Kingdom of Cambodia

NATION | RELIGION | KING

CAMBODIA'S SCIENCE, TECHNOLOGY & INNOVATION ROADMAP 2030

2021

MINISTRY OF INDUSTRY, SCIENCE, TECHNOLOGY & INNOVATION

KINGDOM OF CAMBODIA
NATION | RELIGION | KING

Royal Government of Cambodia

CAMBODIA'S SCIENCE, TECHNOLOGY & INNOVATION ROADMAP 2030

2021

MINISTRY OF INDUSTRY, SCIENCE, TECHNOLOGY & INNOVATION

Foreword

Strengthening national technological capabilities and improving innovation performance will be critical to achieve the ambitious vision of the Royal Government of Cambodia to become an upper-middle-income economy by 2030 and a high-income economy by 2050. Science, technology and innovation (STI) will be a pivotal driver to shift the economic development pathway from a focus on traditional growth to support for inclusive and sustainable growth. STI will enable and accelerate the structural transformations required to increase national prosperity, peace, security, safety and socioeconomic development and to improve quality of life.

The COVID-19 pandemic has precipitated an overwhelming health crisis and hampered global socioeconomic development. Despite impressive economic growth rates in the past decade, the economy of Cambodia has seen a contraction in its growth since 2020 due to the disruption of local and global supply chain. The Cambodia's Science, Technology and Innovation Roadmap 2030 is a timely and crucial asset to guide not only economic recovery but also structural transformation, economic diversification and productivity improvement. Simply put, the STI Roadmap 2030 will help catalyze the economic transformation from a labour-intensive to a skilled-driven economy and eventually enable Cambodia to become an innovation-led growth nation.

This STI Roadmap 2030 targets five main pillars: governance; education; research and development; collaboration and networking; and enabling ecosystem. These pillars are aligned with other national policies and master strategic plans, such as the National Rectangular Strategy Phase IV, the National Strategic Development Plan 2019–2023, National Policy of STI 2020–2030, Industrial Development Plan 2015–2025 and others. I am fully confident that the STI Roadmap 2030 will be a steppingstone for successful implementation of these national strategic plans.

Understanding the cross-cutting nature of STI, as the Prime Minister, I strongly encourage the relevant stakeholders, including government agencies, universities, research institutions, private sector and development partners, to work together to implement this STI Roadmap 2030 under the coordination of the Ministry of Industry, Science, Technology & Innovation and the guidance of the National Council of Science, Technology & Innovation. Together we can achieve our noble endeavour and realize our 2050 vision.

I would like to congratulate the outstanding leadership of **His Excellency *Kitti Settha Panditta* CHAM Prasidh**, Senior Minister and Minister of Industry, Science, Technology & Innovation, for leading the General Department of Science, Technology & Innovation to develop this strategic document. I would also like to express my sincerity to the United Nations Economic and Social Commission for Asia and the Pacific for the technical and advisory assistance provided throughout the creation of this STI Roadmap.

Phnom Penh, 26 July .., 2021

Prime Minister

Samdech Akka Moha Sena Padei Techo HUN SEN

Preface

Science, Technology and Innovation (STI) have been the driving force for economic development of all modern developed nations. The Royal Government of Cambodia (RGC), under the leadership of **Samdech Akka Moha Sena Padei Techo HUN SEN,** Prime Minister of the Kingdom of Cambodia, understands that STI will be fundamental for Cambodia to achieve its ambitious vision to transform the nation and become a high-income country by 2050.

To support this mission, the Ministry of Industry, Science, Technology & Innovation (MISTI), previously known as Ministry of Industry and Handicraft, has received new responsibilities. It has been entrusted to lead and manage the implementation of the National STI Policy 2020–2030, alongside its existing commitments to support industry, handicraft and the potable water sectors. The sub decree 48 ANKr.BK, dated 6 April 2020, assigns to MISTI a clear responsibility to coordinate and execute initiatives to strengthen scientific research, technological development and innovative capacity in the context of the fourth industrial revolution. In addition, the National Council of Science, Technology & Innovation (NCSTI), established in 2020 and chaired by **Samdech Techno Prime Minister**, will guide the promotion of STI for national development.

To comply with the decision of the royal government and fulfill the assigned tasks successfully, MISTI has developed this Cambodia's Science, Technology & Innovation Roadmap 2030 (STI Roadmap 2030) which served as the national strategic document that will help guide government officials in line ministries and other key stakeholders on the critical actions to take and milestones to achieve to realize the ambitious Vision 2050 of RGC.

The STI Roadmap 2030 has been produced with active support from the United Nations Economic and Social Commission for Asia and the Pacific, as well as the substantial contribution from our ministerial team. It integrates evidence-based policy advice and inputs from relevant key stakeholders, including the Directors General of 18 line ministries, Directors and Rectors of eight leading higher education institutions and research centers in Cambodia, eight chief executive officers of successful companies in various sectors, executive leaders of three accelerator centers and three international development partners.

The STI Roadmap 2030 is built on five pillars and each pillar has explicit targets to be achieved by 2030. The first pillar seeks to enhance the governance of the STI system and identifies MISTI as the leading coordinating body for STI policies and implementation. The second pillar seeks to build human capital in STI by increasing the number of university students in STEM fields to at least 50 per cent. The third pillar seeks to improve scientific research by investing 1 per cent of national gross domestic product in research activities.

