

THE SCIENCE, TECHNOLOGY AND INNOVATION ECOSYSTEM OF CAMBODIA



The Science, Technology and Innovation Ecosystem of Cambodia

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FOREWORD

Science, technology and innovation (STI) will be pivotal for Cambodia to meet the ambitions of the Sustainable Development Goals, become an innovation-driven economy, and recover quickly from the COVID-19 pandemic. However, to fully harness the potential of STI and rebuild strategically, evidence-based policies that move beyond the economic imperative and drive inclusive, resilient and sustainable development are essential. Equally, policies that foster a nurturing environment that enables businesses, researchers and innovators to flourish will be fundamental to not leaving anyone behind.

This report on The Science, Technology and Innovation Ecosystem of Cambodia was produced by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in collaboration with the General Department of Science, Technology & Innovation (GDSTI) of the Ministry of Industry, Science, Technology & Innovation (MISTI) to support the formulation of national STI policies. It examines the current policy frameworks, key stakeholders, and the strengths and weaknesses of the national innovation system. Based on the assessment, the report recommends five policy strategies to be considered by policymakers: i) enhance the governance structure of the STI system, ii) develop the national STI workforce, iii) strengthen research capacity and quality, iv) increase collaboration and linkages between different actors, and v) foster an enabling environment for innovation.

Furthermore, this assessment also provides the analytical basis for Cambodia's Science, Technology & Innovation Roadmap 2030, which has been developed by the Ministry of Industry, Science, Technology & Innovation with the support of ESCAP. This Roadmap will guide government officials and other key stakeholders on the critical actions required to enhance national STI capabilities and nurture a dynamic innovation ecosystem. Multiple stakeholders have provided valuable insights to this work, including Directors-General from 18 ministries, directors and rectors of eight leading higher education institutions and research centres, executive directors of companies in various sectors, executives of three accelerator centres, and three international development partners.

This report is also a celebration of the fruitful partnership between ESCAP and the Ministry of Industry, Science, Technology & Innovation. The remarkable effort dedicated to this research and the National STI Roadmap 2030 was only made possible through the collaborative work of both institutions.

We hope that this report will be a valuable resource to advance the goal of creating a more prosperous, inclusive, resilient and sustainable future for Cambodia.



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This analytical report was drafted in 2020 to provide background information for the formulation of Cambodia's National Science, Technology and Innovation Roadmap 2030. The analysis incorporates insights and data gathered during the process of co-creating that Roadmap. The report benefited from the insights and perspectives shared by the following experts from MISTI that participated throughout the co-creation process:

- Mr. Try Sophal, Deputy Director General of the General Department of STI (GDSTI)
- Ms. Kry Nallis, Deputy Director General of GDSTI
- Mr. In Sambo, Deputy Director General of GDSTI
- Mr. Ke Bunthoeurn, Director of Department of Technology Transfer
- Ms. Seng Molika, Director of STI Data Management
- Ms. Ly Sokny, Director of STI Cooperation
- Mr. Cheat Sophal, Director of Policy Monitoring Inspection and Evaluation

The co-creation process was facilitated by Mr. Kal Joffres, Chief Executive Officer, Tandemic. The contribution of multiple national stakeholders that shared their insights during the national consultation and the round tables is also acknowledged.

The manuscript was edited by Ms. Mary Ann Perkins. Ms. Phadnalin Ngerlim and Ms. Su-Arjar Lewchalermvongs provided all the administrative support for producing the report.

EXECUTIVE SUMMARY

Over the past two decades, until the economic shock brought by COVID-19, Cambodia exhibited strong economic performance and made great strides towards sustained and broad-based economic development and poverty reduction. This strong performance has been fostered by sensible public policies that ensure macroeconomic stability and an open economy.

Progress has been achieved in multiple sectors, and the economy is steadily industrializing and modernizing. Cambodia is one of the world's 10 largest rice exporters, doubling its exports of milled rice in the period 2013-2017. The share of the industrial sector in the gross domestic product had increased to 32.8 per cent by 2018. The service sector has also seen strong annual growth, especially via improved performance in domestic trade and transportation.

Cambodia's ambitious Vision 2050 seeks to build a prosperous but also socially inclusive and environmentally sustainable nation through the achievement of the Cambodia Sustainable Development Goals (CSDGs) by 2050.

Science, technology and innovation (STI) will be critical for Cambodia to achieve its vision and become an innovation-driven, high-income country by 2050. Consequently, the Royal Government of Cambodia has drafted significant policies to foster research, innovation and entrepreneurship. It has sought to promote science and technology in the Rectangular Strategy-Phase IV, the National Strategic Development Plan 2019-2023 and the Industrial Development Policy 2015-2025.

More recently, in 2019, the National Science, Technology and Innovation Policy 2020-2030 was adopted to build national capabilities in STI and to strengthen innovation capacity to respond to the fundamental needs of the nation.

In 2020, the Ministry of Industry, Science, Technology and Innovation (MISTI) was established to lead and coordinate STI initiatives that further develop national capacities in this area, support key stakeholders and create favourable framework conditions.

The Cambodian technology start-up ecosystem has progressed rapidly, with over 300 active technology start-ups currently operating at various stages of development. Private support for innovation is also growing, as more co-working spaces, incubators, local angel investors, private equity and venture capital funds appear in the market. Higher education institutions have begun to focus on promoting entrepreneurship and innovation, with some universities establishing their own incubation and start-up centres as well as industry linkage offices. The enactment of several laws, such as the Consumer Protection Law, the E-Commerce Law and the Competition Law, has helped to create more favourable conditions for entrepreneurship and risk-taking.

However, the National Innovation System of Cambodia is still underdeveloped. Cambodia ranked 101 out of 127 countries in the 2018 Global Innovation Index. It scored particularly low in terms of expenditure on education, tertiary enrolment and knowledge-intensive employment. While the new government structure for promoting STI can provide a strong basis for the development of the Cambodian National Innovation System, collaboration among stakeholders (within government and between government, the private sector and academia) is currently weak. The diffused responsibility for science and technology across 11 key ministries presents challenges for effective policy development and governance, and the mandate of MISTI as the main coordinating institution is still to be consolidated.

Awareness about innovation and science in Cambodia is still limited. Social norms related to gender relations continue to constrain the development of women's potential and hinder their empowerment in economic, social, public and political life. In addition, risk aversion in Cambodia constraints innovation. There is a limited scientific culture and a significant mismatch between education in science, technology, engineering and mathematics (STEM) and employment. Only a small percentage of students are studying science, engineering and agriculture – areas of study and skills considered to be key to foster the growth of the Cambodian economy. Furthermore, many small and medium-sized enterprises (SMEs) in Cambodia are still reluctant to formalize their statuses, remaining in the

informal sector. And while framework conditions are improving, the norms and certification system is not fully operational, limiting enterprises' opportunities for entering international value chains.

To further strengthen the National Innovation System of Cambodia, the following policy strategies are recommended:

- **Enhance the governance of the STI system.** Consolidate the mandate of MISTI, clarifying the roles of MISTI and other stakeholders in regard to promoting STI; strengthen awareness and capacities of the Government to implement the STI Policy; and monitor and evaluate advances made in the promotion of STI.
- **Build human capital in STI.** Teaching STI from a very early age will help create a new generation of scientists and innovators. STEM skills will also need to be promoted in higher education. In addition, there is room for strengthening teaching and collaboration with the private sector in technical and vocational education and training institutions.
- **Strengthen research capacity and quality.** To support high quality research and development activities of national interest it will be critical to do the following: develop a national research agenda with the academic community and in close collaboration with the private sector; provide funding to support excellence in science; support the internationalization of research; and encourage collaboration with the private sector.
- **Increase collaboration and linkages between different actors.** To support innovation in SMEs and enhance their absorptive capacities, it will be critical to promote and sustain incubation and acceleration facilities, technological platforms open to the private sector and innovative clusters fostering collaboration.
- **Foster an enabling environment for innovation.** Supporting innovation capabilities and increasing the absorptive capacities of firms requires the financing and promotion of intermediary structures that nurture new firms (start-ups), support technology transfer, and foster domestic technologies. An enabling environment needs fostering institutions that provide technology and quality (i.e., norms and certification) services to firms. It also requires increasing access to finance for innovation activities, including through leveraging investments from the private sector, attracting funding from donors and incentivizing foreign direct investment that supports the building of domestic technological capabilities.

ខ្លឹមសារសង្ខេបប្រតិបត្តិ

Khmer executive summary

ក្នុងរយៈពេលពីរទសវត្សរ៍កន្លងទៅនេះ នៅមុនពេលមានវិបត្តិសេដ្ឋកិច្ចដែលបង្កឡើងដោយជំងឺកូវីដ-១៩ ប្រទេសកម្ពុជាបានរំលេចឡើងនូវសមិទ្ធកម្មសេដ្ឋកិច្ចដ៏ខ្លាំងក្លានិងវឌ្ឍនភាពគួរឱ្យកត់សម្គាល់នៅក្នុងការអភិវឌ្ឍសេដ្ឋកិច្ចប្រកបដោយចីរភាព និងមានវិសាលភាពកាន់តែទូលំទូលាយ ក៏ដូចជាការកាត់បន្ថយភាពក្រីក្រ។ សមិទ្ធកម្មដ៏រឹងមាំនេះអាចសម្រេចទៅបាន ដោយសារតែមានការជំរុញគោលនយោបាយសាធារណៈសមប្រកប ដែលអាចធានាបាននូវស្ថិរភាពម៉ាក្រូសេដ្ឋកិច្ចនិងសេដ្ឋកិច្ចបើកចំហ។

ខណៈដែលរាជរដ្ឋាភិបាលសម្រេចបានវឌ្ឍនភាពនៅក្នុងពហុវិស័យ សេដ្ឋកិច្ចរបស់ប្រទេសក៏កំពុងតែស្ថិតនៅក្នុងដំណាក់កាលនៃការធ្វើឧស្សាហូបនីយកម្ម និងទំនើបកម្មឥតឈប់ឈរ។ កម្ពុជាស្ថិតនៅក្នុងចំណោមប្រទេសនាំចេញអង្ករច្រើនជាងគេទាំង ១០ នៅលើពិភពលោក ដោយបានបង្កើនការនាំចេញអង្ករទ្វេដងក្នុងអំឡុងឆ្នាំ២០១៣ ដល់ ២០១៧។ ការរួមចំណែកនៃវិស័យឧស្សាហកម្មនៅក្នុងផលិតផលក្នុងស្រុកសរុប (ផ.ស.ស.) បានកើនឡើងដល់ទៅចំនួន ៣២,៨% គិតត្រឹមឆ្នាំ២០១៨។ វិស័យសេវាកម្មក៏ឃើញមានកំណើនប្រចាំឆ្នាំខ្លាំងក្លាផងដែរ ជាពិសេសតាមរយៈសមិទ្ធកម្មដែលប្រសើរនៃពាណិជ្ជកម្មក្នុងស្រុក និងការដឹកជញ្ជូន។

ចក្ខុវិស័យកម្ពុជាឆ្នាំ២០៥០ មានមហិច្ឆតាកសាងកម្ពុជាឱ្យក្លាយទៅជាប្រទេសដែលមិនត្រឹមតែមានវិបុលភាពប៉ុណ្ណោះទេ ថែមទាំងមានបរិយាប័ន្នក្នុងសង្គម និងមានចីរភាពបរិស្ថានផងដែរ តាមរយៈការសម្រេចបាននូវគោលដៅអភិវឌ្ឍន៍ប្រកបដោយចីរភាពកម្ពុជាត្រឹមឆ្នាំ២០៥០។

វិទ្យាសាស្ត្រ បច្ចេកវិទ្យា និងនវានុវត្តន៍ (វ.ប.ន.) នឹងដើរតួនាទីយ៉ាងចាំបាច់បំផុត សម្រាប់ប្រទេសកម្ពុជាដើម្បីឈានទៅសម្រេចបាននូវចក្ខុវិស័យរបស់ខ្លួន ព្រមទាំងប្រែក្លាយទៅជាប្រទេសដែលមានចំណូលខ្ពស់ដែលដឹកនាំតម្រង់ទិសដោយនវានុវត្តន៍នៅឆ្នាំ២០៥០។ ហេតុដូច្នេះហើយទើបរាជរដ្ឋាភិបាល

កម្ពុជាបានរៀបចំសេចក្តីព្រាងគោលនយោបាយសំខាន់ៗដើម្បីជួយជំរុញការងារស្រាវជ្រាវ នវានុវត្តន៍ និងសហគ្រិនភាព។ រាជរដ្ឋាភិបាលក៏បានលើកកម្ពស់វិស័យវិទ្យាសាស្ត្រ និងបច្ចេកវិទ្យាដូចមានរំលេចនៅក្នុងយុទ្ធសាស្ត្រចតុកោណដំណាក់កាលទី ៤ ផែនការយុទ្ធសាស្ត្រអភិវឌ្ឍន៍ជាតិឆ្នាំ ២០១៩-២០២៣ និងគោលនយោបាយអភិវឌ្ឍន៍វិស័យឧស្សាហកម្មកម្ពុជា ឆ្នាំ២០១៥-២០២៥។

នៅក្នុងឆ្នាំ២០១៩ រាជរដ្ឋាភិបាលកម្ពុជាបានអនុម័តគោលនយោបាយជាតិស្តីពីវិទ្យាសាស្ត្រ បច្ចេកវិទ្យា និងនវានុវត្តន៍ ឆ្នាំ២០២០-២០៣០ ក្នុងគោលបំណងកសាងសមត្ថភាពជាតិនៅក្នុងវិស័យ វ.ប.ន. និងពង្រឹងសមិទ្ធកម្មនវានុវត្តន៍ សំដៅឆ្លើយតបទៅនឹងតម្រូវការជាមូលដ្ឋានរបស់ជាតិ។

នៅក្នុងឆ្នាំ២០២០ ក្រសួងឧស្សាហកម្ម វិទ្យាសាស្ត្រ បច្ចេកវិទ្យា និងនវានុវត្តន៍ (ខ.វ.ប.ន.) ត្រូវបានបង្កើតឡើងដោយមានភារកិច្ចដឹកនាំ និងសម្របសម្រួលគំនិតផ្តួចផ្តើមនានានៅក្នុងវិស័យ វ.ប.ន. សំដៅអភិវឌ្ឍសមត្ថភាពជាតិបន្ថែមទៀតក្នុងវិស័យនេះ ព្រមទាំងផ្តល់ការគាំទ្រដល់តួអង្គពាក់ព័ន្ធសំខាន់ៗ និងបង្កើតលក្ខខណ្ឌក្របខណ្ឌអំណោយផលផ្សេងៗ។

នៅកម្ពុជា ប្រព័ន្ធអេកូឡូស៊ីសម្រាប់បណ្តុះធុរកិច្ចថ្មីក្នុងវិស័យបច្ចេកវិទ្យាមានការរីកចម្រើនយ៉ាងឆាប់រហ័ស ក្នុងនោះធុរកិច្ចថ្មីផ្នែកបច្ចេកវិទ្យាដែលសកម្មចំនួនជាង ៣០០ គឺកំពុងដំណើរការនៅក្នុងកម្រិតផ្សេងៗគ្នា។ ការគាំទ្រពីវិស័យឯកជនចំពោះនវានុវត្តន៍ក៏កំពុងរីកដុះដាលផងដែរ គួយយោង គេសង្កេតឃើញមានវត្តមានសេវាកម្មមួយចំនួនកើនឡើងនៅក្នុងទីផ្សារដូចជា កន្លែងធ្វើការងាររួមគ្នា (Co-Working Spaces) មជ្ឈមណ្ឌលក្លាស់ (Incubation Centers) វិនិយោគិនគាំទ្រហិរញ្ញវត្ថុក្នុងស្រុក (Local Angel Investors) មូលនិធិមូលធនឯកជន (Private Equity Funds) និងមូលនិធិវិនិយោគផ្សងព្រេង (Venture Capital Funds)។ ស្ថាប័ន

ឧត្តមសិក្សាបានចាប់ផ្តើមផ្ដោតការយកចិត្តទុកដាក់លើការលើកកម្ពស់វិស័យសហគ្រិនភាព និងនវានុវត្តន៍ ដោយមានសាកលវិទ្យាល័យខ្លះបានបង្កើតមជ្ឈមណ្ឌលភ្នាក់ងារ និងមជ្ឈមណ្ឌលបណ្តុះបណ្តាលកិច្ចជំនាញខ្លួន ក៏ដូចជាបានបង្កើតការិយាល័យភ្ជាប់ទំនាក់ទំនងជាមួយសហគ្រាស។ ការអនុម័តច្បាប់មួយចំនួនដូចជា ច្បាប់ស្តីពីកិច្ចការពារអ្នកប្រើប្រាស់ ច្បាប់ស្តីពីពាណិជ្ជកម្មតាមប្រព័ន្ធអេឡិចត្រូនិក និងច្បាប់ស្តីពីការប្រកួតប្រជែង បានរួមចំណែកជួយបង្កើតលក្ខខណ្ឌអំណោយផលដល់សហគ្រិនភាព និងហ៊ានប្រឈមនឹងហានិភ័យ។

ទោះយ៉ាងណា ប្រព័ន្ធនវានុវត្តន៍ជាតិរបស់ប្រទេសកម្ពុជា នៅតែមិនទាន់មានការរៀបចំនៅឡើយ។ ជាក់ស្តែង នៅក្នុងសន្ទស្សន៍នវានុវត្តន៍សកល ឆ្នាំ២០១៨ កម្ពុជាជាប់ចំណាត់ថ្នាក់លេខ ១០១ ក្នុងចំណោម ១២៧ ប្រទេស ក្នុងនោះកម្ពុជាទទួលបានពិន្ទុទាប ទាក់ទងនឹង ការចំណាយលើវិស័យអប់រំ ការចុះឈ្មោះចូលរៀននៅថ្នាក់ឧត្តមសិក្សា និងការងារដែលពឹងផ្អែកខ្លាំងលើចំណេះដឹង។ ខណៈដែលរចនាសម្ព័ន្ធថ្មីរបស់រាជរដ្ឋាភិបាលសម្រាប់លើកកម្ពស់វិស័យ វ.ប.ន. អាចផ្តល់ជាមូលដ្ឋានដ៏រឹងមាំក្នុងការអភិវឌ្ឍប្រព័ន្ធនវានុវត្តន៍ជាតិក្តី ក៏កិច្ចសហការគ្នាក្នុងចំណោមគូអង្គពាក់ព័ន្ធ ជាអាទិ៍៖ នៅក្នុងជួររាជរដ្ឋាភិបាល និងរវាងរដ្ឋាភិបាល វិស័យឯកជន និងគ្រឹះស្ថានអប់រំនៅតែមានភាពទន់ខ្សោយនៅឡើយ។ ការបែងចែកទំនួលខុសត្រូវសម្រាប់វិស័យវិទ្យាសាស្ត្រ និងបច្ចេកវិទ្យា ក្នុងចំណោមក្រសួង-ស្ថាប័នសំខាន់ៗទាំង ១១ គឺជាបញ្ហាប្រឈមនៅក្នុងអភិបាលកិច្ច និងការអភិវឌ្ឍគោលនយោបាយឱ្យមានប្រសិទ្ធភាព ក្នុងនោះដែរ សមត្ថកិច្ចរបស់ក្រសួង ឧ.វ.ប.ន. ក្នុងនាមជាស្ថាប័នចម្បងក្នុងការសម្របសម្រួលក៏នៅតែត្រូវការបង្រួបបង្រួមបន្ថែមទៀតដែរ។

ការយល់ដឹងអំពីនវានុវត្តន៍ និងវិទ្យាសាស្ត្រនៅកម្ពុជានៅមានកម្រិតនៅឡើយ។ បទដ្ឋានសង្គមពាក់ព័ន្ធនឹងទំនាក់ទំនងយេនឌ័រនៅតែបន្តជាឧបសគ្គរារាំងដល់ការអភិវឌ្ឍសក្តានុពលរបស់ស្ត្រី ក៏ដូចជារារាំងការផ្តល់សិទ្ធិអំណាចជូនពួកគាត់ដើម្បីមានលទ្ធភាពប្រឡូកនៅក្នុងវិស័យសេដ្ឋកិច្ច សង្គម សាធារណៈ និងនយោបាយ។ លើសពីនេះទៀត ការបញ្ចៀសមិនចង់ជួបហានិភ័យក៏ជាឧបសគ្គរារាំងដល់វិស័យនវានុវត្តន៍ផងដែរ។ ខណៈដែលវប្បធម៌វិទ្យាសាស្ត្រនៅតែមានកម្រិត គេក៏សង្កេតឃើញពីភាពមិនស៊ីជម្រាក់គ្នារវាងការអប់រំផ្នែកវិទ្យាសាស្ត្រ

បច្ចេកវិទ្យា វិស្វកម្ម និងគណិតវិទ្យា (ស្នែម) និងរវាងទីផ្សារការងារ។ មាននិស្សិតមួយចំនួនតូចតែប៉ុណ្ណោះដែលកំពុងសិក្សាលើមុខវិជ្ជាវិទ្យាសាស្ត្រ វិស្វកម្ម និងកសិកម្ម ពោលគឺជាមុខវិជ្ជាសិក្សានិងជាជំនាញដែលត្រូវបានចាត់ទុកថាជាគន្លឹះដ៏សំខាន់ដើម្បីជំរុញកំណើនសេដ្ឋកិច្ចជាតិ។ ជាងនេះទៅទៀត សហគ្រាសធុនតូច និងមធ្យម ជាច្រើននៅតែមានការស្ទាក់ស្ទើរក្នុងការចុះបញ្ជីជាផ្លូវការ ដោយបន្តស្ថិតនៅក្រៅផ្លូវការដដែល។ នៅពេលដែលលក្ខខណ្ឌក្របខណ្ឌកំពុងមានភាពប្រសើរឡើង ប៉ុន្តែបទដ្ឋាននិងប្រព័ន្ធវិញ្ញាបនបត្រកម្មពុំបានដំណើរការពេញលេញនៅឡើយដែលបានកាត់បន្ថយឱកាសសម្រាប់សហគ្រាសក្នុងការហាក់ចូលទៅក្នុងខ្សែច្រវាក់តម្លៃអន្តរជាតិ។

ដើម្បីពង្រឹងប្រព័ន្ធនវានុវត្តន៍ជាតិបន្ថែមទៀត យុទ្ធសាស្ត្រគោលនយោបាយត្រូវបានផ្តល់ជាអនុសាសន៍ដូចមានរៀបរាប់ខាងក្រោម។

- **កែលម្អអភិបាលកិច្ចនៃប្រព័ន្ធ វ.ប.ន.៖** ពង្រឹងសមត្ថកិច្ចរបស់ក្រសួង ឧ.វ.ប.ន. ដោយការកំណត់ឱ្យបានសំលាស់ពីតួនាទីរបស់ក្រសួង និងតួអង្គពាក់ព័ន្ធដទៃទៀត ទាក់ទងនឹងការលើកកម្ពស់វិស័យ វ.ប.ន. លើកកម្ពស់ការយល់ដឹង និងពង្រឹងសមត្ថភាពរបស់រាជរដ្ឋាភិបាលក្នុងការអនុវត្តគោលនយោបាយជាតិ វ.ប.ន. និងត្រួតពិនិត្យ និងវាយតម្លៃវឌ្ឍនភាពនៅក្នុងការលើកកម្ពស់វិស័យ វ.ប.ន.។
- **កសាងមូលធនមនុស្សផ្នែក វ.ប.ន.៖** ការបង្រៀនមុខវិជ្ជា វ.ប.ន. តាំងពីកុមារភាពនឹងជួយបង្កើតក្រុមអ្នកវិទ្យាសាស្ត្រ និងអ្នកនវានុវត្តជំនាន់ថ្មី។ ជំនាញផ្នែកស្នែមក៏ត្រូវការការលើកកម្ពស់នៅក្នុងថ្នាក់ឧត្តមសិក្សាផងដែរ។ លើសពីនេះទៀត ការពង្រឹងកិច្ចការបង្រៀន និងកិច្ចសហការជាមួយវិស័យឯកជននៅតាមស្ថាប័នអប់រំបណ្តុះបណ្តាលបច្ចេកទេស និងវិជ្ជាជីវៈ (ជីវេត) គួរត្រូវបានគិតគូរពង្រឹងបន្ថែមទៀត។
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ការធ្វើអន្តរជាតិបន្ថែមនឹងកម្មវិធីការស្រាវជ្រាវ ព្រមទាំងលើកទឹកចិត្តឱ្យមានកិច្ចសហការជាមួយវិស័យឯកជន។

- **បង្កើនកិច្ចសហការនិងបណ្តាញរវាងតួអង្គពាក់ព័ន្ធ៖** ដើម្បីគាំទ្រដល់នវានុវត្តន៍នៅក្នុងសហគ្រាសធុនតូច និងមធ្យម និងដើម្បីបង្កើនសមត្ថភាពស្រូបយក ចាំបាច់ត្រូវលើកកម្ពស់និងទ្រទ្រង់បរិក្ខារឧបទេសក្លាស់ និងពន្លឿនធុរកិច្ចវេទិកាបច្ចេកវិទ្យាដែលបើកចំហដល់វិស័យឯកជន និងបណ្តុះស្ថាប័នដែលមានលក្ខណៈនវានុវត្តន៍សំដៅជំរុញកិច្ចសហការ ។
- **ជំរុញប្រព័ន្ធអេកូឡូស៊ីដែលបង្កបរិយាកាសអំណោយផលដល់នវានុវត្តន៍៖** ដើម្បីគាំទ្រសមត្ថភាពនវានុវត្តន៍ និង

បង្កើនសមត្ថភាពស្រូបយករបស់ក្រុមហ៊ុន ទាមទារឱ្យមានហិរញ្ញប្បទាន និងការលើកកម្ពស់រចនាសម្ព័ន្ធអន្តរកាវីដែលជួយបណ្តុះធុរកិច្ចថ្មី (start-ups) ក៏ដូចជាគាំទ្រការផ្ទេរបច្ចេកវិទ្យា និងលើកកម្ពស់បច្ចេកវិទ្យាក្នុងស្រុក។ លើសពីនេះទៅទៀត គេក៏ចាំបាច់ត្រូវជួយជំរុញស្ថាប័នណាដែលមានសមត្ថកិច្ចក្នុងការផ្តល់សេវាកម្មបច្ចេកវិទ្យា និងគុណភាព (ដូចជា បទដ្ឋាននិងវិញ្ញាបត្រកម្ម) ទៅដល់បណ្តាក្រុមហ៊ុន។ ម្យ៉ាងទៀត ក៏ទាមទារនូវការបង្កើនលទ្ធភាពទទួលបានហិរញ្ញប្បទាន សម្រាប់សកម្មភាពនវានុវត្តន៍ តាមរយៈការលើកកម្ពស់ការវិនិយោគពីវិស័យឯកជន និងការទាក់ទាញប្រភពថវិកាពីម្ចាស់ជំនួយ។ ការលើកទឹកចិត្តឱ្យមានការវិនិយោគផ្ទាល់ពីបរទេស ដែលគាំទ្រដល់ការកសាង សមត្ថភាពបច្ចេកវិទ្យាក្នុងស្រុក។

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ABBREVIATIONS

| | |
|----------|--|
| ADB | Asian Development Bank |
| ASEAN | Association of Southeast Asian Nations |
| CDRI | Cambodia Development Resource Institute |
| CSDG | Cambodia Sustainable Development Goals |
| ESCAP | Economic and Social Commission for Asia and the Pacific (United Nations) |
| FDI | foreign direct investment |
| GDP | gross domestic product |
| ICT | information and communication technologies |
| ITC | Institute of Technology of Cambodia |
| MEF | Ministry of Economy and Finance |
| MISTI | Ministry of Industry, Science, Technology and Innovation |
| MOEYS | Ministry of Education Youth and Sports |
| MPTC | Ministry of Post and Telecommunications |
| MSME | micro, small and medium-sized enterprises |
| NIPTICT | National Institute of Post and Telecommunication and ICT |
| OECD | Organisation for Economic Co-operation and Development |
| R&D | research and development |
| RS-IV | Rectangular Strategy, Phase IV |
| RUPP | Royal University of Phnom Penh |
| SME Bank | Small and Medium Enterprise Bank of Cambodia |
| SMEs | small and medium-size enterprises |
| STEM | science, technology, engineering and mathematics |
| STI | science, technology and innovation |
| TVET | technical and vocational education and training |
| UICC | University Industry Cooperation Centre |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |

CHAPTER

1

SOCIOECONOMIC CONTEXT OF CAMBODIA

1.1 GENERAL OVERVIEW

Cambodia has 25 provinces, including Phnom Penh municipality, with varying population distributions and socioeconomic conditions. Provinces in the far north-east (Ratanakiri, Mondulakiri, Preah Vihear and Stung Treng) and south-west (Koh Kong) are remote and either forested or mountainous. Most people live along two major river systems, the Mekong and Tonlé Sap. Cambodia's primary economic corridor runs from the far south-east to the midpoint of the western border with Thailand.¹

After gaining independence in 1953 and facing political and economic turmoil from the 1960s till the 1990s, the country began rebuilding its economy, which was principally based on agriculture, including fishing, forestry and other natural resources (see Box 1.1).²

Cambodia joined the Association of Southeast Asian Nations (ASEAN) in 1999. Smaller and less technologically advanced than some of the other member countries, it is still catching up in terms of institutional reforms and human resources. However, since then, Cambodia has reaped benefits from its membership through a common trading block that has

enlarged its economic prospects and provided a security shield in a region with rising tensions and an opportunity to promote Cambodian culture.

In the past two decades, Cambodia has demonstrated strong economic performance and made great strides towards sustained and broad-based economic development. New industries, such as textiles and tourism, are flourishing with world renowned cultural sites, such as the Angkor Wat Temple and Siem Reap. Oil was discovered in 2005 in the sea off Cambodia and was first exploited in early 2021. The service sector has also seen strong annual growth in recent years.

Cambodia has maintained an average gross domestic product (GDP) growth rate of over 7 per cent per year in the past two decades, supported by policies that ensure strong macroeconomic stability and an open economy. This has resulted in higher average incomes and a dramatic reduction in poverty, accompanied by high levels of employment and the reduction of inequality.³ Domestic revenue is estimated to have reached a record high of 22.3 per cent of GDP in 2018, thanks to improved tax administration.

¹ UNDP 2019.

² In 1991, Employment in Agriculture, as a percentage of total employment, was 78 per cent, against 34.5 per cent in 2019. World Bank Data. <https://data.worldbank.org/country/cambodia>.

³ Government of Cambodia 2019, p. 3.

Box 1.1. Key socioeconomic indicators, Cambodia

- Area: 181,035 square kilometres
- Population: 15.288 million people
- Capital: Phnom Penh
- Language: Official language is Khmer
- Ethnicity: Khmer (90%), Vietnamese, Cham and Lao
- Religions: Buddhism (97%), Muslim (1.1%), Christian (0.5%), (other religions) 0.6%
- GDP: \$24.54 billion (2018)
- GDP per capita: \$1,510.32 (2018)
- Economic growth: 7.5% (2018/19). Projection: 2% contraction in 2020 due to COVID-19 followed by 4% growth in 2021*
- Important industry sectors: Agriculture, manufacturing (garment, non-garment and footwear), construction and tourism
- Government budget: -5.10% of GDP (2018)
- Unemployment (percentage of total labour force): 1.05% (2018)
- Share of the workforce in informal/vulnerable employment: 70% (2018)**

Notes

*World Bank 2020, Cambodia Economic Update, November 2020: Restrained Recovery.

**Government of Cambodia 2019, Decent Work Country Programme 2019-2023. Available at www.ilo.org/wcmsp5/groups/public/---ed_mas/---program/documents/genericdocument/wcms_711728.pdf.

With substantial ongoing investment by both the public and the private sectors, Cambodia's economy was forecasted before 2020 to continue growing robustly, with further structural change in favour of industrial development, from 27.7 per cent GDP in 2015 to 32.8 per cent in 2018 and 38.2 per cent in 2022. The COVID-19 pandemic led to global economic perturbations that impacted the Cambodian economy, which has been forecasted to contract by 2 per cent in 2020. However, the World Bank has forecasted that growth will be renewed in 2021 with an estimated figure of 4 per cent. The leading manufacturing sector – garments and footwear – continues to grow and support positive structural change and growth in value-added. There has also been some diversification of the industrial base, notably in automotive parts and electronics.⁴

The percentage of Cambodians living under the national poverty line⁵ fell by around 1 per cent per year

on average, down to about 13 per cent in 2018 from 48 per cent in 2007.⁶ Though impressive gains continued to be made, the reduction in poverty during 2013–2017 was less than during 2009–2013, mainly because economic growth benefited the non-poor more, while urban poverty stagnated compared to the earlier period. Poverty is overwhelmingly concentrated in rural areas, and the gap appears to be growing as economic opportunity is concentrated in urban areas (reduced agricultural share of GDP), which is associated with migration from rural areas.

Even though Cambodia still experiences some needs, essential access to infrastructure is assured in the country and can be a driver for innovation. Currently, electrical infrastructure enables to supply electricity to 12,305 villages, representing 86.85 per cent of all villages in Cambodia. In 2016, 18 per cent of the population relied primarily on clean fuel and technology, in the sense that these do not create

⁴ Government of Cambodia 2019.

⁵ KHR 3,871 (\$0.95) per day, as defined by the Ministry of Planning in 2013.

⁶ See <https://www.worldbank.org/en/country/cambodia/overview>; See also Asian Development Bank data on poverty in Cambodia.

pollution within the home. The share of renewable energy in total energy consumption has not kept pace with overall consumption. In 2000, it was 81.4 per cent but fell below 68.52 per cent in 2010 and, after some fluctuation, reached 64.92 per cent in 2015. However, renewable energy electricity generation has increased over the past 16 years, with hydropower being the main renewable energy source in 2016. Telecommunications infrastructure has expanded quite rapidly in the past two decades. The use of information and communications technology (ICT) has risen substantially as reflected in the rise in mobile phone numbers from 2.7 million in 2012 to 10 million in 2017 according to the Rectangular Strategy-Phase IV (RS-IV).

Internet usage in the country is in rapid development and now covers 98 per cent of the population. Similarly, to other frontier markets, it is highly social with 9.7 million Facebook active users (57 per cent of the population) at the beginning of 2020, a 40 per cent

increase from 2018. The majority of businesses with any online presence are on Facebook. The country might lean on its wide access to electricity and basic digital tools to support and sustain innovation.

Finally, drawing on this economic progress, the Government of Cambodia has improved its tax administration and benefits from increased public resources. Direct and indirect taxes increased significantly during the past several years, partly thanks to better revenue administration. E-tax services covering tax returns, tax registrations and e-value-added tax (VAT), as well as the use of the banking system for tax payments have been introduced.⁷ In addition, driven by rising imports, trade tax collection is estimated to have accelerated in 2019, contributing 2.4 per cent of GDP, or a 20 per cent year-on-year increase, up from 2.2 per cent in 2017. This happened despite commitments made under the ASEAN Free Trade Agreement.⁸

1.2 SECTORAL STRUCTURE OF THE CAMBODIAN ECONOMY

Agricultural sector, still the first source of production and employment

Policies that prioritize industrialization and modernization of the economy have resulted in a declining share of the agricultural sector in GDP. The significant migration of workers to industry in urban centres and abroad has further shifted the balance away from the rural economy. Yet, the agricultural sector remains an important source of production and employment. Cambodia is one of the world's 10 largest rice exporters, doubling its exports of milled rice in the period 2013–2017.⁹

During the past decade or so, there has been some progress on quality differentiation and branding. As Cambodia neighbours commodity giants, Malaysia, Thailand and Viet Nam, the country has strategically worked toward quality differentiation (rice, pepper), sustainability premiums ("green") and improved food safety ("clean"), while advancing agro-processing (cashews, starch). In this regard, authorities have introduced the "Malys Angkor" rice brand as well as

products with geographical indications, such as Kampot pepper and Mondulhiri coffee. Cassava processing plants are being built. However, diversification toward the production of animal products and fisheries remains less successful despite rising demand and prices. Rising income and urbanization with a rapid expansion of the tourism sector, although temporarily halted by COVID-19, is changing household food consumption, particularly the consumption of animal products. This is also true for exports as the Asian middle class expands, especially in China.¹⁰

In February 2019 when trade safeguard measures were fully applied by the European Union, rice exports to the European Union declined by 57.8 per cent month-on-month. In contrast, rice exports to the Chinese market grew by 45.6 per cent. As a result, milled rice exports from Cambodia managed to increase by 2 per cent during the first two months of 2019. Official data show that Cambodia received \$413.5 million from its milled rice exports in 2018.¹¹

⁷ World Bank 2019, p. 18.