The fourth pillar aims to strengthen collaboration and networking between key stakeholders. Lastly, the fifth pillar seeks to foster an enabling ecosystem for innovation, improving the absorption capacities of firms, attracting investment in STI-related industries and promoting technology transfer.

I commend and endorse the splendid efforts of all who worked together to create this Roadmap. STI is the backbone of all successful development experiences and no country on Earth has escaped the middle-income trap and become a prosperous society without a clear strategy for STI development. Under the great leadership of **Samdech Techo Prime Minister**, embracing STI will be a game-changing decision, enabling Cambodia to enter a new era of revitalized civilization.

As Senior Minister, Minister for Industry, Science, Technology & Innovation, and Chair of NCSTI, I am committed to promote STI for the sustainable and inclusive growth of Cambodia.

Phnom Penh, 22 July, 2021

Senior Minister
Minister of Industry, Science, Technology & Innovation
and Chair of National Council of Science Technology & Innovation

***Kitti Settha Pandita* CHAM Prasidh**

Acknowledgements

This Roadmap was drafted in 2021 to provide direction for the implementation of the National Science, Technology and Innovation (STI) Policy. It was produced by the Ministry of Industry and Science, Technology & Innovation (MISTI), under the supervision of H.E. Dr. Hul Seingheng, Director General of the General Department of Science, Technology & Innovation (GDSTI); and with the support of the Trade, Investment and Innovation Division of the Economic and Social Commission for Asia and the Pacific (ESCAP).

An initial blueprint was drafted by Ms. Francie Sadeski, Partner Consultant and Mr. Matthieu Lacave, Leading Consultant and General Managing Partner of Technopolis Group; with the support of Mr. Rafael Torquato Cruz, Project Officer, Technology and Innovation Section (ESCAP), and under the supervision of Ms. Marta Pérez Cusó, Economic Affairs Officer (ESCAP).

The document incorporates insights gathered during the process of co-creating this Roadmap, a process endorsed by MISTI, and duly managed by Dr. Srun Pagnarith, Director of Department of Science, Technology & Innovation Policy, with the support of the following people:

- Dr. Try Sophal, Deputy Director General of GDSTI
- Dr. 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 Department of STI Data Management
- Dr. Ly Sokny, Director of Department of STI Cooperation
- Dr. Cheat Sophal, Director of Department of Policy Monitoring, Inspection and Evaluation

The co-creation process was facilitated by Mr. Kal Joffres, Chief Executive Officer of Tandemic.

The contribution of multiple national stakeholders that shared their insights during the interviews and two-day workshops is also acknowledged.

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

Abbreviations

EDF	Entrepreneurship Development Fund
ESCAP	Economic and Social Commission for Asia and the Pacific
FDI	foreign direct investment
GDP	gross domestic product
ICT	information and communication technologies
MAFF	Ministry of Agriculture Forestry and Fisheries
MEF	Ministry of Economy and Finance
MISTI	Ministry of Industry, Science, Technology & Innovation
MLVT	Ministry of Labour and Vocational Training
MOEYS	Ministry of Education Youth and Sports
MOH	Ministry of Health
MPTC	Ministry of Post and Telecommunications
NCSTI	National Council of Science, Technology & Innovation
R&D	research and development
SEZ	special economic zones
SME	small and medium-sized enterprises
STEM	science technology engineering and mathematics
STI	science, technology and innovation
TVET	technical and vocational education and training
UNESCO	United Nations Educational, Scientific and Cultural Organization

Table of contents

Tables

1 Introduction

Innovation can make a difference in addressing urgent developmental challenges such as providing access to drinking water, eradicating neglected diseases or reducing hunger. The transfer and, when necessary, adaptation of technologies from developed countries can often contribute significantly to these goals. Substantial research efforts are needed to find solutions that address other global challenges. Effective international cooperation that involves both public and private bodies is an important mechanism for finding these much-needed solutions.

Moreover, one of the important lessons of the past two decades has been the pivotal role of innovation in economic development. The build-up of innovation capacities has played a central role in the growth dynamics of successful developing countries. These countries have recognized that innovation is not just about high-technology products and that innovation capacity has to be built early in the development process so that learning can enable “catch up” to happen. They also need innovation capacity to address local challenges (e.g., pandemics) through innovation. Ultimately a successful development strategy must build extensive innovation capacities to foster economic growth.

Aware of the challenge ahead, the Prime Minister of Cambodia approved the **National Science, Technology & Innovation (STI) Policy 2020–2030** (National STI Policy) in December 2019. The main objectives of the National STI Policy are strengthening the STI foundation (human resources in science and technology, research and development (R&D), institutions) and improving the STI ecosystem (framework conditions, relevant laws and regulation, synergy across organizations) to support an innovation environment for sustainable and inclusive development.

To realize the objectives of the National STI Policy, the Government sought collaboration on developing this **National Science, Technology & Innovation Roadmap 2030** (STI Roadmap 2030) to guide government ministries and relevant institutions on actions to take in the short and medium terms until 2030. The STI Roadmap 2030 operationalizes the National STI Policy by setting clear objectives, defining a set of key actions within a time horizon and specific targets to achieve by 2030. It gives a clear role to the Ministry of Industry, Science, Technology & Innovation (MISTI) to oversee and coordinate the implementation of the National STI Policy across ministries.