⁸ Ibid.

⁹ Government of Cambodia 2019.

¹⁰ World Bank 2019, p. 13–14.

¹¹ Ibid.

Growing importance of the industrial and manufacturing sector

The share of the industrial sector in GDP increased from 27.7 per cent in 2015 to 32.8 per cent, and the industrial sector employed 23.9 per cent of the labour force in 2018 and 23.8 per cent in 2017, ahead of the target set by the Government.¹² However, the manufacturing sector has increased from 16.0 per cent of GDP in 2015 to only 16.8 per cent in 2018, signifying the slower progress of the core industrial base. Construction has been the most dynamic sector, growing by about 9.8 per cent in 2015 and by an estimated 13.7 per cent in 2018.¹³

Investment by the Government of Cambodia, development partners and the private sector has continued to target infrastructure, essentially roads, rail, bridges, ports, hydropower, solar farms, power transmission lines and irrigation systems. This has, to some extent, enabled the relocation of garment factories from the capital to rural areas that are closer to labour sources and this has relieved some burdens on urban infrastructure. The Government of Cambodia formulated the Industrial Development Policy 2015–2025 with some 100 detailed measures for addressing a range of priorities, including skill development, technology, financing, trade facilitation and investment. Cambodia has continued to receive significant amounts of foreign direct investment (FDI), although it has been skewed to real estate and tourism development in the past few years. Construction and infrastructure industries are the first beneficiaries of FDI in the country, followed by textiles, agriculture and tourism.¹⁴

However, Cambodia is still faced with high logistics costs; relatively weak institutional coordination; and a lack of coherent quality infrastructure limiting producers' access to market and enterprises' choice of locations across the country. Weaknesses in energy, skill development and technologies, including digital technologies, are constraining the growth of the manufacturing subsector, and capacity is inadequate to implement the Industrial Development Policy.¹⁵

Cambodia's industrial base remains narrow and uneven with most of its activities concentrated in garment production and food processing. There is a

"missing middle" in the industrial base. A small percentage (0.6 per cent) of large enterprises account for some 76 per cent of Cambodia's turnover and 63 per cent of employment, while 97 per cent of microenterprises account for only 12 per cent of turnover and 30 per cent of employment.¹⁶ Some 80 per cent of large industrial enterprises manufacture garments, textiles and footwear and more than 63 per cent of large manufacturers are driven by FDI and exports.¹⁷ The bulk of Cambodia's export revenue comes from textiles at nearly 68 per cent of total exports.¹⁸ By contrast, almost all microenterprises and small enterprises in Cambodia are locally owned.¹⁹

The number of informal businesses in Cambodia is very high. The informal sector is estimated to account for an overwhelming 98.6 per cent of microenterprises, 62.8 per cent of small enterprises, 28.6 per cent of medium-sized enterprises and 7.0 per cent of large enterprises.²⁰ A limited number of medium-sized and large companies that are formally registered contribute the bulk of the Government's revenue from taxes. This is mainly caused by the fact that microenterprises account for the vast majority of businesses in Cambodia. Notably, approximately 45 per cent of Cambodian women are self-employed in the informal sector.²¹

An emerging and thriving service sector

The service sector has seen strong annual growth, especially via better performance in domestic trade and transportation. Growth in recent years has been robust in tourism, retail/wholesale and real estate sectors, which represent major components of employment and output in the economy.²²

Financial services and the banking sector have been growing sharply in the past decade and more soundly since 2016, as high credit growth was brought under control. There has been a recent boom in the construction and real estate sectors. For example, in 2018, approved residential and commercial development projects (excluding mega projects of \$1 billion or more) amounted to \$4.6 billion, representing a 14 per cent increase from 2017. However, it is unlikely

¹² Government of Cambodia 2019, p. 51.

¹³ Government of Cambodia 2019, p. 50.

¹⁴ See <https://santandertrade.com/en/portal/establish-overseas/cambodia/investing-3>.

¹⁵ Government of Cambodia 2019, p. 66.

¹⁶ Ministry of Industry and Handicraft 2016.

¹⁷ Ibid.

¹⁸ World Bank 2016a.

¹⁹ OECD 2018, p. 58.

²⁰ Ministry of Industry and Handicraft 2016.

²¹ Ministry of Industry and Handicraft 2016; OECD 2018, p. 58.

²² Ibid.

to be sustainable due to the speculative nature of businesses in those sectors.²³

Recently, domestic credit to the service sector appears to be rising. This includes credit for wholesale, transport, telecommunications and personal consumption purposes. The trend underscores rising consumption and construction demands, which are increasingly met by relatively large wholesale businesses. This can be witnessed through a surge in imports of durable goods such as motor vehicles and construction materials.

In contrast, domestic credit to the agriculture sector, manufacturing activities or retail services (including the food sector) shrank.²⁴

Total outstanding loans financed by the banking and microfinance sectors reached more than 100 per cent of GDP, or 104.2 trillion riels in 2018, of which 80 per cent was provided by the banking sector and the remaining 20 per cent by the microfinance sector. This, however, excludes credit provided by the “shadow banking” system introduced by real estate developers, rental and leasing firms, pawn shops and informal lenders. Therefore, the magnitude of total credit provided to the economy is much greater.²⁵

Despite sector growth, there are clear needs in financial services: some 78 per cent of the population is unbanked, only 3 per cent of the population owns a credit card; and only 13 per cent use any form of mobile payment. The rise of fintech platforms and products that circumvent the traditional banking system, could represent ‘leapfrog’ solutions in the Cambodian market.²⁶

The growth of international tourist arrivals was sustained at 10.7 per cent year-on-year in 2018, slightly lower than 11.8 per cent in 2017, thanks mainly to the rising number of Chinese visitors. This rising trend, however, halted following the outbreak of COVID-19, and the country received 1.26 million foreign visitors during the first 10 months of 2020, down 76 per cent from the same period in 2019 according to the Ministry of Tourism.²⁷

Several initiatives have been introduced to improve and upgrade tourism services such as “clean city-clean resorts-good services”, street food standards, public places with free Wi-Fi, and green belt and smart city initiatives. However, there is a need to invest more toward providing sufficient and well-functioning public tourism infrastructure and improving cooperation between commercial and public entities.²⁸

²³ World Bank 2019.

²⁴ World Bank 2019, p. 17.

²⁵ Ibid.

²⁶ Kem et al. 2019, p. 8.

²⁷ See www.phnompenhpost.com/national/foreign-tourist-arrivals-down-761-ministry.

²⁸ World Bank 2019, p. 12.

CHAPTER

2

AMBITIONS FOR 2030 AND 2050

2.1 NATIONAL STRATEGIES

Rectangular Strategy and national strategic development plan

The integration of economic, social and environmental dimensions is key to achieving sustainable development. The Government of Cambodia mainstreams these three dimensions into strategic planning both at the national and subnational levels. At the national level, RS-IV, endorsed in July 2018, specifies four policy rectangles: (1) human resource development; (2) economic diversification; (3) private sector and market development; and (4) sustainable and inclusive development. This feeds into the National Strategic Development Plan 2019-2023, which in turn drives budgeting for sector planning and delivery.

The five-year development plans and three-year rolling plans at the capital and provincial level have been developed to support RS-IV and have been endorsed by the capital and provincial councils.

Vision 2050: achieving the Cambodia Sustainable Development Goals

The Government has taken several bold steps to promote sustainable development - Cambodia's ambitious Vision 2050 seeks a prosperous but also socially inclusive and environmentally sustainable

Cambodia through the achievement of the Cambodia Sustainable Development Goals (CSDGs) by 2050. Building on the 2030 Agenda and the global Sustainable Development Goals, the CSDGs include an additional goal on de-mining. The CSDGs are supported by 88 targets and 148 indicators, and the framework draws heavily on local data sets and the national policy approach.

The CSDGs have been integrated in national plans and policies, through their inclusion in the National Strategic Development Plan monitoring and evaluation framework, where about 40 per cent of the indicators have been adopted. Additionally, the Government of Cambodia intends to innovatively use CSDG indicators as performance measures within ministry and agency budget strategic plans. This innovation has attracted some international interest.²⁹

However, there are still many challenges to overcome, and a more evidence-based approach to supporting sustainable development is needed. Three major priorities are to be tackled: enabling effective oversight by strengthening evidence and credible data sources; building thorough management capacity and enacting governance reforms to support delivery; and financing the CSDGs. The latter includes finding new resources to support the CSDGs as official development assistance and other traditional sources decline and channelling the role of non-State actors.

²⁹ Government of Cambodia 2019.

2.2 SECTORAL STRATEGIES

In 2015, the Government of Cambodia adopted the Industrial Development Policy 2015-2025 with some 100 detailed measures for addressing a range of priorities, including skill development, technology, financing, trade facilitation and investment. The vision of the Government is to transform and modernize Cambodia's labour-intensive industrial structure to a skill-driven industrial structure by 2025, through the following: connecting to regional and global value chains; integrating into regional production networks and developing interconnected production clusters while working to strengthen competitiveness and enhance productivity of domestic industries; and developing a technology-driven and knowledge-based modern industry. The realization of this vision should contribute to national economic development, sustainable, inclusive and high economic growth, employment creation, increased valued-added to the economy and increased income for the Cambodian people.

More recently, in March 2019, a package of 17 reform measures aimed at improving competitiveness, promoting SMEs and attracting FDI was presented by the Prime Minister of the Kingdom of Cambodia at the Government Private Sector Forum. The measures range from reducing logistics costs to lowering electricity tariffs, improving the labour law, increasing the ability of SMEs to access finance and finalizing the amendment of the Law on Investment and the Law on Special Economic Zones. There are around 30 special economic zones where businesses enjoy more favourable operating conditions. The aim is to enable the development of industrial clusters and, in turn, new and better-quality employment opportunities for local populations.

To support SMEs, MISTI promulgated the Five-Year SME Development Plan in the early 2020 to create synergies with the current work attached to the Industrial Development Policy and the ASEAN Strategic Action Plan on SME Development 2016-2025 that promotes micro, small and medium-sized enterprises (MSMEs) in the region individually and collectively.

The Skills Development Fund was set up in 2018 to bridge the skills gaps in the Cambodian economy and focus on five priority areas, namely, manufacturing, construction, ICT, electronics and tourism. In the same year, the Government of Cambodia issued a subdecree to provide tax breaks to SMEs for up to five years. In addition, the Small and Medium Enterprise Bank of

Cambodia (SME Bank) and the Entrepreneurship Development Fund and Entrepreneurship Promotion Centre were created by the Ministry of Economy and Finance (MEF) and began operating from early 2020.

A new investment law is being reviewed by the Government and should be approved in 2021. It aims to increase Cambodia's competitiveness and to modernize and increase the productivity of local industries through greater integration into the regional and global supply chain. It also seeks to establish an investment incentive regime that is transparent, predictable, non-discriminatory and competitive, that supports socioeconomic policies and safeguards the rights and legitimate interests of investors in Cambodia.

With the Industrial Development Policy and various supporting strategies in place, the Government of Cambodia has cooperated with various international partners to co-implementing various programmes and projects. These include the Programme for Country Partnership 2018-2023 with the United Nations Industrial Development Organization, various intellectual property agencies, the ASEAN Coordinating Committee on Standards and Quality and the ASEAN Committee on Science, Technology and Innovation.

In late 2017, MEF set up a Public-Private Partnership Unit to boost projects that are predominantly financed by private enterprises. It is expected that contracts could be drawn between government agencies (such as line ministries) and private partners in designing, building, operating and maintaining investment projects, including build-operate-transfer and concession projects.

On the digital front, under the supervision of the Ministry of Post and Telecommunications (MPTC), the Government of Cambodia has adopted the Law on Telecommunications, the Telecommunications/ICT Development Policy 2020 and the ICT Master Plan 2020. The Law on Telecommunications aims to ensure efficient use of infrastructure and networks and the provision of effective, safe, quality, reliable and affordable telecommunications services. It encourages private sector participation in the development of this sector, ensures fair competition and protects consumers. The Telecommunications/ ICT Development Policy 2020 sets certain measures and interventions to develop infrastructure, human capacity, cybersecurity, e-services and the ICT industry.

The ICT Master Plan 2020 has four strategic thrusts:

1. “Empowering People” comprises ICT human resource development and e-awareness.
2. “Ensuring Connectivity” consists of three sectors: national ICT infrastructure, legal framework and cyber security.
3. “Enhancing Capabilities” is formulated with three sectors: ICT industry, ICT standards, and research and development (R&D).
4. “Enriching e-Services” includes e-government services, e-public services, e-economy services and e-education services.

MPTC has reformed the telecommunication license regime from single-service licenses to unified (multi-services) licenses and has set up a Universal Service Obligation fund (2 per cent of telecommunication gross revenue) and Capacity Building and R&D Fund (1 per cent of telecommunication gross revenue). An ICT Innovation Centre is being constructed to accelerate the development of the country’s human capital, boost research and innovation, and multiply the number of start-ups in the digital sector. This facility is financed by the Capacity Building and R&D Fund.

MPTC is currently drafting and preparing the following:

- Digital government policy framework and master plan in order to build a clean, strong and smart Government based on the development and use of digital technology. The draft includes the following:
 - Three principles: the once-only principle³⁰, interoperability as an ecosystem³¹, and “land and expand” strategy³² for efficiency.
 - Four policy measures: public service digitalization, key enablers (digital infrastructure, laws, industry and R&D), data-driven governance and security framework and mechanisms.
 - Governance framework: institutional arrangements, leadership and capacity-building and mechanism for funding and procurement.
- A subdecree on transforming the National Institute of Post, Telecommunications and ICT (NIPTICT) into the Cambodia Academy of Digital Technology. The

Academy consists of three institutes: the National Institute of Digital Technology (Digital Engineering, Digital Business and Education Center); the National Institute of Digital Governance (Digital Governance and Training for Government Officials); and the National Institute of Digital Research and Innovation (artificial intelligence, Internet of things, cloud computing, blockchain technology, data science, digital policy and innovation).

Pursuant to goal 4 of the CSDGs, the Ministry of Education, Youth and Sports (MOEYS) developed and adopted the National Higher Education 2030 Roadmap, which provides the overarching framework for a long-term holistic sector-wide approach for the development and delivery of education services and sets priorities and strategies on how Cambodia will achieve these targets. Improved general education, vocational and competence skills, entrepreneurship, creativity and innovation, and a healthy lifestyle are core components in Rectangle 1 of the RS-IV. Goal 4 of the CSDGs is well aligned with the priorities in RS-IV. Side 1 of Rectangle 1 is the strengthening of the quality of education, science and technology with the objective of “quality, equitable and inclusive education system”. Side 2 touches on technical training with an aim to ensure that “each individual youth specializes in at least one skill in life”. Side 4 is on gender equity and social protection to enhance the social and economic situation of women and strengthen the role of women.

MOEYS has streamlined science, technology, engineering and mathematics (STEM) throughout its Roadmap and has defined a number of specific indicators to monitor and evaluate STEM education.

Building on ICT policy and strategies, MOEYS published the Master Plan for ICT in Education 2009–2013. Achievements under the Master Plan are currently being reviewed and a successor to it is being developed.³³ In 2015, MOEYS published the curriculum framework for general education and technical education to guide other stakeholders in developing relevant and significant documents such as student textbooks, teaching-learning aids, guidelines for teaching and learning methods and indicators of student learning outcomes. Among other things, the framework incorporates ICT into the curriculum from grade 4 through grade 12 and introduces the modernization of the teaching methodology in all levels of education.³⁴

³⁰ Citizens, institutions, and companies only have to provide certain standard information to the authorities and administrations one time

³¹ Maximising the ability to transfer and render useful data and other information across systems, applications, or components

³² “Land” users with small applications, and then “expand” to more products and services

³³ Konrad-Adenauer-Stiftung Cambodia 2019, p. 31.

³⁴ Ibid.

To address ICT infrastructure in education, MOEYS published the New Generation School Policy in 2016 to provide guidance to educators and students on new methods of learning, enhance educational innovation throughout the school system and empower the education system to be competitive in the ASEAN region, where there is an urgent need for a work force with twenty-first century skills. According to the ICT Development Policy 2020, the Government also aims to develop ICT human resources by increasing the percentage of students finishing high school who have basic ICT skills and the percentage of the workforce having professional skills in ICT.³⁵

On technical and vocational education and training (TVET), the Ministry of Labour and Vocational Training is implementing the National Policy Framework on Technical and Vocational Training 2017-2025, the Cambodia Qualification Framework, the National Competency Standards and Competency-based

Curriculum. Consistent with the objectives set in the National Strategic Development Plan 2019-2023, the Ministry is focusing on improving the quality of the TVET centres (training the teachers, accreditation, curricula design, equipment); enhancing attractiveness of TVET programmes to students and families; strengthening public and private collaboration within TVET; improving the governance of TVET centres; and developing entrepreneurship and innovation culture within TVET centres.

The Ministry of Agriculture, Forestry and Fisheries developed the Agriculture Development Strategic Plan 2020-2025 to accelerate agriculture development, including enhanced agricultural productivity, diversification and commercialization, promotion of livestock farming and aquaculture, land reform and sustainable management of natural resources.³⁶ It identifies specific efforts within technology, education and research.

2.3 THE ROLE OF INNOVATION IN ACHIEVING VISION 2050

There is wide recognition of STI as an engine to achieve the Sustainable Development Goals. Cambodia has recognized the role of innovation to achieve SDGs in its RS-IV as well as its Vision 2050.

Cambodia's long-term Vision 2050 promotes scientific and technological development and innovation, focusing on:

- Strengthening the foundation, including:
 - Institutionalization of national science and technology framework and legal framework;
 - Cultivation of science and technology human resources; and
 - Systemization of science and technology financial support.
- Creating a science and technology environment which is necessary to efficiently secure R&D:
 - Enhancement of public awareness and support;
 - Promotion of science and technology information systems; and

- Developing a monitoring and evaluation system.

Vision 2050 will be supported by the implementation of the National STI Policy 2020-2030, approved in 2019. The STI Policy strengthens the STI foundation and builds national STI capability to do the following: create potential technologies for development; strengthen innovation capacity in response to fundamental needs of the nation; improve the quality of people's lives; increase national wealth; develop competitive national industrial foundation; and improve STI governance.

These two major long-term guiding policy documents illustrate the reform agenda around STI in Cambodia and are fundamental tools to push forward socioeconomic development towards a new sustainable phase. These policy documents aim at achieving the national development agenda.

Moreover, the Government of Cambodia has begun to mainstream technologies, in addition to gender and climate change adaptation, in development projects financed by development partners.

³⁵ Ibid.

³⁶ Government of Cambodia 2019, p. 51.

2.4 PRIORITY TECHNOLOGIES

The National STI Policy 2020-2030, approved by the Prime Minister of the Kingdom of Cambodia in December 2019, focuses on five scientific and technological domains:

- Agricultural yield increase, produce diversification and agro-processing;
- Modern production and engineering;
- Health and biomedical;
- Material science and engineering; and
- Services and digital economy, including artificial intelligence, and space and spatial technology.

These five domains are aligned with the key targeted economic sectors prioritized in the Industrial Development Plan.

In order to achieve national development goals and promote national economic growth in accordance with the Rectangular Strategy, the General Secretariat of the National Science and Technology Council conducted a survey to identify national priority technologies. The findings of the survey suggest 10 priority technologies to help improve the competitiveness of the economy.³⁷

Three technologies were identified as primary priorities:

- Agricultural processing (highest priority);
- Software and digital content technology; and
- Biotechnology.

Two other technologies are considered as additional priorities:

- Agricultural engineering technology; and
- Electronics and electricity technology.

Five other technologies should be considered for the long-term:

- Household utilities;
- Renewable energies;
- Medical and health technologies;
- Tourism technologies; and
- Technologies of material design.

³⁷ General Secretariat of the National Science and Technology Council 2019.

CHAPTER

3

NATIONAL INNOVATION SYSTEM

3.1 CONCEPTUAL FRAMEWORK

The National Innovation System (NIS) conceptual framework can help policymakers to systemically identify interventions to promote innovation. The concept of 'national innovation systems'³⁸ is now commonly used by governments and global finance and development organizations, such as the Organisation for Economic Co-operation and Development (OECD), the United Nations and the World Bank, to examine how STI takes place or may be promoted. Unlike the older 'linear model' of innovation, which assumed that research somehow produces innovations, the concept of NIS considers that innovation is co-produced by networks of actors and can potentially be stimulated anywhere in the system (by research centres, businesses, government action, etc.). Research can help satisfy needs and research can itself be initiated following the identification of needs. This type of research particularly occurs in organizations that have "absorptive capacity",³⁹ that is, the ability to specify scientific and technological problems, seek solutions and apply them to business opportunities.

Figure 3.1 provides a conventional representation of a NIS and its components, including the research and

higher education system, the production system, the links between the two and various other contextual conditions, such as demand, innovation infrastructures and framework conditions as well as government and governance more broadly.

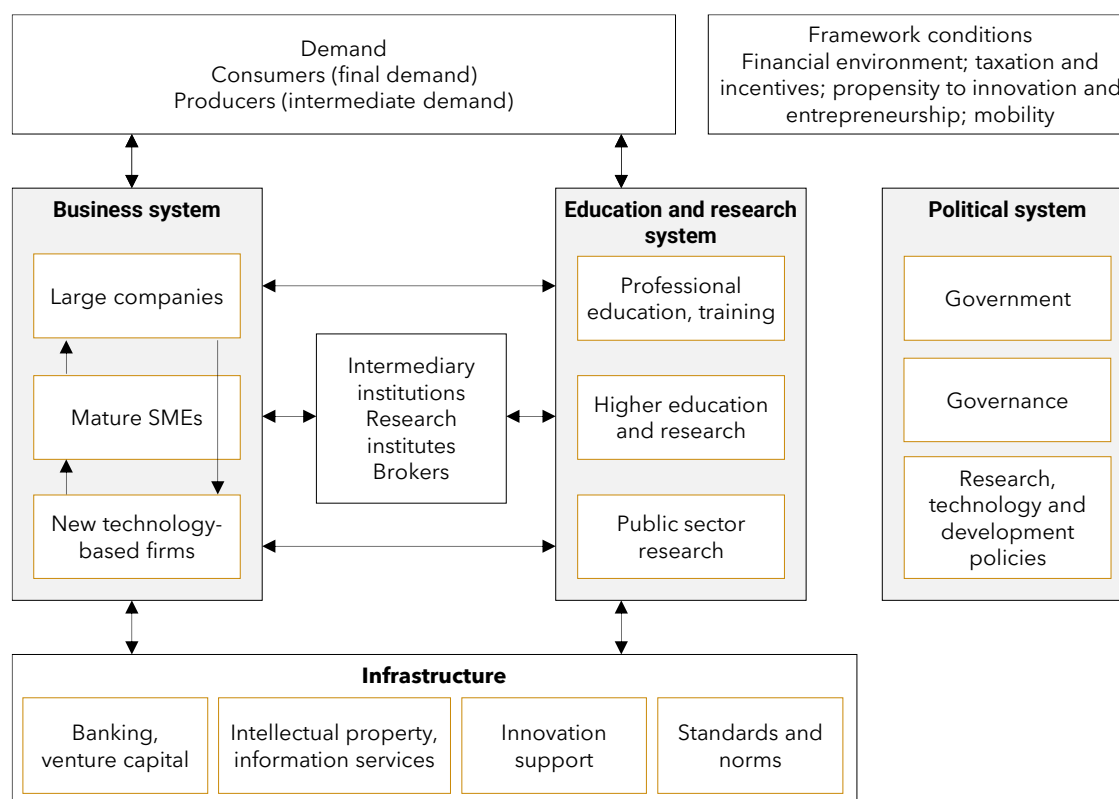
The interdependence of the various components implies that a well-functioning NIS needs every subsystem to work at a reasonable level of efficiency and effectiveness and – since innovation is largely co-produced – the links among the components need to function well. Hence, the policy mix needs to be designed in a way that achieves this and there is balance among the different components. For example, there should be some consistency between the supply and demand for graduates, PhDs and researchers; national thematic research priorities should be consistent with the needs of government and industry and so on. To achieve this, it is often advantageous to have a national policy 'arena' such as a research and innovation policy council that monitors the NIS and provides advice and coordination to government.⁴⁰

³⁸ Freeman 1987; Lundvall 1992; Nelson 1993.

³⁹ Cohen and Levinthal 1990.

⁴⁰ Schwaag-Serger et al. 2015.

Figure 3.1. National innovation system framework



Source: S. Kuhlmann and E. Arnold, 2001, RCN in the Norwegian Research and Innovation System, Background Report No. 12 in the Evaluation of the Research Council of Norway. Oslo: Royal Norwegian Ministry of Education, Research and Church Affairs.

Because different parts of the NIS work together, they tend to co-evolve into specific patterns. Therefore, policies need to be specifically designed for the national context and not directly copied from elsewhere.

According to World Bank research,⁴¹ the observed low level of technological adoption in developing countries is a rational response of firms to the conditions they face, including barriers to accumulating physical and human capital, low firm capabilities and weak government capacity. Findings

of the research point to the need for the State to carry out ambitious programmes that develop the NIS and improve its policymaking capabilities as well as its ability to implement research and innovation policies via new agencies.

A well performing NIS provides a number of functions: encourages entrepreneurial activities as well as knowledge development and diffusion, provides directionality and mobilizes adequate resources, enables market formation and provides legitimacy (see table 3.1).

Table 3.1. Functions of a national innovation system

| Component | Explanation |
|----------------------------|--|
| Entrepreneurial activities | Entrepreneurs are essential for a well-functioning innovation system. This function can be analysed by mapping the number of new entrants, the number of diversification activities of incumbent actors and the number of experiments with the new technology. |
| Knowledge development | Knowledge development encompasses learning by searching and learning by doing. Three typical indicators to map this function over time are: 1) R&D projects; |

⁴¹ Cicera and Maloney 2017.

| | |
|---|---|
| | 2) patents; and 3) investments in R&D. While these indicators map the effort put into knowledge development, one might also map the increase in technological performance by means of so-called learning curves. |
| Knowledge diffusion through networks, including policy networks | Here policy decisions (standards, long term targets) should be consistent with the latest technological insights and, at the same time, R&D agendas should be affected by changing norms and values. This function can be analysed by mapping the number of workshops and conferences devoted to a specific technology topic and mapping the network size and intensity over time. |
| Directionality | Since resources are almost always limited, it is important that, when various technological options exist, specific foci are chosen for further investments. Without this selection there will be insufficient resources left for the individual options. This function can be analysed by mapping specific targets set by governments or industries regarding the use of a specific technology and by mapping the number of articles in professional journals that raise expectations about new technological developments. |
| Market formation | New technology often has difficulty to compete with embedded technologies. It is then important to create specific spaces for technologies. This function can be analysed by mapping the number of niche markets that have been introduced, specific tax regimes for new technologies and new environmental standards that improve the chances for new environmental technologies. |
| Resource mobilization | For a specific technology, the allocation of sufficient resources is necessary to make knowledge production possible. This function is difficult to map by means of specific indicators over time. |
| Creation of legitimacy/counteracting resistance to change | In order to develop well, a new technology has to become part of an incumbent regime, or it must overthrow it. Parties with vested interests will often oppose the force of creative destruction. In that case, advocacy coalitions can function as a catalyst; they put a new technology on the agenda and lobby for resources and favourable tax regimes. By doing so they create legitimacy for a new technological trajectory. This function can be analysed by mapping the rise and growth of interest groups and their lobby actions. |

Source: M.P. Hekkerta, R.A.A. Suursa, S.O. Negroa, S. Kuhlmann, R.E.H.M. Smits (2007). "Functions of innovation systems: A new approach for analysing technological change", in *Technological Forecasting and Social Change*, 74, pp. 413-432.

3.2 A NASCENT NATIONAL INNOVATION SYSTEM






Cambodia has a relatively weaker NIS as reflected in the Global Innovation Index 2020. Cambodia is ranked 110 out of 131 countries and is third from the last among the included ASEAN countries. Cambodia has particularly low scores on expenditure on education, tertiary enrolment and knowledge-intensive employment. Notably, Cambodia scores well relative to ASEAN competitors on FDI net inflows, suggesting

that FDI, could lead to technology absorption and innovation in Cambodia. Figure 3.2 shows the ranking of Cambodia on some innovation drivers measured in the Global Competitiveness Report of the World Economic Forum.⁴²

The following two chapters explore in more detail the strengths and weaknesses of the NIS of Cambodia.

⁴² World Bank 2018, p. 20.

Figure 3.2. Cambodia country profile, Global Innovation Index 2020

| GLI 2020 rank | Output rank | Input rank | GLI 2019 rank | | |
|---|--|------------|---------------|-------------|----------------|
| 110 | 101 | 117 | 98 | | |
| | | | | Score/Value | Rank |
|  | INSTITUTIONS..... | | | 50.0 | 112 |
| 1.1 | Political environment..... | | | 49.4 | 90 |
| 1.1.1 | Political and operational stability*..... | | | 73.2 | 49 ● ◆ |
| 1.1.2 | Government effectiveness*..... | | | 37.4 | 103 |
| 1.2 | Regulatory environment..... | | | 50.3 | 103 |
| 1.2.1 | Regulatory quality*..... | | | 28.5 | 104 |
| 1.2.2 | Rule of law*..... | | | 17.6 | 126 ○ ◇ |
| 1.2.3 | Cost of redundancy dismissal, salary weeks..... | | | 19.4 | 81 |
| 1.3 | Business environment..... | | | 50.5 | 127 ○ ◇ |
| 1.3.1 | Ease of starting a business*..... | | | 52.4 | 131 ○ ◇ |
| 1.3.2 | Ease of resolving insolvency*..... | | | 48.5 | 74 |
|  | HUMAN CAPITAL & RESEARCH..... | | | 11.1 | 122 ◇ |
| 2.1 | Education..... | | | 20.0 | [127] |
| 2.1.1 | Expenditure on education, % GDP..... | | | 2.2 | 113 ○ ◇ |
| 2.1.2 | Government funding/pupil, secondary, % GDP/cap..... | | | n/a | n/a |
| 2.1.3 | School life expectancy, years..... | | | n/a | n/a |
| 2.1.4 | PISA scales in reading, maths, & science..... | | | n/a | n/a |
| 2.1.5 | Pupil-teacher ratio, secondary..... | | | 21.9 | 102 |
| 2.2 | Tertiary education..... | | | 12.8 | 110 |
| 2.2.1 | Tertiary enrolment, % gross..... | | | 13.7 | 101 |
| 2.2.2 | Graduates in science & engineering, %..... | | | 15.4 | 93 |
| 2.2.3 | Tertiary inbound mobility, %..... | | | n/a | n/a |
| 2.3 | Research & development (R&D)..... | | | 0.6 | 111 |
| 2.3.1 | Researchers, FTE/mn pop.Ⓢ..... | | | 30.4 | 102 |
| 2.3.2 | Gross expenditure on R&D, % GDP..... | | | 0.1 | 102 |
| 2.3.3 | Global R&D companies, avg. exp. top 3, mn \$US..... | | | 0.0 | 42 ○ ◇ |
| 2.3.4 | QS university ranking, average score top 3*..... | | | 0.0 | 77 ○ ◇ |
|  | INFRASTRUCTURE..... | | | 23.1 | 120 ◇ |
| 3.1 | Information & communication technologies (ICTs).... | | | 32.7 | 117 ◇ |
| 3.1.1 | ICT access*..... | | | 46.8 | 95 |
| 3.1.2 | ICT use*..... | | | 41.5 | 96 |
| 3.1.3 | Government's online service*..... | | | 25.0 | 123 ◇ |
| 3.1.4 | E-participation*..... | | | 17.4 | 126 ○ ◇ |
| 3.2 | General infrastructure..... | | | 17.6 | 114 |
| 3.2.1 | Electricity output, kWh/mn pop..... | | | 437.1 | 109 |
| 3.2.2 | Logistics performance*..... | | | 23.9 | 94 |
| 3.2.3 | Gross capital formation, % GDP..... | | | 23.5 | 64 |
| 3.3 | Ecological sustainability..... | | | 19.0 | 109 |
| 3.3.1 | GDP/unit of energy use..... | | | 7.1 | 88 |
| 3.3.2 | Environmental performance*..... | | | 33.6 | 108 |
| 3.3.3 | ISO 14001 environmental certificates/bn PPP\$ GDP..... | | | 0.7 | 71 |
|  | MARKET SOPHISTICATION..... | | | 46.6 | 72 |
| 4.1 | Credit..... | | | 66.4 | 11 ● ◆ |
| 4.1.1 | Ease of getting credit*..... | | | 80.0 | 23 ● |
| 4.1.2 | Domestic credit to private sector, % GDP..... | | | 99.6 | 24 ● ◆ |
| 4.1.3 | Microfinance gross loans, % GDP..... | | | 38.3 | 2 ● ◆ |
| 4.2 | Investment..... | | | 25.6 | 114 |
| 4.2.1 | Ease of protecting minority investors*..... | | | 40.0 | 110 |
| 4.2.2 | Market capitalization, % GDP..... | | | n/a | n/a |
| 4.2.3 | Venture capital deals/bn PPP\$ GDP..... | | | 0.1 | 33 ● ◆ |
| 4.3 | Trade, competition, and market scale..... | | | 47.9 | 121 |
| 4.3.1 | Applied tariff rate, weighted avg., %..... | | | 9.8 | 113 |
| 4.3.2 | Intensity of local competition*..... | | | 59.6 | 108 |
| 4.3.3 | Domestic market scale, bn PPP\$..... | | | 76.9 | 91 |
|  | BUSINESS SOPHISTICATION..... | | | 17.3 | 119 |
| 5.1 | Knowledge workers..... | | | 11.8 | 121 ◇ |
| 5.1.1 | Knowledge-intensive employment, %..... | | | 5.3 | 114 ◇ |
| 5.1.2 | Firms offering formal training, %..... | | | 22.2 | 66 |
| 5.1.3 | GERD performed by business, % GDP..... | | | 0.0 | 82 |
| 5.1.4 | GERD financed by business, %..... | | | 19.4 | 65 |
| 5.1.5 | Females employed w/advanced degrees, %..... | | | 2.3 | 99 |
| 5.2 | Innovation linkages..... | | | 25.7 | 45 ● ◆ |
| 5.2.1 | University/industry research collaboration*..... | | | 36.7 | 91 |
| 5.2.2 | State of cluster development*..... | | | 48.1 | 61 ● |
| 5.2.3 | GERD financed by abroad, % GDP..... | | | 0.0 | 53 |
| 5.2.4 | JV-strategic alliance deals/bn PPP\$ GDP..... | | | 0.1 | 36 ● ◆ |
| 5.2.5 | Patent families 2+ offices/bn PPP\$ GDP..... | | | n/a | n/a |
| 5.3 | Knowledge absorption..... | | | 14.3 | 129 ○ ◇ |
| 5.3.1 | Intellectual property payments, % total trade..... | | | 0.1 | 104 ◇ |
| 5.3.2 | High-tech imports, % total trade..... | | | 2.8 | 127 ○ ◇ |
| 5.3.3 | ICT services imports, % total trade..... | | | 0.8 | 85 |
| 5.3.4 | FDI net inflows, % GDP..... | | | 12.6 | 7 ● ◆ |
| 5.3.5 | Research talent, % in business enterprise..... | | | 4.3 | 73 |
|  | KNOWLEDGE & TECHNOLOGY OUTPUTS..... | | | 13.2 | 96 |
| 6.1 | Knowledge creation..... | | | 3.1 | 121 |
| 6.1.1 | Patents by origin/bn PPP\$ GDP..... | | | 0.1 | 126 ○ |
| 6.1.2 | PCT patents by origin/bn PPP\$ GDP..... | | | 0.0 | 100 ○ ◇ |
| 6.1.3 | Utility models by origin/bn PPP\$ GDP..... | | | n/a | n/a |
| 6.1.4 | Scientific & technical articles/bn PPP\$ GDP..... | | | 2.3 | 113 |
| 6.1.5 | Citable documents H-index..... | | | 5.6 | 99 |
| 6.2 | Knowledge impact..... | | | 21.9 | 73 |
| 6.2.1 | Growth rate of PPP\$ GDP/worker, %..... | | | 5.1 | 8 ● |
| 6.2.2 | New businesses/th pop. 15-64..... | | | 0.7 | 90 |
| 6.2.3 | Computer software spending, % GDP..... | | | 0.0 | 113 ◇ |
| 6.2.4 | ISO 9001 quality certificates/bn PPP\$ GDP..... | | | 2.6 | 79 |
| 6.2.5 | High- and medium-high-tech manufacturing, %..... | | | n/a | n/a |
| 6.3 | Knowledge diffusion..... | | | 14.6 | 97 |
| 6.3.1 | Intellectual property receipts, % total trade..... | | | 0.0 | 88 |
| 6.3.2 | High-tech net exports, % total trade..... | | | 1.1 | 66 |
| 6.3.3 | ICT services exports, % total trade..... | | | 0.3 | 108 |
| 6.3.4 | FDI net outflows, % GDP..... | | | 0.5 | 78 |
|  | CREATIVE OUTPUTS..... | | | 13.4 | 102 |
| 7.1 | Intangible assets..... | | | 21.6 | 88 |
| 7.1.1 | Trademarks by origin/bn PPP\$ GDP..... | | | 34.2 | 71 |
| 7.1.2 | Global brand value, top 5,000, % GDP..... | | | 0.0 | 80 ○ ◇ |
| 7.1.3 | Industrial designs by origin/bn PPP\$ GDP..... | | | 0.2 | 105 |
| 7.1.4 | ICTs & organizational model creation*..... | | | 60.6 | 41 ● ◆ |
| 7.2 | Creative goods and services..... | | | 7.2 | [93] |
| 7.2.1 | Cultural & creative services exports, % total trade..... | | | n/a | n/a |
| 7.2.2 | National feature films/mn pop. 15-69..... | | | 3.2 | 57 |
| 7.2.3 | Entertainment & Media market/th pop. 15-69..... | | | n/a | n/a |
| 7.2.4 | Printing and other media, % manufacturing..... | | | n/a | n/a |
| 7.2.5 | Creative goods exports, % total trade..... | | | 0.4 | 66 |
| 7.3 | Online creativity..... | | | 3.1 | 116 |
| 7.3.1 | Generic top-level domains (TLDs)/th pop. 15-69..... | | | 0.8 | 100 |
| 7.3.2 | Country-code TLDs/th pop. 15-69..... | | | 0.1 | 117 |
| 7.3.3 | Wikipedia edits/mn pop. 15-69..... | | | 16.2 | 114 |
| 7.3.4 | Mobile app creation/bn PPP\$ GDP..... | | | 0.1 | 84 |