The Government of Cambodia requested support from the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) to develop the STI Roadmap 2030 for the implementation of the National STI Policy. ESCAP had already provided some policy guidance in recent stages of the development of the National STI Policy to achieve sustainable and inclusive development in Cambodia. Furthermore, the consultancy firm Technopolis Group was also engaged by ESCAP to support the development of this Roadmap.

The STI Roadmap 2030 was developed based on an assessment of Cambodia’s National Innovation System (published separately as The Science, Technology and Innovation

Ecosystem of Cambodia), and consultations held with stakeholders across different ministries, academia and the private sector (interviews, and workshops). The list of stakeholders is included in the Appendix. Based on the guidelines presented in this Roadmap, the implementation of policy instruments will also benefit from further consultations with national and international funding agencies and development partners, including the United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Technology Bank, United Nations Industrial Development Organization, Japan International Cooperation Agency, China International Development Cooperation Agency, Korea International Cooperation Agency and others.

In this report, R&D is defined as the generation of new knowledge. Innovation is understood consistent with the definition provided by the Organisation for Economic Co-operation and Development in the Oslo Manual. Innovation goes far beyond the confines of research labs to users, suppliers and consumers everywhere – in government, business and non-profit organizations and across borders, sectors and institutions. The Oslo Manual defines four types of innovation:

- Product innovation: A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics.
- Process innovation: A new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.
- Marketing innovation: A new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
- Organizational innovation: A new organizational method in business practices, workplace organization or external relations.

2 The STI Roadmap 2030: An overview

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

The promotion of STI is also embedded in the Rectangular Strategy Stage 4, the Royal Government of Cambodia's Vision 2050, the National Strategic Development Plan 2017–2023 and the Industrial Development Policy 2015–2025. The line ministries strategies all include specific objectives for science, technology, engineering and mathematics (STEM) and innovation. Prioritized sectors of the economy are agriculture, industry (manufacturing) and digital services.

The National STI Policy notably focuses STI priorities on five scientific and technological domains:

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

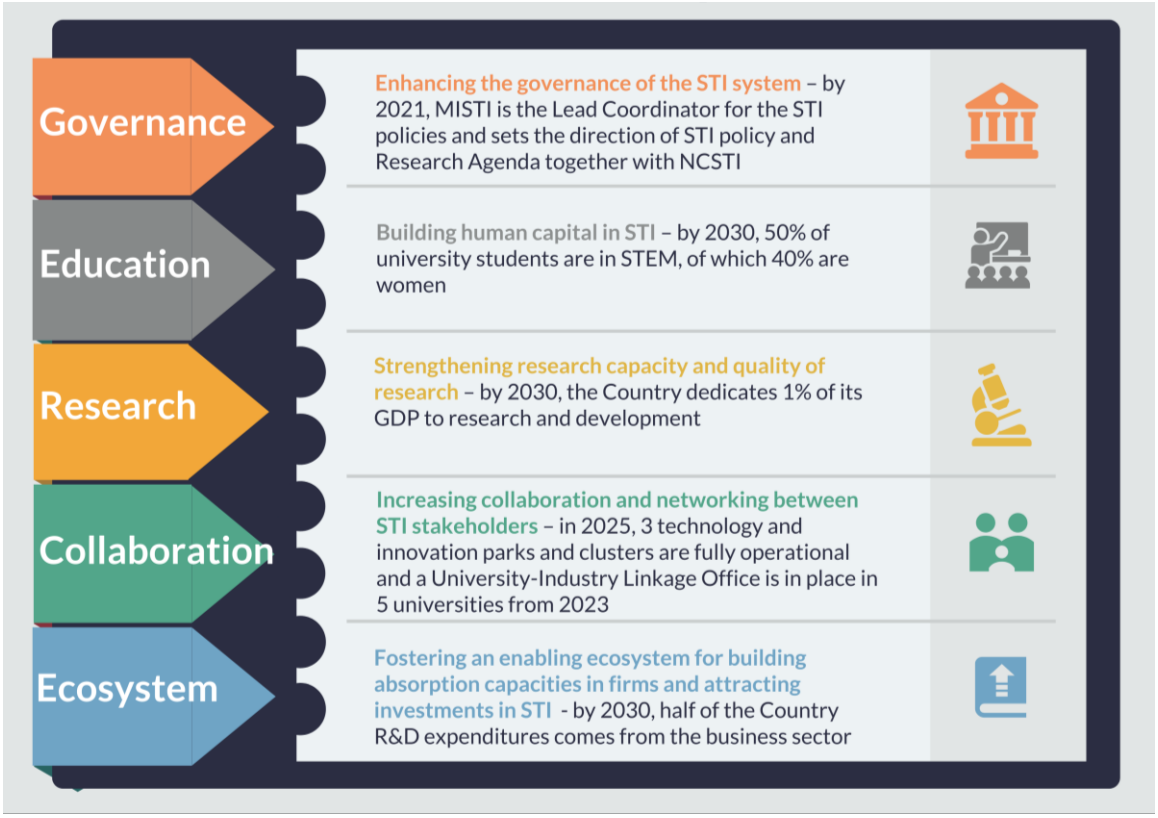
Indeed, the innovation system is still under development. The National Council of Science, Technology & Innovation (NCSTI) was established in October 2020. The Ministry of Industry, Science, Technology & Innovation was established in March 2020, and STI governance was reorganized in 2020.