NOTES: ● indicates a strength; ○ a weakness; ◆ an income group strength; ◇ an income group weakness; * an index; † a survey question. Ⓢ indicates that the economy's data are older than the base year. Square brackets [] indicate that the data minimum coverage (DMC) requirements were not met at the sub-pillar or pillar level.

Source: Cornell University, INSEAD, WIPO. Global Innovation Index 2020. Available at www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf.

CHAPTER

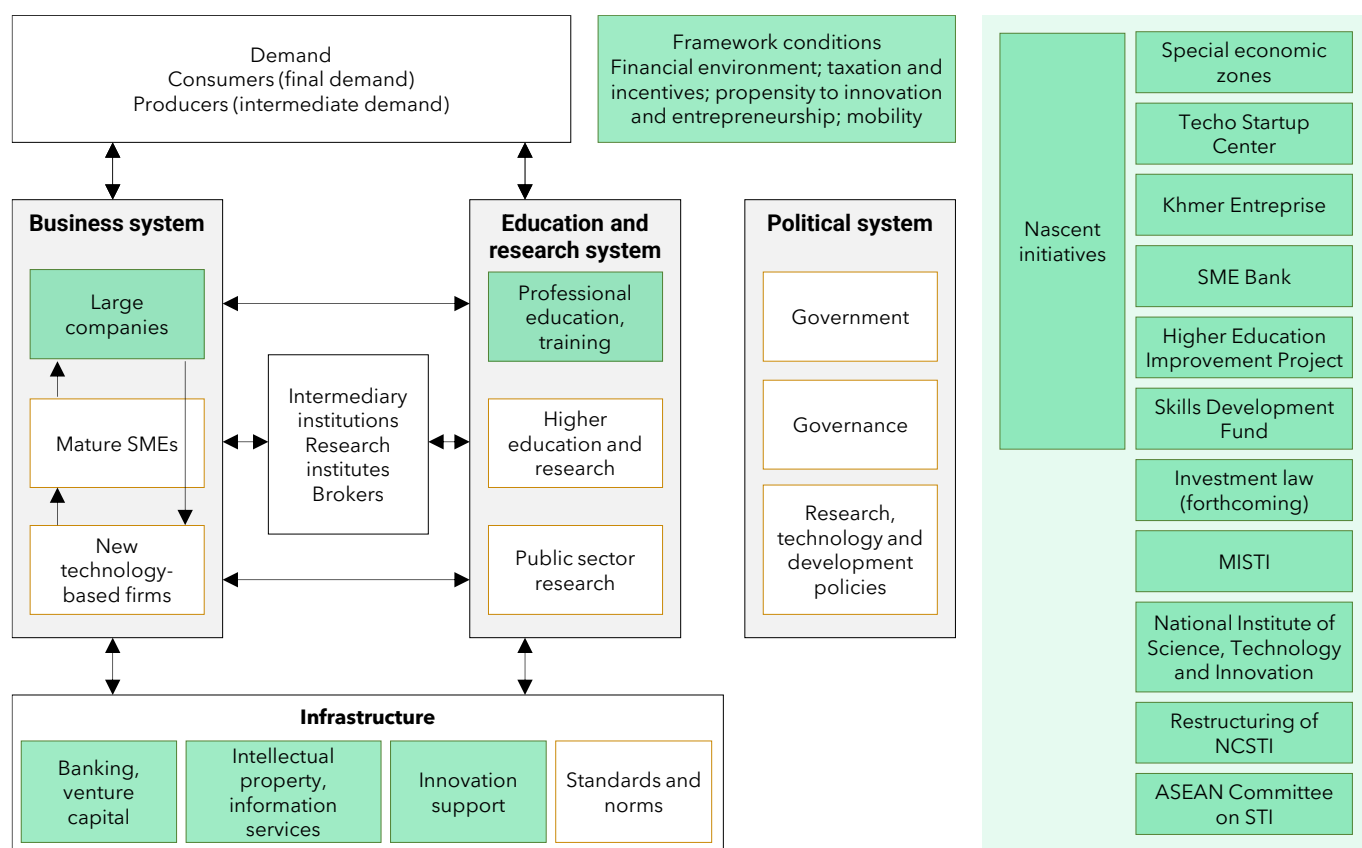
4

STRENGTHS OF THE NATIONAL INNOVATION SYSTEM

The development of the NIS of Cambodia has progressed considerably in the past six years, and the Government of Cambodia has a number of initiatives

upon which to continue building in the next 10 years (figure 4.1).

Figure 4.1. Strengths of the national innovation system of Cambodia



4.1 AN OVERALL FAVOURABLE GOVERNMENT AND GOVERNANCE FOR STI DEVELOPMENT

A recently restructured Ministry to steer STI

The new government structure, including the new Ministry of Industry, Science, Technology and Innovation and the interministerial National Council of Science, Technology and Innovation, provides a strong basis for the development of the NIS, even though it

still needs increased coordination and effective actions.

Following the signature of the Law on the Establishment of the Ministry of Industry, Science, Technology and Innovation in March 2020, MISTI replaced the previous Ministry of Industry and Handicraft. MISTI is composed of the departments listed below (table 4.1).

Table 4.1. The organizational structure of MISTI

| |
|---|
| Minister, Secretary of State and Under-Secretary of State |
| Minister's Cabinet |
| General Department of General Affairs |
| General Department of Industry |
| General Department of SMEs and Handicraft |
| General Department of Potable Water |
| General Department of Science, Technology & Innovation |
| Institute of Standards of Cambodia |
| National Institute of Science, Technology & Innovation |
| National Metrology Center |
| General Department of Inspection |
| Department of Internal Audit |
| Provincial Department of Industry, Science, Technology & Innovation |

Concerning coordination with other line ministries, the interministerial National Science and Technology Council was established in 2014 under Ministry of Planning. In 2020 it was renamed the National Council

of Science, Technology and Innovation under MISTI, and it is composed of the members listed below (Table 4.2).

Table 4.2. Members of the National Council of Science, Technology and Innovation

| Position | Membership |
|-------------------|--|
| Honorary Chairman | Prime Minister of the Kingdom of Cambodia |
| Chairman | Minister of Industry, Science, Technology & Innovation |
| Deputy Chairmen | Minister of Planning |
| | Minister of Health |
| | Minister of Mines and Energy |
| | Minister of Agriculture, Forestry, and Fisheries |
| | Minister of Education, Youth, and Sport |
| | Minister of Post and Telecommunication |

| | |
|---------------------------|--|
| Permanent Deputy Chairman | Secretary of State, Ministry of Industry, Science, Technology & Innovation (one person) |
| Members | Secretary of State, Office of the Council of Ministers (one person) |
| | Secretary of State, Ministry of Interior (one person) |
| | Secretary of State, Ministry of Economy and Finance (one person) |
| | Secretary of State, Ministry of Commerce (one person) |
| | Secretary of State, Ministry of Information (one person) |
| | Secretary of State, Ministry of Public Works and Transport (one person) |
| | Secretary of State, Ministry of Justice (one person) |
| | Secretary of State, Ministry of Labour and Vocational Training (one person) |
| | Secretary of State, Ministry of Environment (one person) |
| | Secretary of State, Ministry of Land Management, Urban Planning and Construction (one person) |
| | Secretary of State, Ministry of Water Resources and Meteorology (one person) |
| | Secretary of State, Ministry of Culture and Fine Arts (one person) |
| | Secretary of State, Ministry of Rural Development (one person) |
| | Secretary of State of the Ministry of Tourism (one person) |
| | Secretary of State of the State Secretariat of Civil Aviation (one person) |
| | Deputy Secretary General of the Sub-Committee on Rehabilitation and Development of Cambodia (one person) |
| | Vice Chairman of the Supreme National Economic Council (one person) |
| Permanent Member | Representatives of research institutes related to science, technology and innovation |
| | Representative of Cambodia Chamber of Commerce (one person) |
| | Director General of Institute of the National Institute of Science, Technology & Innovation |
| | Director General of the General Department of Science, Technology & Innovation |

Furthermore, Cambodia participates in the ASEAN Committee on Science, Technology and Innovation. The Committee supports ASEAN cooperation in STI and promotes the implementation of programmes and activities in the areas defined in the ASEAN Plan of Action on Science, Technology and Innovation 2016–2025. In Cambodia, the ASEAN Committee on Science, Technology and Innovation is under the supervision of MISTI.

Concrete opportunities to channel the swift development of the country towards STI

Cambodia's rapid development has been a catalyst for the transformation of the economy. The economy is steadily industrializing and modernizing, including the agricultural sector. With appropriate support, this trend will facilitate the increase of R&D efforts in the country.

In line with economic development, domestic credit to the service sector appears to be rising. This includes

credit for wholesale, transport, telecommunications and personal consumption purposes. The trend underscores rising consumption and construction demands, which are increasingly met by relatively large wholesale businesses. This can be witnessed through a surge in imports of durable goods such as motor vehicles and construction materials. This rising consumption must be channelled towards innovation and new products and is an important resource for encouraging innovation.

The effective implementation of the national STI Policy will be an important opportunity for the development of STI in the country. Cambodia's extensive planning and analysis led to the identification of key areas of intervention. For example, among the prioritized technologies submitted and supplemented by the line ministries (see section 9), three were identified as key areas: agricultural processing technology, software and digital contents technology; and biotechnology. The Roadmap is an opportunity to channel resources to areas where needs are most urgent and improve government intervention.

4.2 AN EMERGING INNOVATION INFRASTRUCTURE SYSTEM

Innovation support is thriving

Co-working space and incubators are in rapid development in the country. Excluding those that are offering only a temporary desk and Internet, there are over 17 seed-stage co-working spaces, 14 in Phnom Penh and 3 in Siem Reap, with an estimated capacity of over 500 desks. Most of the spaces are privately owned, and only a few have non-profit funding. Most of them were recently created.

A handful of co-working spaces have community managers who facilitate some level of support service and programming. These cover a range of activities from community-building events to training workshops, mentorship and investor networking.

Although relatively new to Cambodia, in line with the rise of co-working spaces, a number of regional or corporate early-stage incubator or accelerator programmes have emerged. These usually include pitching competitions along with a component of business development over a short-term period (days, weeks, or months) or a series of cohort-based bootcamps with limited associated funding. These programmes are concentrated primarily in Phnom Penh, and to a much lesser extent in Siem Reap and Battambang.

A few local accelerator programmes emerged in recent years with the focus on supporting ready-to-scale businesses, but none cater specifically to technology start-ups.

Regional acceleration programmes have also developed recently: TigerMekong accelerator, Echelon Top100 APAC, Mekong Business Initiative and Seedstars Bootcamp. Cambodian start-ups can also be exposed to new ideas, network and increase their visibility and funding through participation in regional competitions and events.

Over the past three years, the Government has drawn significant policy initiatives and discourse around propelling the technology sector and developing the start-up ecosystem. This includes setting out an initial vision for what Cambodia's digital economy aspires to become in RS-IV. This is the first time the digital economy has been included explicitly in the national development plan.

The MPTC has kick-started public engagement through the introduction of broad-based awareness

campaigns, such as the annual Cambodia ICT Awards and Women in Tech Awards, that raise the profile of local start-ups and entrepreneurs. These are critical for role-modelling and media exposure for the sector. This is bolstered by the support of incubator programmes and pitching competitions driven by industry, such as SmartStart, Echelon Top100 APAC and Seedstars Bootcamp, with increasing presence in universities and media coverage. MPTC is also expected to release the Cambodia start-up policy, the first of its kind in this region, after having a series of consultations with the entrepreneur community and private sector.

Cooperating with the Ministry of Commerce, MISTI had also supported highly visible initiatives, such as Cambodian Young Entrepreneur of the Year Awards in association with Young Entrepreneurs Association of Cambodia and Junior Chamber International.

Spearheaded by MEF, the Skills Development Fund, with aggregate capital of \$5 million, seeks to bridge the mismatch between university curricula, existing entrepreneur capabilities and market needs. The Fund will yield more technically trained talent and increase private sector partnerships that ensure talent meets the needs of employers, especially SMEs and start-ups. A second \$5 million fund, the Entrepreneurship Development Fund, will contribute to engendering mindsets that encourage innovation and careers beyond more traditional professional pathways. This may include support for incubators and projects that do capacity-building in the ecosystem.

Innovation with purpose

Business innovation is critical to provide livelihood opportunities as well as goods and services that address social needs. Cambodia has a large social enterprise sector (e.g., a large number of small social enterprises addressing social and environmental needs), unfortunately the sector still depends largely on grants.

There is vast potential in Cambodia to support innovative businesses that address key social and environmental needs, including in the following areas: health; education, training and job placement; insurance; access to renewable energy; and access to clean and reliable water. This can be done by encouraging both social enterprises (which tend to work at small scale and depend more on grants) and inclusive businesses (larger firms that provide solutions on a commercial basis at scale). There are good

examples of these types of firms in Cambodia, particularly in agribusiness (such as Amru Rice or Lyly Foods) and also in energy (ACE solar cooking, Khmer Green Charcoal, Okra Solar, Sun-eee), handicrafts (Artisans d'Ankor), water supply (Khmer Water Supply Holding), fintech (BanhJi), insurance (Forte Insurance, Prevoir) and housing (My Dream Home, World Bridges Social housing).⁴³

MISTI is in the process of adopting a strategy for promoting an enabling environment for inclusive business in Cambodia. The strategy seeks to raise awareness on inclusive businesses, establish an inclusive business accreditation system, provide business coaching services and facilitate funding for this type of business.⁴⁴

Access to finance is steadily improving

The investment landscape in Cambodia is growing with an increasing number of local angel investors, private equity and venture capital funds available in the market. Significant development over the past few years spans the spectrum of financial deals, including investments and support structures from the earliest stage all the way to preparing for an initial public offering. Significant opportunities exist for strategic investors at all levels.

A number of government initiatives have been launched to improve access to finance, including a specialized state-owned bank for SMEs (SME Bank) launched in early 2020, and the Government Entrepreneurship Development Fund (see box 4.1).

Box 4.1. Measures to boost access to finance in Cambodia

Small and Medium Enterprise Bank of Cambodia (SME Bank) established with an initial capital of \$100 million

The Small and Medium Enterprise Bank of Cambodia (SME Bank) is under the supervision of MEF. With an initial capital of \$100 million, the SME Bank provides financing and commercial banking services to support local small and medium-sized enterprises (SMEs) with an objective to increase economic diversification and expand export volume. This builds upon a joint venture between SME Bank and 23 commercial banks, two specialized banks, seven microfinance institutions – of which five are microfinance deposit-taking institutions. SMEs can borrow \$200,000 for working capital and \$300,000 for investment capital, at a 7 per cent annual interest rate and a four-year period of payment. The collateral depends on the criteria of the financial institution. All SMEs can apply for a loan, but they must be registered with MEF. Due to COVID, the operation of the SME Bank has been focused on providing emergency fund for SMEs, having difficulty to borrow money from commercial banks. The SME Bank, which became operational in April 2020, has already benefited 752 SMEs across Cambodia. The SME financing scheme was launched on 1 April and was fully subscribed by 16 October 2020. The main sectoral focuses are: agriculture; food production and processing; manufacturing of local products; manufacturing of souvenirs and handicrafts for tourists; waste processing; assembling and information technology; and research and development (including information technology management services).

The Government Entrepreneurship Development Fund boosts start-ups with an annual budget of \$5 million.

Established in 2019, operational since the start of 2020, this is a \$5 million annual fund to support entrepreneurs, innovative start-ups, potential SMEs and partnering institutions to implement any innovative activity and create economic value-added in Cambodia's economy. The Entrepreneurship Development Fund provide grants and equity match funding to enterprise and incubation facilities, plus services to entrepreneurs and start-ups. The first call for proposals was launched at the start of 2020, but due to COVID-19, the support has been mainly targeted towards traditional SMEs instead of innovative start-ups and SMEs. Four key priority sectors are targeted: ICT (including fintech); service (i.e., tourism); agro-processing; and manufacturing (agriculture for export) (industrial cluster and import substitution). Interestingly, the Entrepreneurship Development Fund is managed by a public-private partnership, and the board comprises both public authorities (the Minister of Economy and Finance is the Chairman), and the private sector.

⁴³ ESCAP and iBAN 2021.

⁴⁴ Ibid.

MPTC also aspires to do more through one of the most ambitious policy initiatives thus far – the Capacity Building and R&D Fund, resourced through a 1 per cent service revenue contribution by telecommunications companies from 2017. The Capacity Building and R&D Fund has already introduced many initiatives in partnership with the private sector to promote start-ups and technology entrepreneurship in the country.

Overall, it is expected that the investment landscape will improve due to currency stability, ease of capital flow and market openness.⁴⁵

Intellectual property rights and information services are on the right path

Patent requests are generally registered with Cambodia's Ministry of Industry and Handicraft (MIH,

now MISTI); copyrights may be registered with the Ministry of Culture and Fine Arts. A partnership with the Intellectual Property Office of Singapore allows patent owners and applicants in Singapore to register with MISTI. Fast-track procedures are also established with the Japanese intellectual property authorities. Since December 2016, patent protection may also be sought under the framework of the Patent Cooperation Treaty.⁴⁶ These initiatives clearly reflect efforts to improve registration processes. Continuing efforts to improve the functioning of the court system, would also benefit intellectual property rights holders by facilitating the enforcement of intellectual property rights.

Cambodia's intellectual property laws are relatively more advanced than those of other members of ASEAN. The law has encouraged foreign firms to introduce technological improvements to their onshore production systems.⁴⁷

4.3 A CONTEMPORARY TECHNOLOGY START-UP ECOSYSTEM ON AN UPWARD TREND

The Cambodian technology start-up ecosystem has progressed rapidly over the past three to five years. There are over 300 active technology start-ups operating at various stages of development. These start-ups largely relate to establishing early digital platforms and infrastructure, marketplaces and businesses concentrated on consumer technology. In these markets, early movers combined with good operators can capture a sizeable market share. Cambodia presents multiple opportunities for digital start-ups (see box 4.2).

A potential opportunity for the development of STI in the country is the diversification and expansion of its manufacturing base by moving away from labour-intensive industries – mainly the cut, trim and make sector in the garment industry – to those that demand a more skilled workforce, more advanced technologies, and higher value-added.

Another potential opportunity exists in the limited presence of deep technology of any kind (machine-learning or big data) at this time, which leaves the door open to those with the necessary drive and skills.

The number of start-ups operating in Cambodia is estimated to double between 2019 and 2022, notably because of increasing awareness of basic digital needs (e-commerce, fintech, logistics etc.) and the natural growth of market opportunities related to the digital economy as consumers become more tech-savvy and as the impulse towards digital transformations continues to be impacted by COVID-19. Global or regional technology companies continually entering an increasingly open Cambodia create market opportunities and training for prospective start-up founders. Entrepreneurship is becoming a career option, according to a large research study on Cambodia's technology start-up ecosystem.⁴⁸ In addition, some regional start-ups will likely expand into Cambodia in search of new consumers and experimentation, and an increase in tech-oriented trade visits from regional technology communities has already been witnessed. Finally, the development of incubators and accelerators in the country will most likely contribute to the growth of viable start-ups.

⁴⁵ Kem et al. 2019.

⁴⁶ See www.southeastasia-iprhelpdesk.eu/sites/default/files/bean_files/cambodia_factsheet.pdf.

⁴⁷ UNESCO 2015, p. 711.

⁴⁸ Kem et al. 2019.

Box 4.2. Untapped opportunities for digital start-ups in Cambodia

As Cambodia's early start-ups are able to establish their prominence within their respective segment, research indicates significant untapped opportunities.

- **Development services:** While current capacity and client demands largely centre on consumer technology such as web and application development, future development demand will require both updated technical knowledge as well as deep technology applications including automation, blockchain, and AR/VR. Although existing agencies may not yet have the capacity to create new platforms and standard protocols, the most successful development service firms will be able to customize and tailor solutions using more advanced development platforms. In order to capture this market, they must continue to invest in evolving both in terms of technical skills and delivery culture.
- **E-commerce and logistics:** Social selling is made possible due to the proliferation of social channels, aided by the availability of logistics and delivery services with accessible online store platforms. Payment is likely to be frictionless in the very near future allowing more seamless transactions for both buyers and sellers. Existing platforms for last-mile delivery can be improved by leveraging 'shared economy' infrastructure. Additional opportunities in logistics delivery infrastructure also exist on a macro-level, nationwide.
- **Digital financial services (fintech):** A large unbanked, underserved population will eventually transition into formal financial systems, a significant portion of which will 'leapfrog' to some form of fintech solution, delivered at multiple levels. Simultaneously, banks and microfinance institutions need to address consumer demand for online banking tools while continuously finding ways to reduce costs, operate efficiently and reduce risks with innovative enterprise software. Enterprise-level software-as-a-service, virtual banks, non-traditional credit assessment and digital lending platforms all present significant opportunities as reported in several interviews with industry and other stakeholders. Major questions remain open on how to create an integrated banking ecosystem (across financial institutions, consumers, merchants, regulators). While the National Bank of Cambodia has been progressively minded about recent innovations like blockchain, they are continuing to explore the appropriate legal framework and compliance, including consumer protection law (which is reported to be currently under development), institutional management, and systematic risk mitigation.
- **Digital marketplaces:** Existing marketplaces, such as classifieds, have facilitated transactions as an information platform to date. However, through opportunities in socialised data and predictive algorithms, searches can be increasingly personalised and targeted. This enhances the potential of such platforms and marketplaces in exponentially increasing transaction volume, whilst providing a level of trust as a third party.
- **Digital media and advertising:** Along the global trend of consumers transitioning from watching televisions to accessing news and entertainment online, companies have the opportunity to dominate the market through localised content and online media. Successful media companies must be content focused and take advantage of existing social media platforms (versus competing head-to-head).
- **Digital disruptor:** While competition is evolving in transport such as the ever-visible ride-hailing platforms in Phnom Penh and first-tier cities, there are many untapped market opportunities outside of the country's capital. For example, education technology and agricultural technology start-ups have the potential to serve consumers in highly remote areas in the country (comprising the majority of the country's population). There are few agricultural technology start-ups that have reached significant scale across the market yet, in any advanced technologies related to data (cultivation and yield-oriented) or supply chain (communication or transaction between farmers and buyers). Given the proportion of GDP in Cambodia represented by agriculture, this is naturally identified as a huge untapped opportunity. Equally health technology start-ups can address awareness and early detection through healthcare information platforms, mirroring very successful solutions in other rural and emerging markets recently rolled out in West Africa.

Source: CDRI 2019.

Even though traditional Cambodian education and values do not incentivise risk-taking and start-up creation, a generational shift is observed that can encourage further innovation in the coming years. Bustling start-up events (more than 20 held in 2018 alone), 25 innovation and co-working spaces, the popularization of start-up entrepreneurship via social media and traditional media and the success stories of entrepreneurs and business role models, are all indicative of a shift in the mindset of Cambodian youth. As mentioned above, entrepreneurship is becoming a career option.⁴⁹

To diversify the labour market, there is an opportunity is to link repatriated Cambodians (with international education and professional experience) with technology start-ups in the local market. To close the technical skill gap and build entrepreneurial culture, the majority of Cambodian technology start-ups have allocated resources for internal training programmes,

and they are willing to finance certified trainings for their staff, although such training is scarce in the country.⁵⁰

Industry professionals noted another major trend in the increasing amount of young people willing to start their own companies and join start-ups immediately upon graduation from tertiary (or even secondary) education. Given the development stage of the digital economy, there is still a significant gap between industry needs and skilled technical professionals. In addition to domestically trained talent (estimated at 2,000–5,000 new technology graduates per year and increasing), the high-skilled talent gap is likely to be partially bridged by an increase in the number of foreign expatriates and digital nomads. Numerous technology start-ups are founded by and/or employ expatriate technology talents and returning overseas Cambodians.

4.4 A TRANSITIONING EDUCATION AND RESEARCH SYSTEM

Basic education is in progress and can be built on for the development of innovation in the next 10 years

Available data suggest that Cambodia has achieved significant progress on many fronts in the education sector. Education completion rates have been increasing from 2015 to 2018. For example, at the primary level, completion increased from 80.0 to 86.1 per cent, at the secondary level it increased from 39.0 to 47.6 per cent. The proportion of grade 1 students who passed through all early childhood education programmes increased from 62.0 to 72 per cent. Similarly, Cambodia has achieved gender parity in terms of gross enrolment rate, and the balance began to tilt in the favour of girls in recent years.

In 2010, MOEYS implemented a tracking system between science and social science and nearly 80 per cent of upper secondary school students are choosing the science track. This indicates a strong foundation for enrolment in STEM-related majors in higher education. This is furthered by more recent policies such as the National Education 2030 Roadmap and the New Generation School Policy aiming at enhancing the presence of educational innovation throughout the

school system and empowering the education system to effectively compete with other education systems in the ASEAN region.

However, while impressive progress continues, a number of challenges remain to be addressed, including: equitable and inclusive access for children to all levels of education and training; the transition from primary to lower-secondary and high drop-out rates at the lower-secondary levels; quality issues from pre-primary to tertiary educators; and life-long learning.

Furthermore, although MOEYS long published a Master Plan for ICT in Education, Cambodia still lags behind in ICT infrastructure in education due to the lack of ICT trainers, network infrastructure and technological equipment. According to the Global Education Monitoring Report in 2014, only 8 per cent of public primary and secondary schools have access to stable electricity to support ICT integration in classrooms and only 7 per cent are connected to the Internet. Moreover, Cambodia also has a very low learner-to-computer ratio, where 500 or more secondary pupils shared a computer.⁵¹

⁴⁹ Kem et al. 2019.

⁵⁰ Ibid.

⁵¹ Konrad-Adenauer-Stiftung Cambodia 2019, p. 31.

Higher education institutions have started focusing on entrepreneurship and innovation

Most of the 118 higher educational institutions in Cambodia, both public and private, offer business-related courses, and about 30 per cent offer information technology and engineering programmes. Although business is one of the most popular majors, the emphasis on entrepreneurship education is a fairly recent phenomenon. In recent years, in response to increasing interest in technology business, a few leading universities in Phnom Penh have taken steps to bridge entrepreneurship and technology education.⁵²

Many significant initiatives have been enabled in recent years. Some universities, such as the Royal University of Phnom Penh (RUPP), the National University of Management (NUM), the Institute of Technology Cambodia (ITC) and NIPTICT established university-based incubation and start-up centres as well as industry linkage offices.

Contrary to some perceptions and a large body of literature,⁵³ there have been significant developments on improving the entrepreneurial ecosystems within the university environment, notably at RUPP and NUM (see box 4.3).⁵⁴ Both universities have important roles in the national education ecosystem. Universities are exploring different models for supporting student learnings and projects. Four universities, namely NUM, ITC, Paragon University (previously Zaman University) and University of Puthisastra, established on-campus innovation labs with the purpose of spurring entrepreneurial mindsets amongst students. However, the incubator of the ITC is considered, by far, the most advanced and to be taken as a model.

The National University of Management has been running annual business competitions, a start-up simulator for university students and recent graduates since 2006. ITC, Norton University, and NIPTICT partner with Emerald Hub and SmallWorld Ventures to implement start-up bootcamps for students. University of Puthisastra partnered with Trybe to extend the co-working space and innovation lab space into a student innovation centre.

Box 4.3. Support for entrepreneurial activities in universities

Development of the entrepreneurial ecosystem at the Royal University of Phnom Penh (RUPP)

- 2011: The Faculty of Development Studies establishes several courses on social entrepreneurship and innovation for its master's degree programme.
- 2013: The Faculty of Engineering introduces several formal entrepreneurship courses – Technology Entrepreneurship, Business Management, and Entrepreneurship – and internships in industry for undergraduates. The faculty and its three departments establish good foundations for industry engagement in research, curriculum development and internship.
- 2017: Under the Southeast Asia Social Innovation Project, the Social Innovation Support Unit (SISU) is established as “a hub for research, education and training, incubation and dialogue on social enterprise, cooperatives, social innovation, corporate social responsibility and broader social economy organizations in Cambodia and the region.” The mission of SISU is to help social entrepreneurs and other social changemakers (including government, non-government and private sector actors) to contribute to a sustainable and inclusive economy in Cambodia. SISU is managed and hosted by the Faculty of Development Studies. The Faculty of Development Studies introduces undergraduate courses on entrepreneurship and cooperatives.
- 2019: The Techo Startup Centre is launched as a national agency to serve as an incubator, accelerator, research and development centre, and internship programme. Located on RUPP campus but serving all universities by linking them with industry, this Centre serves as a venue for students to do internship, research and have access to mentors. In addition to students, small and medium enterprises also stand to benefit from the centre's services. In the same year, the University-Industry Cooperation Centre (UICC), funded by the European Union, is established. The aim of UICC is to equip students “with entrepreneurship skills, innovation skills, cross-cultural competence, and employability skills” and establish comprehensive university-industry linkages in Cambodia.

⁵² Kem et al. 2019, p. 20.

⁵³ Sam and Dahles 2017

⁵⁴ CDRI 2019.

The entrepreneurial ecosystem at the National University of Management

The vision of the National University of Management is to be the leading university in Cambodia in entrepreneurship and innovation. To that end, it has launched two new academic programmes – a four-year undergraduate programme on entrepreneurship and innovation, and a one-year master’s programme on global innovation management – and established partnerships with multinational companies through seminars and training on innovation.

- The innovation lab (iLab) serves as an incubator and a venue for the National Business Model Competition. It offers state-of-the-art office space and technologies, including 3D printing for rapid prototyping and virtual reality for teaching and learning. Part of the *regional network of the Social Innovation Support Unit*, it is an example of a public-private partnership between the National University of Management and Smart Axiata, a major telecom company.
- iLab hosts several start-ups. Book Bank was started by MSK, a second-year student in International Business. Her aim was to promote the culture of reading across the country by providing a book loan and delivery service. Multi-award winning Demine Robotics was developed by RCY during his 4th year design project to make demining work in Cambodia safe and more efficient. This robotic solution is now being used in Canada and Cambodia.
- The National Business Model Competition is an entrepreneurship competition for university students and recent graduates in the fields of technology, medicine/healthcare, education, agriculture and general business. The event is one of the longest running competitions in Cambodia and has raised awareness and excitement among many undergraduates in Phnom Penh.

In 2018 alone, more than 20 start-up programmes for university students and graduates were organized. Moreover, due to better external, public and private sector funding, university-industry linkages have gained interest and commitment from institutional leaders. In particular, formal and active partnerships between academic institutions, intermediary organizations and the private sector (ITC-SmallWorld, RUPP-Impact Hub, National University of Management-Smart Axiata) in curriculum development, networking and resource sharing. These partnerships build both formal and informal networks for entrepreneurship. Intermediary organizations (e.g., SmallWorld, Impact Hub, incubation and start-up centres, industry-university relations offices) provide technology and entrepreneurial support services, help bridge communication gaps and forge partnerships between education and business institutions.

Corporate funding, most notably from Smart Axiata and EZECOM, and other development partners, such as the United States Agency for International Development (USAID) and the European Union, have made it possible for universities to offer a dedicated on-campus facility such as innovation labs for students to work for technology projects. Between 2013 and 2019, Development Innovations was a USAID-funded project that helped civil society organizations, technology companies, social enterprises and young innovators to design and use ICT solutions and employ innovative processes to tackle Cambodia’s development challenges. The services and activities

funded by Development Innovations ranged from digital skills courses to business incubators and accelerators, and social media campaigns to youth professional development programmes. With universities in the country generally failing to teach research skills and promote innovation, these new initiatives seek to fill gaps in students’ academic and professional formation, particularly for R&D, innovation and the promotion of entrepreneurial and start-up culture.⁵⁵

In 2018, the World Bank allocated \$92.5 million through the Higher Education Improvement Project to improve the quality and relevance of higher education and research mainly in STEM and agriculture. This programme is composed of four components: improving teaching and learning capacity, improving research in STEM and agriculture, strengthening sectoral governance and project management and a contingent emergency response. The project will end in 2024.