Following the National Innovation System conceptual framework (which suggests that innovation is coproduced by networks of actors and takes placed in specific contexts and proposes that promoting innovation requires a systemic approach)[1] and taking into account the current strengths and weaknesses of the National Innovation System of Cambodia,[2] the STI Roadmap 2030 was designed to guide the implementation of the National STI Policy. This Roadmap is summarized in figure 1 and described below.

[1] Freeman, C. (1987). Technology Policy and Economic Performance: Lessons from Japan. London: Pinter; Lundvall, B-Å ed. (1992). National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning. London: Pinter; Nelson, R.R. (1993). National Innovation Systems: a Comparative Study. New York: Oxford University Press.

[2] A detailed assessment has been drafted and is available in a separate report named "The Science, Technology and Innovation Ecosystem of Cambodia".

Figure 1 – Summary of the National Science, Technology & Innovation Roadmap 2030



- **Enhancing 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 breaking down silos. This will require clarifying the role of MISTI and other stakeholders, strengthen awareness and capacities of the Government to implement the National STI Policy, and monitoring and evaluating advances made in the promotion of STI.
- **Build human capital in STI.** Current demand for innovation is low and there is a limited scientific and entrepreneurship culture. It will be critical to promote scientific, digital and entrepreneurship literacy, and the technological readiness of the youth, starting in basic education. Teaching science, technology and innovation from very early age will help create a new generation of scientists and innovators. Skills in science technology engineering and mathematics (STEM) 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 (TVET) institutions. Strategic development of human resources is at the foundation of promoting STI.
- **Strengthening research capacity and quality**. Build the capacity of the higher education and research system to conduct high quality R&D activities of national interest and in priority sectors is much needed. This will require developing a national research agenda with the academic community and in close collaboration with the private sector, providing funding to support excellent science and the internationalization of research and encourage collaboration with the private sector.

- **Increasing collaboration and networking between different actors**. Innovation comes 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 private sector and innovative clusters fostering collaboration to support innovation in small and medium-sized enterprises (SMEs) and enhance their absorptive capacities.
- **Fostering an enabling ecosystem for building absorptive capacities in firms and attracting investments in STI**. Supporting innovation capabilities and increasing the absorptive capacities of firms requires financing and promoting intermediary structures that nurture new firms (start-ups), support technology transfer and promote domestic technologies. It needs to be fostered by institutions that provide technology and quality (norms and certification) services to firms. It also requires increasing access to finance for innovation activities, including through leveraging investments from the private sector and attracting funding from donors. Incentivizing foreign direct investment (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 ecosystem for innovation.

The implementation of these priorities will rely on **a partnership between the public sector and the private sector.** Firms, from start-ups to SMEs to large foreign corporations, and business associations play a key role in STI, being the most prominent innovators, investors and users of technologies. The Government cannot instruct the private sector to invest in STI activities, but it can certainly encourage investment through regulations, incentives, enabling an innovation-friendly environment and building the relevant infrastructure. Furthermore, it will be vital to consult and engage multiple international development partners that can further support the implementation of the proposed actions through technical and financial assistance.

The following chapters present the key targets and instruments of the National STI Policy and the timeline to address these priorities.

3 The five pillars of the STI Roadmap 2030

3.1 Improving the governance of the national innovation system

3.1.1 Policy targets

Cambodia has defined ambitious targets in its Rectangular Strategy and Vision 2050.

The following are the specific targets to improve the governance of the National Innovation System, and measure progress:

- MISTI is the lead coordinator of the National STI Policy, and with NCSTI it sets the direction of STI policies.
- The combined public and private investments in STI by 2030 will be 1 per cent of gross domestic product (GDP). The public investments in STI by 2030 will be 0.5 per cent of GDP.
- Public funding for research and innovation activities progressively focuses on the achievement of socioeconomic development as well as national sustainable development goals (e.g., Sustainable Development Goals, integration of regional value chains) by 2030.

3.1.2 Description of actions and instruments

The actions and instruments proposed to meet the above policy targets are set in three directions (table 1).

Table 1 – Improving the governance of the national innovation system

Clarifying the roles of all stakeholders in implementing the National STI Policy	1. Clearly assign a leadership role to MISTI to design and monitor the National STI Policy, but also clearly define roles and responsibilities across line Ministries. 2. Entrust NCSTI as the body to approve the direction of STI policies. 3. Co-define sectoral science and innovation roadmaps with relevant ministries. 4. Engage dialogue with high tech countries.
Strengthening awareness and capacities of the Government to implement the National STI Policy	5. Set up a training plan for MISTI to supervise, coordinate, and monitor STI Policy implementation. 6. Conduct awareness raising activities within the government about STI and the objective of the National STI Policy. 7. Establish a government budget plan for STI investments.

Monitoring and evaluating the implementation of the roadmap to design evidence-based policies	8. Set up the monitoring and evaluation system. 9. Partner with the National Institute of Statistics to conduct a firm-level survey on innovation performance. 10. Review the implementation of the roadmap every three to four years.

Clarifying the roles of all stakeholders for implementation of the National STI Policy

It is inherently difficult to precisely define innovation and the boundaries of an innovation system. An STI policy must also interact with and complement other policies that specifically target priority markets (e.g., telecommunications, energy, health and manufacturing) or that address markets from a horizontal perspective (e.g., FDI, competition, normalization) in order to achieve synergies. Hence, governance is key to disseminate information about the nature and importance of innovation and to coordinate all efforts to enhance the innovation performance of a country.

In the short term, the Government will seek to do the following:

- Clearly assign a leadership role to MISTI to design and monitor the National STI Policy, but also clearly define the role of MISTI vis-à-vis other ministries as well as the roles of each ministry and body that has already engaged a number of policies and programmes to support STEM development. MISTI will also be given a clear leadership role in coordinating the work across the Government to support STI and be involved in sectorial policies working groups that have connections with STI policies and the STI system.
- Ensure coordination by setting up innovation units as well as a cross-ministerial working group, including the following ministries: Ministry of Education Youth and Sports (MOEYS), Ministry of Labour and Vocational Training (MLVT), Ministry of Economy and Finance (MEF), Ministry of Agriculture Forestry and Fisheries (MAFF), Ministry of Health (MOH), Ministry of Post and Telecommunications (MPTC) and Ministry of Planning (MOP).
- Entrust the NCSTI, as the body to discuss and approve the direction of STI policies and the National Research Agenda (cf. section 3.3).
- Co-define sectoral STI roadmaps with relevant ministries (notably in agriculture and agroprocessing, digital economy, education, research, trade, health and biomedical, advanced manufacturing technologies and engineering, material science and engineering, science diplomacy and international cooperation in STI).
- Engage dialogue and science diplomacy with high tech countries, to build relationships and further ascertain cooperation programmes in the higher education, research and private sectors.

Strengthening awareness and capacities of the Government to implement the National STI Policy

To develop coherent policies, it is critical to enhance the understanding of innovation and the relation between innovation and other government policies among government officials. It is also important to develop the necessary skills to design and implement innovation (and other related) policies. Hence the Government will do the following:

- Set up a training plan for MISTI to strengthen its capacity of MISTI to supervise, coordinate and monitor the implementation of the National STI Policy.
- Develop awareness raising activities about STI, the National STI Policy and this Roadmap within government as a whole, such as co-construction of policy instruments or setting up a campaign to promote STI, starting with extensive communication about the National STI Policy. Initial activities will focus on the following stakeholders: politicians and government officials (at various levels of government), teachers and professors, researchers, business associations and organization, intermediary support organizations.
- Establish a government budget plan for STI investment, targeting the critical actions drafted in this roadmap, as well as focusing on the leading science/technical institutions.

Monitoring and evaluating the implementation of the STI Roadmap 2030 to provide more evidence for policymakers to build sound STI policies and fine tune them as necessary

Monitoring and evaluation is key to adapt the course of the policy implementation. Currently, relatively few data are available about STI activities, performance and impact in Cambodia. This means that measuring progress in realizing the goals of the STI Roadmap 2030 is difficult at the moment. To continuously assess progress and generate knowledge to assess whether policy measures are in place and are effective, data gathering on STI activities and impacts will be improved. In this context, MISTI will:

- Put in place a monitoring system of the key policy targets of the Roadmap as well as the activities implementation indicators and to report annually on the progress and performance for discussion at the NCSTI.
- Establish a partnership between MISTI and the National Institute of Statistics of the Ministry of Planning to provide more data and statistics on innovation performance by the governmental sector and the private sector. This may include conducting an enterprise innovation survey every three or four years and applying international standard calculation methods. [3]
- Evaluate and review this Roadmap every three or four years and adapt it if necessary. Every three or four years (beginning in 2023) this Roadmap will be evaluated so that policies and actions can be adapted to increase effectiveness and/or efficiency and make sure that external developments are addressed.

3.1.3 Policy mix

Table 2 provides a summary the combined measures to be adopted.

[3] Similar to “Community Innovation Survey” of Eurostat or the “Business R&D and Innovation Survey” conducted by the National Science Foundation in the United States. UNESCO Institute of Statistics provides a guidance on how to conduct R&D survey. See http://uis.unesco.org/sites/default/files/documents/guide-to-conducting-an-rd-survey-for-countries-starting-to-measure-research-and-experimental-development-2014-en.pdf.