Recent achievements in technical and vocational education and training

In recent years, there have been some achievements such as the implementation of the National Policy Framework on Technical and Vocational Training 2017-2025, the Cambodia Qualification Framework, National Competency Standards and Competency-

⁵⁵ Konrad-Adenauer-Stiftung Cambodia 2019, p. 31.

based Curriculum, framework for accrediting students from TVET moving to higher education institutions; the establishment of model centres for technical training in many places and the national technical and vocational training day (TVET day).

These actions are an opportunity for the development of new skills and the diversification of the Cambodian labour market. Other actions will most likely be implemented until 2024 in the context of the Higher Education Improvement Project.

Research has improved over the past twenty years

Research in Cambodia is mainly concentrated in universities and public research institutes, that produce scientific publications. This production is dynamic and following an upward trend (albeit from a small base), from little to no publications before the year 2000 to around 500 publications a year in 2018, 80 per cent of which being scientific articles. Box 4.4 summarizes the publication trends for Cambodia in the past 20 years.

Box 4.4. Key publication trends in Cambodia, 2000–2019

There were nearly 5,000 scientific publications (articles, book chapters, ...) in the past 20 years with authors or co-authors affiliated to Cambodian research institutions. Some 80 per cent of the documents are articles.*

- Cambodia ranks twenty-third in Asia based on scientific documents published in 2019 (and nineteenth if considering medical publications only).**
- RUPP is one of the top 10 research institutions, in terms of publications with authors or co-authors affiliated to Cambodian research institutions (2000–2019), and the only Cambodian one.
- The top 10 research areas (2000–2019) are medicine, agricultural and biological sciences, immunology and microbiology, social sciences, environmental sciences, biochemistry, genetics and molecular biology, engineering, earth and planetary sciences, nursing and multidisciplinary.
- Among the top 10 researchers, in terms of publications, affiliated to Cambodian research institutions (2000–2019), two are Cambodian (D. Socheat and V. Saphonn). ***

Notes

* Elsevier's Scopus, the largest abstract and citation database of peer-reviewed literature.

** The SCImago Journal and Country Rank is a publicly available portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.). These indicators can be used to assess and analyze scientific domains.

*** Elsevier's Scopus, the largest abstract and citation database of peer-reviewed literature.

Cambodia is extremely connected to (and reliant on) international research collaboration. Between 2008 and 2013, 96 per cent of Cambodian articles involved at least one international co-author, a trend which may explain the high citation rate. Cambodians count both Asian (Thailand and Japan) and Western scientists (United States, United Kingdom and France) among their closest collaborators.⁵⁶

In terms of connectivity, CamREN is the country's National Research and Education Network (a specialized Internet service dedicated to supporting the needs of the research and education communities within the country). The Network Operation Center of CamREN is located at ITC. By law, representatives from the Ministry of Culture and Fine Arts, MOEYS, MEF and the Ministry of Mines and Energy are members of the board.

⁵⁶ UNESCO 2015, p. 711.

4.5 FAVOURABLE FRAMEWORK CONDITIONS

Following the 2018 general election, MEF began rolling out new initiatives to support the start-up and MSME sector with input from General Department of Taxation. A highly anticipated policy change was implemented in October 2018 with tax breaks for SMEs, including ICT as one of six priority sectors. All newly registered SMEs are eligible for the three-year tax break. To be eligible for the five-year break, newly registered SMEs must use at least 60 per cent local raw material, increase the number of employees by 20 per cent or be located in the SME cluster zone.

To note also, the Ministry of Commerce enacted the Consumer Protection Law, the E-Commerce Law and the Competition Law in 2019 to support the development of e-commerce activity within Cambodia and regionally, by providing greater legal certainty and deepening consumer protection in the country.

The Institute of Standards of Cambodia is the national standards body responsible for the preparation and publication of Cambodian standards and guidelines for products, commodities, materials, services and operations. The main functions and duties of ISC are as follows:

- i. To prepare national standards for products, commodities, materials and services;
- ii. To operate conformity assessment schemes in accordance with provisions set out by law;

- iii. To establish and maintain laboratories, libraries and other equipment to promote standardization and quality;
- iv. To certify the conformity and safety of products, commodities, substances, materials and equipment for local consumption and export; to certify the conformity of production and services management systems;
- v. To provide training and consultancy services to promote standardization and quality;
- vi. To recognize laboratories, facilities and other equipment locally and abroad ;
- vii. To assist and protect consumers in safety and quality of goods and services ; and
- viii. To cooperate with local authorities, industries, commercial and trade sectors to ensure implementation of standards.

The Institute of Standards of Cambodia participates in the International Electrotechnical Commission Affiliate Country Programme, and it is a member of the ASEAN Consultative Committee on Standards and Quality. Cambodia became a subscriber member of ISO in January 1995 and a correspondence member in 2016.

CHAPTER

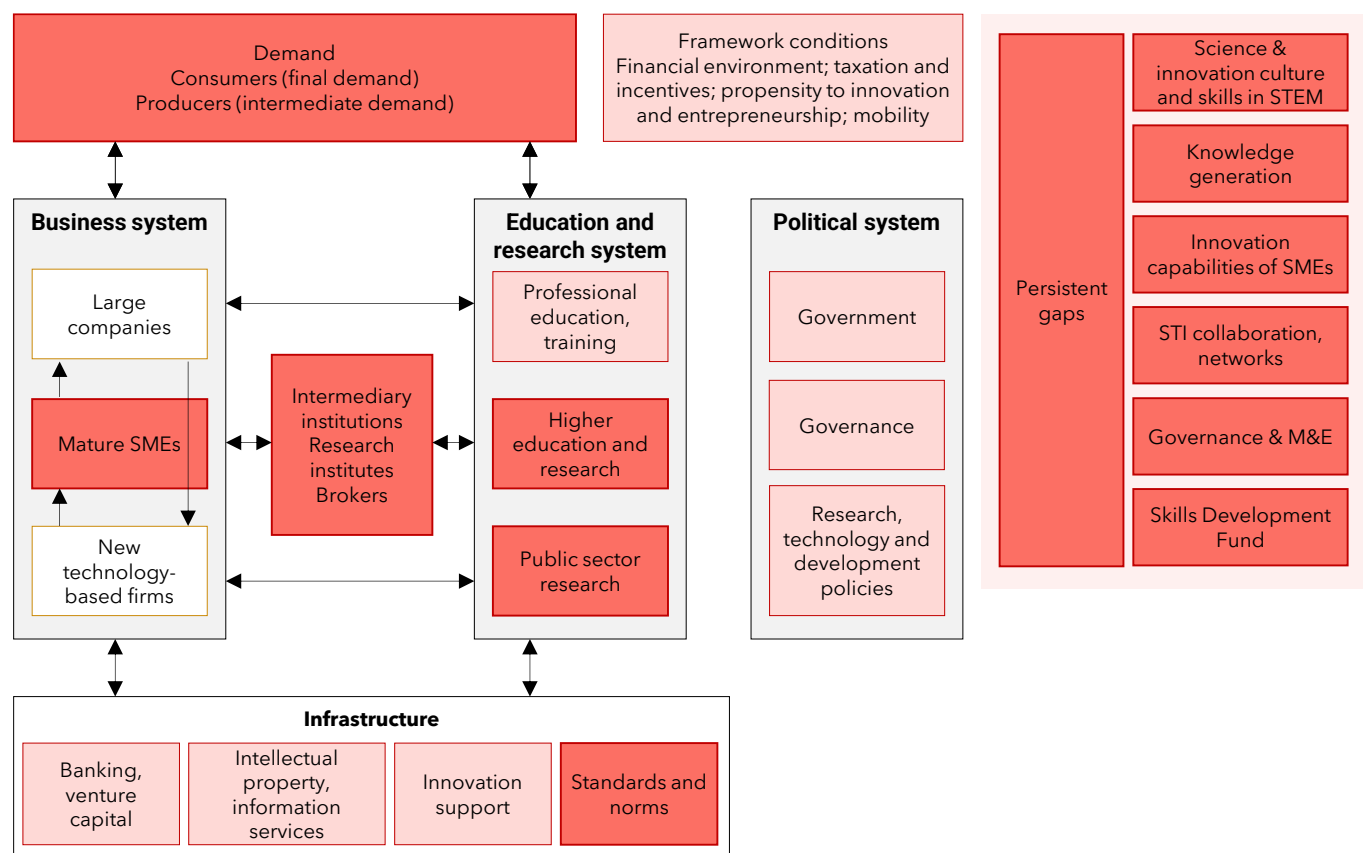
5

WEAKNESSES OF THE NATIONAL INNOVATION SYSTEM

The NIS of Cambodia presents a number of weaknesses, such as challenges in the governance of STI, an unbalanced industrial ecosystem and insufficient human resources and knowledge

generation (see figure 5.1). Such weaknesses could limit the impact of policy interventions, therefore, initiatives to address them must be prioritized in the next 10 years.

Figure 5.1. Weaknesses of the national innovation system of Cambodia



Note: A darker shade of red indicates a relatively weaker component.

5.1 STI GOVERNANCE FACES MANY DIFFICULTIES

The lack of culture of coordination between government offices

Innovation comes from networking, collaboration and the exchange of ideas, scientific knowledge, people and actions across organizations and sectors. However, government bodies in Cambodia seldom coordinate. Interviewed ministries reported about the difficulty of properly communicating among ministries. The diffused responsibility for science and technology across 11 key ministries presents challenges for effective policy development and governance. Although there is evidence of growing collaboration across some key agricultural institutions, such as the Cambodian Agricultural Research and Development Institute and the Royal University of Agriculture, difficulties persist in extending this type of collaboration to a broader range of institutions.⁵⁷

The governance of the national innovation system in Cambodia remains fragmented between the different ministries and the roles of MISTI, of the NCSTI and of ASEAN Committee on Science, Technology and Innovation are yet to be appropriated by government stakeholders.

Informality of SMEs remains a challenge

Many SMEs in Cambodia are still reluctant to formalize their statuses (they remain in informality). Hence there is little data available about them and their needs, which hampers public sector interventions. According to the Federation of Associations for Small and Medium

Enterprises of Cambodia, there are an estimated 530,000 SMEs in the country.⁵⁸ However, low compliance with regulations and uneven regulatory enforcement has meant that only 39,141 SMEs had registered with the Ministry of Industry and Handicraft at the end of 2016.⁵⁹ This low rate of compliance with regulations can potentially lead to difficulties in supporting SMEs and limit the effect of public action on private innovation and R&D. Specifically, it will be difficult to tailor SMEs support instrument and programmes to the needs of SMEs that are not well known.

A recent shift in industrial development benefiting the non-poor

While poverty continues to decline in Cambodia, the drivers of poverty reduction are changing. Though impressive gains continued to be made in recent years, the reduction in poverty during 2013–2017 was less than during 2009–2013, mainly because economic growth benefited the non-poor more, while the rate of urban poverty stagnated compared to the earlier period. Consumption per capita by income group during 2013–2017 grew at 13 per cent for the bottom 40 per cent, while it expanded at 22 per cent for the top 60 per cent. The non-agricultural wage played a more significant role in reducing poverty during 2013–2017 compared to 2009–2013 when household agriculture was the primary driver of poverty reduction.⁶⁰

Increased investment in NIS, mainly concentrated in urban areas, can lead to greater inequality between urban and rural populations and an increase in geographic imbalances.

5.2 AN UNBALANCED INDUSTRIAL ECOSYSTEM

In Cambodia the industrial base is characterized by the missing middle: a small percentage of large enterprises account for the majority of turnover and employment. The number of informal businesses in Cambodia is very high.

Most SMEs in Cambodia are traditional and will face tremendous difficulties in modernizing. Compared to

neighbouring countries, digital adoption by businesses is at a nascent stage in Cambodia.⁶¹ In this context, public policies should focus on promoting a new generation of entrepreneurs, digitizing SMEs and providing an enabling business environment. On the 490,000 SMEs in Cambodia, there are about 200–300 active technology start-ups.

⁵⁷ Ibid.

⁵⁸ Phnom Penh Post 2017.

⁵⁹ Ministry of Industry and Handicraft 2016.

⁶⁰ World Bank 2019, p 13–14.

⁶¹ Pidior 2018.

Additionally, there is a strong rural predominance in Cambodia, as about 80 per cent of the population live in rural areas. Structurally, innovation develops around R&D infrastructure, networks and clusters that are more often found in cities, thus a mismatch between the urban aspect of R&D and the rural aspect of most of the population hinders STI development.

Peripheral regions of Cambodia, which lack access to markets, generally lag behind others. Phnom Penh and its neighbouring core provinces are the most economically vibrant areas by some margin. Provinces with high trade potential and an ability to benefit from an open economy – such as those on the south-east Vietnamese border, those close to the Sihanoukville port and others on the Thai border – have also grown rapidly in recent years.

A dissociation between start-ups and the Cambodian economy would be a threat. The vast majority of start-ups are working on urban solutions, with very few products aimed at mass or rural markets. This is also true for solutions that target lower socioeconomic market segments, in spite of high smartphone penetration and cheap data rates. This represents an additional opportunity considering future market participation. Although several platforms, apps and services are bilingual or fully Khmer language, the majority still use Anglophone solutions.

Diversity in the technology ecosystem is equally challenging in Cambodia. Of all the technology start-up founders who voluntarily participated in Mekong Strategic Partners and Raintree Development research on the Cambodian technology ecosystem, over 80 per cent were male. While they did not survey full team gender diversity, it is likely that this gender bias is even stronger in start-up teams.

Finally, external influences (FDI, donor countries) are often significant to Cambodian society.

While these dynamics may not be surprising, they represent real long-term commercial challenges if Cambodia aspires to truly build its digital economy. In order to be sustainable and create true value in the domestic economy, the technology ecosystem needs to actively build local talent to avoid dynamics like those found in sub-Saharan Africa, where a mere 9 per cent of all venture capital funds are awarded to founders native to the region (versus expatriate founders building start-ups in those markets). Overcoming these challenges will require public and private sector solutions driven by potential partnerships, to achieve truly optimal commercial environment.

5.3 LACK OF SCIENTIFIC AND ENTREPRENEURIAL CULTURE, OF PROFESSIONAL SKILLS AND OF EXCELLENCE IN RESEARCH

Science, digital and entrepreneurship culture is weak

Awareness about innovation and science in Cambodia is still limited. Furthermore, social norms related to gender relations continue to constrain the development of women's potential and hinder their empowerment in economic, social, public and political life. Women are more engaged than men in the formal labour market (about 56 per cent of paid employees are women). This is partly because women represent 85 per cent of the garment sector labour force.⁶²

However, there are major gender gaps in earnings and job quality. Most women in the garment sector are engaged in assembly, while the higher-paying quality control and supervision work is done by men. In 2014, the gender earnings gap was up to 30 per cent among those with low education.⁶³ The general attitude of rural parents towards the education of their daughters results in low participation of girls in STEM fields.

People in Cambodia are often risk-averse, mainly because traditional Cambodian approaches to parenting and education do not necessarily encourage asking questions and risk-taking behaviour. Studies

⁶² International Labour Organization, 2019.

⁶³ World Bank 2016b.

have also indicated that this risk aversion constrains innovation. Indeed, research found innovation and risk appetite to be the exception, rather than the rule, across Cambodia.⁶⁴ There is a general “avoidance of risky enterprise in favour of expansive social investments and ... higher education through which one moves into the professions rather than business”.⁶⁵

To prepare for the digital economy, most firms say they are likely to invest in improving their existing products and services and in improving the capacity of their staff. However, almost half of the firms say they do not have a clear training plan and around 30 per cent say they will provide on-the-job training. Almost everyone expresses a concern that their staff will leave the company after receiving training.⁶⁶ Therefore, it is to be anticipated that firms will not invest sufficiently in training and skills development for Cambodia to reach its full innovative potential.

Higher education system does not provide enough graduates with required skills

The current situation in higher education reveals an alarming mismatch between education and employment and a lack of scientific culture. According to various reports, the areas of study that are popular among Cambodian university students are social sciences and business-related majors. Only a small percentage of students are studying science, engineering and agriculture; areas of study considered to be key skills to foster the growth of the Cambodian economy. Further, there are concerns about the quality of higher education provision across the country.

The lack of skills in the labour market has risen steadily in recent years. A survey conducted by the National Employment Agency in 2017 found that 47.5 per cent employers experienced recruitment difficulties, of which around half were caused by a low number of applicants with required skilled and the lack of work experience or qualification.

Recruitment difficulties are most pronounced in the accommodation sector (including short-term accommodation activities and camping parks), 77.9 per cent of accommodation employers stated that they

had difficulty recruiting staff, followed by logistics, warehousing and transportation (64.1 per cent), health (58.3 per cent), education (53.0 per cent), food and beverage (51.7 per cent), finance and insurance (50.7 per cent). The least affected by recruitment difficulties were ICT (36.5 per cent), construction (34.4 per cent), garment, footwear and apparel (29 per cent), and rubber and plastics (7.3 per cent).⁶⁷

When it comes to skills that employers look for, foreign languages (especially English), technical or practical skills, customer handling, oral communication, problem-solving and teamwork skills come out on top. Jobseekers who do not possess one or several skills demanded by employers will find it particularly difficult to find a job.

Almost all participants in the 2019 study “Innovation and Entrepreneurship Ecosystem in Cambodia: The Roles of Academic Institutions” recognized that many businesses struggle to find workers and managers with the right skills and talents, as well as the difficulty of addressing this issue.⁶⁸ In the words of an academic, “industry wants us to produce qualified graduates, but it does not want to have any involvement. It just waits to recruit qualified graduates”.⁶⁹ The lack of dialogue between education and training providers, industry leaders and employers results in both a lack of skilled graduates in some occupations and an oversupply in others. The Cambodian education system also needs behavioural development among graduates, such as specific risk-taking training to encourage graduates to get out of their comfort zone.

As of 2019, the majority of the 50,000 Cambodian workers with strong digital skills were employed in large traditional companies (banks, retailers, industrials, etc.). Those who are not mostly provide information technology services for web and applications companies.⁷⁰

Universities and support programmes report growing interest among young people, especially recent graduates, who are excited about the idea of building their own start-ups immediately upon graduating, rather than working for another company.

⁶⁴ Lyne, Ngim and Santoyo-Rio 2013.