Table 2 – Policy mix: Governance

Pilar	Time frame	Regulatory instruments	Actions	Financial instruments
Improve the overall governance of the National Innovation System	2021–2022	• Assign a leadership role to MISTI vis-à-vis other ministries as well as clearly define the roles of each ministry and body, eventually setting up innovation units in all ministries and establishing a cross-ministries working group (MEF, MAFF, MPTC, MOP) • Co-develop sectoral National Innovation Plans e.g., for ICT (with MPTC), for agriculture (with MAFF), for health (with MOH), for science diplomacy and international cooperation (with Ministry of Foreign Affair and International Cooperation) • Entrust the NCSTI as the body to discuss and approve the direction of the STI policies • Develop a plan for training MISTI employees • Engage dialogue and science diplomacy with high tech countries	• Improve coordination of actors in the STI system • Train MISTI employees on STI policy design and STI policy monitoring and evaluation • Campaign to promote STI and the National STI Policy and the STI Roadmap 2030 • Strengthen the data gathering body on STI for policymaking (monitoring and evaluation unit) and establish a partnership with the National Statistical Office • Conduct an enterprise innovation survey (modelled on the Community Innovation Survey or the World Bank) every three years	• Establish a government budget plan for STI investment
	2023–2030	• Co-develop other sectoral National Innovation Plans • Continuously improve data gathering on STI for policymaking • Evaluate this roadmap every three years and adapt if necessary	• Continuously promote STI • Continuously train MISTI employees on STI policy design and STI policy monitoring and evaluation	

3.2 Building human capital in science, technology & innovation

3.2.1 Policy targets

As Cambodia aims to develop an industrial-based economy and to become an upper-middle income country by 2030, having qualified human resources in STEM related fields

will be critical. To attract FDI, particularly in intensive technology sectors that can create local jobs with a greater added value (see section 3.5.), and to export goods and services to the international open market, it will be crucial to improve the skills of the existing workforce and those entering the workplace. In this regard, educating highly skilled graduates in STEM fields to respond to job market needs or even create new trends in the job market is much needed. However, there is an imbalance between the shares of enrolment in STEM and non-STEM-related fields in the higher education sector. The higher education level of Cambodia has experienced a mass enrolment in and an oversupply of graduates in non-STEM fields such as business, management, economics, humanities and accounting. To use, develop and transfer technologies to the market, it is necessary to build, in addition to engineers and scientists, a pipeline of skilled technicians in the TVET institutions.

In the medium to long term, demand for skilled human resources to teach, conduct research and innovate will increase. To ensure the availability of such skills, it will be critical to promote a scientific culture in the society as a whole, to build strong human resources in STEM and strengthen the teaching of STEM through TVET and higher education. From basic to higher education, policies must be co-designed together with MOEYS, MLVT, MAFF, MOH, MPTC and MISTI.

The following are the specific targets to promote a scientific culture, increase STEM knowledge transmission and measure progress:

- Increase the proportion of STEM graduates to at least 50 per cent by 2030. [4]
- At least 40 per cent of STEM graduates are women by 2030. [5]
- Master and PhD curricula are developed in collaboration with private sector before 2024.
- Technology platforms (laboratories with equipment such as robots, censors, imagery) are set up at the university and TVET level for teaching purposes by 2023 and used by 500 students.
- Two science museums (or science education centres) promote science education to children across the country by 2030, starting with one in a city location (Phnom Penh) by 2023.
- Twenty innovation days and 20 innovation forums by 2030, reaching 10,000 citizens, 5,000 SMEs and 1,000 government employees.
- Three sciences libraries open to all across the country by 2030, starting with one in a city location (Phnom Penh) by 2023.

[4] Statistics compiled by Department of Higher Education 2010–2016, MOEYS (2016) show that in 2016 out of 220,000 student graduates from higher education institutions, only 20 per cent were in STEM (i.e., 44,000 students). Source: Sovansophal, Kao and Kinya Shimizu (2020). A Review on STEM Enrolment in Higher Education of Cambodia: Current Status, Issues, and Implications of Initiatives. 26. 123–134.

[5] In 2016 STEM graduates were14 per cent female and 84 per cent male.

3.2.2 Description of actions and instruments

To achieve the above objectives, several actions and instruments are proposed focusing on four directions: enhancing the technology readiness of the youth and the society as a whole and providing the necessary skills to use and develop technologies (table 3).

Table 3 – Building human capital in STI

Enhancing the scientific culture in the society	1. Promote science fairs, science festival, open days, social media campaigns, science competitions, science museum, involving the private sector, mediatize role models and examples of STI projects.
Enhancing technology readiness of youth at primary and secondary school	2. Introduce science, digital and entrepreneurship in primary and secondary school curricula. 3. Introduce a specific training for schoolteachers on teaching STEM with innovative approaches and techniques of teaching. 4. Equip pupils with computers.
Increasing the attractiveness of STEM curricula and the number of STEM graduates in the higher education system	5. Innovation and entrepreneurship in curricula at BSc, Master and PhD levels. 6. Introduce innovative approaches and techniques to teach STEM. 7. Promote young scientists through competitions, such as an innovation and entrepreneurship competition in STEM. 8. Expand international network and collaboration of STEM departments to attract senior visiting researchers. 9. International mobility of STEM students. 10. Internship and apprenticeship with industry for STEM students. 11. Equip STEM departments with up-to-date testing machines.
Strengthening the quality of teaching and collaboration with private sector at the TVET institutions	12. Develop training the trainers programmes at TVET (in collaboration with industry). 13. Internship and apprenticeship with the industry for TVET students. 14. Equip TVET institutions with up-to-date technology equipment used in the private sector. 15. Mobilize funding to support TVET programmes and STI centres of excellence to both create a critical mass of well-trained professionals as well as to exemplify how a TVET institution should work.

Enhancing the scientific culture of society as a whole

A coherent strategy to raise awareness about digital technologies, science and STEM careers among youth and their families (as they have great influence on the career development of students) should be developed at all levels of education. The strategy should be co-designed together with MOEYS, MLVT, MAFF, MOH, MPTC and MISTI among others. The objective is to build students' interests in and positive attitudes towards science subjects in upper secondary school and increase their confidence and encourage them to pursue science or STEM related fields in higher education. Such a strategy should also build society's interest and understanding of science.

Broad campaigns will be developed to continuously promote STI to businesses, entrepreneurs, youth and the general public until 2030. These campaigns may include (international) science fairs, science festivals, open days at universities and research institutes, social media campaigns, science-related competitions, games and mobile applications, etc. Role models and STI projects that are relevant in solving social and environmental issues will be publicized to provide practical examples to youth on "why" and "what for" to pursue a career in a STEM-related field.

Science museums and science libraries will be established to generate appreciation for STEM among the general public and enhance access to knowledge for professionals.

At the primary and secondary education level, enhancing the technology readiness of youth

A number of policies have already been drafted by MOEYS and MEF aiming at enhancing digital connectivity and to include STEM in curricula at primary and secondary education levels. Specific indicators have been designed to follow up the implementation of these policies. MISTI will co-monitor implementation of these policies. Further actions are required, however, to increase the science and technology readiness of the youth at school:

- Introduce specific science, digital and entrepreneurship curricula at primary and secondary school levels.
- Introduce a specific training for schoolteachers on teaching STEM with innovative approaches and techniques of teaching, focusing on low-cost and interactive teaching methods that are easy for teachers to learn.
- Equip pupils with computers.

At the higher education level, increasing the attractiveness of the STEM curricula and the number of graduates

Policies drafted by MOEYS, MLVT, MPTC and MEF include STEM in curricula at higher education level. A first action will be for MISTI to co-monitor implementation of these policies.

Further actions are required to increase the number of graduates in STEM:

- Include science culture and innovation in curricula at BSc, Master and PhD levels.
- Introduce innovative approaches and techniques to teach STEM, such as interactive techniques and practicing on equipment.
- Promote young scientists through innovation and entrepreneurial related competitions for STEM students and the promotion of "best STEM students" of the year.
- Set up an extensive network of international academic collaborations with top-ranking research institutions and higher education institutions to attract talented professors, and assistant professors from abroad and provide attractive remuneration packages (Talents Grants In).
- Facilitate and support Cambodian students to study abroad, and set up the right incentives for them to return to Cambodia to start their professional career (Talents Grants Out).

- Initiate and support stronger collaboration with the private sector to develop internship and apprenticeship programmes for STEM students, and co-design STEM curricula to fit the needs of industry (see section 3.4).
- Promote the use of digital technologies and up-to-date technology equipment for teaching and learning how to use robots, censors, imagery and other technologies and equip universities with those technologies.

In the TVET sector, strengthening the quality of teaching and connection with the private sector

The purpose is to enhance TVET institutions and TVET training programmes to make them more attractive and connected to industry:

- Develop training-of-trainers programmes at TVET, for instance on new advanced manufacturing technologies (robotics, mechatronics, electronics) to improve the qualifications of TVET teachers. Such programmes shall be built in close collaboration with industry and include specific training in tech companies.
- Initiate and support stronger collaboration with the private sector to propose internship and apprenticeship programme to TVET student in the industry, to co-design STEM curricula fitting the needs of the industry (see section 3.4).
- Promote the use of digital technologies and technology platforms for teaching and learning how to use robots, censors, imagery and other technologies, and equip TVET institutions. This will ensure that practical and marketable skills are acquired at TVET institutions.
- Mobilize funding (e.g., from the Skills Development Fund) to support, equip with technologies and promote five “TVET institutions of excellence” to both create a critical mass of well-trained professionals as well as to exemplify how a TVET institution should work

3.2.3 Policy mix

Table 4 provides a summary of the combined measures to be adopted.

Table 4 – Policy mix: Education

Pilar	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
Build the science technology and innovation	2021–2022	• Co-monitor the implementation of the Education Strategy related to STEM • Co-monitor the setting up of digital	• Promote science museums, STI libraries, science fairs, science festivals, open days, social media campaigns, innovation and	• Finance computers for pupils at primary and secondary school • Establish a national

Pilar	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
human capital		education at all levels of education • Complete existing curricula, notably STEM curricula at primary and secondary school and innovation curricula at the Bachelor, Master and PhD levels, in collaboration with the private sector • Introduce specific curricula for training on teaching STEM with innovative approaches and technique for schoolteachers, higher education professors and TVET teachers on advanced manufacturing technologies	entrepreneurial-related competitions, mediatize role models and examples of STI projects • Promote “best STEM students” of the year • Set up a network of international academic collaborations with top-ranking research institutions and higher education institutions • Initiate and support stronger collaboration with the private sector • Propose internship and apprenticeship programme to STEM student in the industry • Promote the use of digital technologies and up-to-date technology equipment for teaching and learning how to use robots, censors, imagery and other technologies	programme to equip universities and TVET institutions with technology platforms for teachers and students • Finance Innovation Days and an Innovation Forum • Provide attractive remuneration packages to higher education professors from international top-ranking institutions (Talents Grants In) • Set up the right incentives for students to study abroad and come back to the country to start their professional career (Talents Grants Out) • Mobilize funding (e.g., from the Skills Development Fund) to support, equip and promote five “TVET institutions of excellence”
	2023–2030	• Continue other measures	• Expand science museums and libraries across the country	• Facilitate and support Cambodian students to study abroad