⁶⁵ Smith-Hefner 1999.

⁶⁶ Konrad-Adenauer-Stiftung Cambodia 2019.

⁶⁷ National Employment Agency 2017.

⁶⁸ See CDRI 2019. Similar findings are revealed in Kem et al. 2019.

⁶⁹ Sam and Dahles 2017, p. 17.

⁷⁰ See [Cambodian_Tech_Startup_Report_Final_150319.pdf](#) (squarespace.com).

In the job market or after launching a start-up, developing new skills can be difficult if there is no access to mentorship opportunities.

The roles of networks, mentorship and role models, worker talent and investment capital are key in the development of STI. In Cambodia, although young local entrepreneurial role models and innovation centres have provided some support, including mentorship and apprenticeship for university students and would-be entrepreneurs, coaching support is limited in scale and structure.

Despite some forms of active partnerships among education institutions, such as universities working together for annual business plan competitions, universities mention the lack of meaningful partnerships with other stakeholders in the technology start-up ecosystem.⁷¹

Public universities note that challenges lie in programme development, personnel with experience in building meaningful communities and managing innovation space, and financing support for programmes and student projects.⁷²

More generally, Cambodia faces a skills shortage in STEM. Cambodia has only 17 science and technology researchers and 13 technicians per million inhabitants.⁷³ College graduates specializing in business, finance, foreign languages and liberal arts account for more than 70 per cent of Cambodian higher education graduates. In addition, the quality of science and mathematics in Cambodia is hindered by a combination of a lack of qualified teachers for science and mathematics, poor teaching and learning facilities in upper secondary schools and lower interest and attitudes of the students towards science and mathematics.⁷⁴ As a consequence, Cambodia was ranked eighty-sixth by the World Economic Forum among 100 countries with regards to having skilled human resources in digital, science and management ready for the fourth industrial revolution.

TVET faces pressing challenges to increase technology capacities in SMEs

Another pressing challenge for Cambodia will be to develop human resources at the vocational and technical level to enhance the technological capacity of the many SMEs active in agriculture, engineering and the natural sciences. Large foreign enterprises in Cambodia that are the main source of value-added exports tend to specialize in electrical machinery and telecommunications. Technology transfer from these large operators towards small enterprises and across other sectors is currently incomplete and facilitating this type of technology transfer would increase skills and innovation capability in the country.⁷⁵

Along with important achievements, TVET in Cambodia still faces major challenges as indicated by national stakeholders interviewed in the context of this report:

- Insufficient technical training at both intermediate and advanced levels;
- Skills, curriculum, professionalism and the level and quality of technical training cannot fully respond to the market demand; and
- Private sector involvement in the technical and vocational trainings remains limited.

Lack of attractiveness and excellence in research

Knowledge generation in Cambodia remains limited. While the Government has focused investments on supporting innovation at the enterprise level so far, investment in research activities is still low, coordination across national research institutions and ministries on the research agenda is weak, and links between research institutions and the private sector are still nascent.

⁷¹ Kem et al. 2019, p. 20.

⁷² Ibid.

⁷³ Government of Cambodia 2013.

⁷⁴ Ministry of Education, Youth and Sports 2016.

⁷⁵ See De la Pena and Taruno, 2012 and UNESCO 2015, p. 711.

5.4 NASCENT INFRASTRUCTURE AND FRAMEWORK CONDITIONS TO BE FURTHER STRENGTHENED

Incubation facilities and access to finance for early-stage companies are not optimal

While programmes supporting businesses in early-stage of development are becoming more available, there are limited incubators and accelerators for mid-stage start-ups.

Stakeholders identified access to investment capital and funding as a major challenge for start-up founders. In general, there is a low level of understanding of the needs of early-stage and growing start-ups among investors, including co-investors and angel investors. The low level of sophistication in doing business and the lack of extensive experience of founders is a challenge for the development of innovation in the country. Investors observe that early-stage start-ups pitch to them before even talking to customers or gaining strong consumer insight. Founders who attended accelerator or mentoring programmes often overly focus on fulfilling competition requirements and less on creating sustainable business progress after the programme.

Formal financing for start-ups from credit institutions is also lacking. The venture capital market and angel investors are still nascent, with few active fund managers. The small size of the Cambodian market is a constraint, although it could offer the potential to become a marketplace to test innovations before rolling them out on the regional ASEAN market.⁷⁶

Young start-up founders lack an understanding of basic financing models at a fundamental level, such as the difference between equity and debt, different terms for phased financing, performance conditions of fund release, and more. This is partially reflective of the level of business education currently available via formal education or through entrepreneurship support programmes.

Legal and financial systems are often complex and ambiguous for start-ups and SMEs. Simplified regulations and policies, particularly for start-ups and innovative SMEs, would help further encourage start-ups and innovation in firms.

Intellectual property rights and information services

Cambodia's intellectual property laws are relatively more advanced than those of other ASEAN member States, but enforcement is uneven and challenging. Cambodia's patent authority lacks sufficient funding and expertise to examine patent applications and has been collaborating with the intellectual property offices of Singapore and Japan to grant patent protection to applicants who have already registered their patents in those countries.⁷⁷ There is still a lack of skilled officials who can process and respond swiftly. Public awareness about intellectual property is still limited, and there is a lack of facilities to support intellectual property processes.⁷⁸ The application, registration and enforcement mechanisms reportedly "remain relatively nascent" in Cambodia, despite some improvement in recent years.⁷⁹ Against this background, the Industrial Development Policy includes specific goals to improve the effectiveness of the process of registering industrial property rights (including by seeking to recognize registration agents of partner countries) and to increase automation of registration processes (see clause 6.3 B of the Policy).

The Law on Patents, Utility Model Certificates and Industrial Designs (2006) has had limited practical use, thus far, except for larger foreign enterprises operating in Cambodia. Indeed, since 2011, the annual number of patent applications filed in Cambodia is on average 77. Out of 620 patent applications between 2011 and 2018, only 5 were filed by residents.⁸⁰

Information about funding, as well as legal and tax advice are extremely important for SMEs but highly

⁷⁶ An increased number of technology-oriented trade visits from regional technology communities was observed in the "Cambodia's Vibrant Tech Startup Ecosystem" report, highlighting the recognition of Cambodia as a "test-bed" market for piloting new ideas.

⁷⁷ OECD, ERIA and the Association of Southeast Asian Nations 2018, p. 245.

⁷⁸ Government of Cambodia 2019.

⁷⁹ DFDL 2015.

⁸⁰ See www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=KH.

inaccessible. Legal and tax processes for start-ups and technology appears to be difficult for start-up founders to manage. They report struggling to find up-to-date, definitive resources that guide them through policy, instead of straining their resources with complexity or ambiguity.

Start-ups ranked the provision of co-working space as the least significant support they require, and note that investment, legal and tax consultation services, as well as access to investment professionals as mentors or strategic partners are far more important.

Norms and certification

A discussion of the Institute of Standards of Cambodia and its functions is provided in section 4.5.

National stakeholders report that information about norms and certifications are not accessible for Cambodian start-ups and SMEs, and that the norms and certification system is not fully operational. This limits enterprise opportunities for entering regional value chains and developing products with a geographical indication.

CHAPTER

6

CONCLUSIONS AND RECOMMENDATIONS

Cambodia's STI Policy seeks to promote STI as a driving force for inclusive and sustainable socioeconomic development. It contributes to the achievement of Vision 2050 of becoming an upper-middle income economy by 2030 and a high-income economy by 2050 and of the CSDGs. The objectives of the STI Policy are to strengthen the STI foundation, improve the enabling environment and develop an STI ecosystem for sustainable development, and enhance the quality of people's lives, at all levels and in all sectors. The STI Policy seeks to achieve these objectives by adopting and adapting technologies and promoting further innovation.

The promotion of STI is embedded in RS-IV, Vision 2050, the National Strategic Development Plan 2017–2023 and the Industrial Development Policy 2015–2025.

The NIS of Cambodia is under development. Based on its current strengths and weaknesses, it will be necessary to do the following to further strengthen the NIS:

Enhance the governance of the STI system. STI governance is key and has been recently restructured with the creation of MISTI in March 2020. It will be important to consolidate this new structure, while reducing fragmentation and silos. This will require clarifying the role of MISTI and other stakeholders, strengthening awareness and capacities of the Government to implement the STI Policy, and monitoring and evaluating advances made in the promotion of STI.

Build human capital in STI. The current demand for innovation is low and there is a limited culture of science and entrepreneurship. It will be critical to promote scientific, digital and entrepreneurship

literacy, and the technological readiness of the youth, starting in basic education. Teaching STI from a very early age will help create a new generation of scientists and innovators. STEM skills will also need to be promoted in higher education. In addition, there is room to strengthen teaching and collaboration with the private sector in TVET centres. Strategic development of human resources is at the foundation of promoting STI.

Strengthen research capacity and quality. There is a strong need to build the capacity of the higher education and research system to conduct high-quality R&D activities of national interest and in priority sectors. This will require developing a national research agenda with the academic community and in close collaboration with the private sector, providing funding to support excellence in science, supporting the internationalization of research and encouraging collaboration with the private sector.

Increase collaboration and linkages between different actors. Innovation comes out from the exchange of ideas, across different people, organizations, sectors and scientific domains. Intermediary organizations and knowledge-broker institutions are essential to facilitate such exchanges. Hence, it will be critical to promote and sustain incubation and acceleration facilities, technological platforms open to the private sector, and innovative clusters fostering collaboration to support innovation in SMEs and enhance their absorptive capacities.

Foster an enabling environment for innovation. Supporting innovation capabilities and increasing the absorptive capacities of enterprises requires financing and promoting intermediary structures that nurture new enterprise (start-ups), support technology transfer, and promote domestic technologies. It needs fostering

institutions that provide technology and quality services (i.e., norms and certification) to enterprises. It also requires increasing access to finance for innovation activities, including through leveraging investments from the private sector and attracting funding from donors. Incentivising FDI that supports

the building of domestic technological capabilities, facilitating the importing of technology equipment and promoting intellectual property rights are additional avenues for fostering an enabling environment for innovation.

REFERENCES

- Cambodia Development Resource Institute (CDRI) (2019). "Innovation and Entrepreneurship Ecosystem in Cambodia: The Roles of Academic Institutions".
- Cambodia, Government of Cambodia (2013). National Science and Technology Master Plan 2014-2020. Available at <http://snt.gov.kh/wp-content/uploads/2016/03/Master-Plan-2014-2020.pdf>.
- _____ (2019). Cambodia's Voluntary National Review 2019 on the Implementation of the 2030 Agenda for Sustainable Development.
- Cambodia, Ministry of Education, Youth and Sports (2016). Policy Guidelines for New Generation Schools.
- Cambodia, Ministry of Industry and Handicraft (2016). Cambodia Industrial Development Policy 2015-2025. Available at www.mih.gov.kh/File/UploadedFiles/12_9_2016_4_29_43.pdf.
- Cambodia, National Employment Agency (2018). Skills Shortages and Skills Gaps in the Cambodian Labour Market: Evidence from Employer Survey 2017. Available at www.khjobs.net/images/survey/ESNS%202017--Final--05282018.pdf.
- Cicera, Xavier, and William F. Maloney (2017). "The Innovation Paradox: Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up". Washington D.C.: World Bank.
- Cohen, Wesley M., and Daniel A. Levinthal (1990). "Absorptive Capacity: A New Perspective on Learning and Innovation", in *Administrative Science Quarterly*, 35, pp. 128-152.
- DFDL (2015). Cambodian Intellectual Property Laws and Regulations Update 2015. 3 March. Available at www.dfdl.com/resources/legal-and-tax-updates/cambodia-intellectual-property-laws-regulations/.
- De la Pena, F. T., and W. P. Taruno (2012). Study on the State of S&T Development in ASEAN. Taguig City, the Philippines: Committee on Science and Technology of Association for Southeast Asian Nations.
- Freeman (1987). Technology and Economic Performance: Lessons from Japan. London: Pinter.
- General Secretariat of the National Science and Technology Council (2019). Summary of National Priority Technology Report.
- International Labour Organization (2019). "The Footwear Sector - New Opportunities for Cambodia?", in *Cambodia Garment and Footwear Sector Bulletin*, 9. Available at www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/publication/wcms_714915.pdf.
- Kem, Bora, Jolyda Sou, Zoë Ng, Penhleak Chan (2019). "Cambodia's Vibrant Tech Startup Ecosystem in 2018." Research Report 2. Phnom Penh: Mekong Strategic Partners and Raintree Development.
- Konrad-Adenauer-Stiftung Cambodia (2019). Preparing Cambodia's Workforce for a Digital Economy. Digital Insights. Phnom Penh.
- Lundvall (1992). National Innovation Systems: Towards a Theory of Innovation and Interactive Learning. London: Pinter.
- Lyne, Isaac, Chanrith Ngin, Emmanuel Santo Rio (2013). Understanding Social Enterprise, Social Economy and Local Social Entrepreneurship in the Context of Rural Cambodia. Conference: 4th EMES International Research Conference on Social Enterprise. Liege, Belgium, July.
- Nelson (1993). National Innovation Systems. A Comparative Analysis. New York/Oxford: Oxford University Press.

REFERENCES

- OECD (2018). "Chapter 3. Cambodia", in Good Regulatory Practices to Support Small and Medium Enterprises in Southeast Asia, pp. 56-75.
- OECD, ERIA and the Association of Southeast Asian Nations (2018). "Chapter 13. Cambodia", in SME Policy Index: ASEAN 2018 – Boosting competitiveness and inclusive growth, pp. 231-255.
- Pidor, Lydet (2018). Cambodian SMEs in the 4th Industrial Revolution: Government Policies and Opportunities.
- Sam, Chanphirun, and Heidi Dahles (2017). "Stakeholder Involvement in the Higher Education Sector in Cambodia," in *Studies in Higher Education*, 42 (9) pp. 1764-1784.
- Schwaag Serger, S., Emily Wise and Erik Arnold (2015). National Research and Innovation Councils as an Instrument of Innovation Governance – Characteristics and challenges. Vinova Analysis, November.
- Smith-Hefner, N. J. (1999). *Khmer American: Identity and moral education in a diasporic community*. Berkeley: University of California Press.
- Stam, F.C. (2017). "Measuring Entrepreneurial Ecosystems," Working Papers 17-11, Utrecht School of Economics.
- United Nations Development Programme (UNDP) (2019). Human Development Report Cambodia: Sustaining natural resources for all. Phnom Penh.
- United Nations Economic Commission for Asia and the Pacific (ESCAP) and Inclusive Business Action Network (iBAN) (2020). Landscape Study of Inclusive Business in Cambodia. Available at www.unescap.org/sites/default/d8files/knowledge-products/Landscape%20Study%20Inclusive%20Business%20Cambodia%20ESCAP%20iBAN%202021%20REPORT%20Final.pdf.
- United Nations Educational, Scientific and Cultural Organization (UNESCO) (2015). "Chapter 27. Southeast Asia and Oceania", in UNESCO Science Report, pp. 692-731.
- World Bank (2016a). Cambodia Economic Update: Enhancing export competitiveness – the key to Cambodia's Future Economic Success. Phnom Penh, Cambodia Country Office.
- World Bank (2016b). Globalization and the Gender Earnings Gap: Evidence from Sri Lanka and Cambodia.
- World Bank (2018). Entrepreneurial Cambodia – Cambodia Policy Note. Washington D.C.
- World Bank (2019). Cambodia Economic Update: Recent economic developments and outlook. Phnom Penh, Cambodia Country Office.
- World Vision (2015). Country Profile: Cambodia. Available at www.worldvision.com.au/docs/default-source/global-one/country-profile-cambodia.pdf.

APPENDIX

LIST OF ORGANIZATIONS CONSULTED

Ministry of Industry Science Technology and Innovation (MISTI)

- General Department of Science Technology of Innovation
- National Institute of Science Technology of Innovation
- General Department of Industry
- General Department of SME and Handicraft
- Institute of Standards of Cambodia

Advisory Board Members of National Council of Science Technology and Innovation

Former National Science and Technology Council

Ministry of Economy and Finance (MEF)

- General Department of Economic Policy and Public Finance

Supreme National Economic Council (SNEC)

Ministry of Foreign Affair and International Cooperation (MFAIC)

- General Department of International Cooperation
- National Institute of Diplomacy and International Relations

Ministry of Education, Youth and Sports (MOEYS)

- General Department of Higher Education
- General Department of Policy and Planning

Ministry of Post and Telecommunications (MPTC)

- General Department of ICT

Ministry of Commerce (MOC)

- General Department of International Trade
- General Department of Trade Promotion

Ministry of Labour and Vocational Training (MLVT)

- General Department of TVET

Ministry of Agriculture, Forestry and Fisheries (MAFF)

- General Department of Agriculture

Ministry of Health (MOH)

- General Department of Health

Ministry of Planning (MOP)

- General Department of Planning
- National Institute of Statistics

Ministry of Public Work and Transportation (MPWT)

- General Department of Logistics
- General Department of Planning

Ministry of Interior (MOI)

- General Commissariat of National Police

Ministry of Defense (MOD)

- Royal Cambodian Armed Forces

Ministry of Civil Service (MCS)

Council for the Development of Cambodia (CDC)

Techo Startup Center (TSC)

SME Bank of Cambodia

Federation of Associations for Small and Medium Enterprises of Cambodia (FASMEC)

Cambodia Chamber of Commerce (CCC)

Institute of Technology of Cambodia (ITC)

Royal University of Phnom Penh (RUPP)

Royal University of Agriculture (RUA)

National Institute of Post and Telecommunication and ICT (NIPTICT)

National Polytechnic Institute of Cambodia (NPIC)

Cambodia Development Research Institute (CDRI)

Kirirom Institute of Technology (KIT)

Asian Vision Institute (AVI)

Impact Hub Company

Small World Company

Amru Rice Company

GGear Group Company

ISI Group Company

Mong Reththy Group Company

Chip Mong Group Company

Royal Group Company

Wing Company

Bongloy Company

Japan International Cooperation Agency (JICA)

Asian Development Bank (ADB)

World Bank