Pilar	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
				• Continue other measures

3.3 Strengthening research capacities and the quality of research in public research institutions and universities

3.3.1 Policy targets

The objective is to enhance knowledge generation, that is to strengthen the capacity of the higher education and research system to conduct R&D activities that address societal interest and private sector needs. In the long term, innovation requires strong scientific foundations. Producing strong scientific foundations requires a shared national research agenda, a long-term commitment from the public and the private sector to increase R&D expenditures in applied and basic research, stronger local and international collaboration to increase the quality of research, and linkages with the business sector.

The following are the specific targets to strengthen research capacities and the quality of research in public research institutions and universities, and to measure progress:

- Adopt a five-year National Research Agenda setting the directions in research domains.
- Set up a national research fund by 2023.
- Increase from 0.12 per cent of GDP dedicated to R&D and innovation (2015, UNESCO) to 1 per cent by 2030, of which 0.5 per cent of GDP will be from the public sector.
- Increase the number of researchers in the public sector (30 per million people in 2015, UNESCO Institute for Statistics [6]) up to 700 researchers per million people by 2030.
- Increase the number of scientific publications authored by Cambodian scientists in international journals (206 in 2014, UNESCO Science Report) to 1,500 by 2030.
- Establish, label and support by 2025, seven research-intensive universities or research centres of excellence on key research and technological domains providing international standards research education (PhD) and delivering top quality research with international research partners.

[6] https://data.worldbank.org/indicator/SP.POP.SCIE.RD.P6

3.3.2 Description of actions and instruments

The actions and instruments proposed sets three directions: setting an agenda (directionality), providing financing to research; enabling an attractive ecosystem and incentives for conducting research (table 5).

Table 5 – Strengthening research capacities and quality of research

Setting a national research agenda	1. Mandate the NCSTI to lead the process of setting up the National Research Agenda. 2. Set a National Research Agenda in association with national research institutes, universities and private sector. 3. Develop sectoral roadmaps. 4. Develop roadmaps for each university/centre of excellence. 5. Establish a national programme for accreditation of research institutions.
Providing competitive R&D funding for applied and basic research	6. Include 'doing R&D' among the missions of higher education institutions and allocate a minimum share of base funding to these activities. 7. Set up a national research fund (to finance equipment, research projects, collaborative research and participation to international research networks).
Enabling the research ecosystem and providing the right incentives to conduct research	8. Include a module on research management and research methodologies in Master and PhD curricula. 9. Set up academic cooperation on research management capacities with top-ranking universities abroad. 10. Enforce a performance review mechanism for researchers, professors and assistant professors. 11. Set up an incentive system for research staff and PhD grants.

Setting a National Research Agenda

Responsibility for setting the strategic direction for research is diffused across a high number of line ministries which supervise national public research institutes. An enforced mandate should be given to NCSTI to lead the process of setting a National Research Agenda for the public sector and to monitor its implementation across the line ministries. Setting the research agenda will have to be defined in association with national research institutes, universities' research departments and private sector associations. Additionally, a dialogue shall be initiated on taking up the results of research in policymaking.

The National Research Agenda would be developed further into sectoral research roadmaps for the selected priority sectors (agricultural research, health, digital technologies, education, intellectual property and other sectors intended to serve the

National Innovation System) to provide further detailed directions in close association with relevant stakeholders (private sector notably) so as to ensure their needs are addressed.

Research Roadmaps for universities/centres of excellence would be drafted, prioritizing specific fields of research in the priority sectors in each of these universities, defining the needs for building infrastructure and equipping the laboratories. Expertise of international research institutions shall be sought.

This agenda-setting process will be combined with the establishment of a national programme for accreditation of the research institutions.

Providing financing for applied and basic research and internationalization

Governmental support to STI has focused on supporting innovation in firms (including through the recent establishment of the Entrepreneurship Development Fund (EDF), [7] and other initiatives). Cambodia should increase investments in R&D activities of national interest, particularly in the public sector, in association with the private sector.

A first action is to include "doing R&D" among the missions of higher education institutions, and to allocate a minimum share of the base funding provided by the Government to universities dedicated to finance research activities. This system will be piloted in a limited number of research-intensive universities, the ones that are judged to be the most advanced, before rolling it out at the national level. Focus will be brought to applied research.

A second action is to set up a national research fund, based on the model of some advanced developed countries, to provide competitive funding (i.e., based on a call for proposals and a peer-review selection according to quality criteria) to individual researchers (PhD, post-doctorate, researchers) and research institutions to support quality research, internationalization of research and collaborative research in priority research areas.

The national research fund would provide funding for the following:

- Research and technological equipment (e.g., testing machine) in public research institutions and universities.
- Applied and basic research projects led by researchers and research teams addressing societal interest and/or private sector needs (aligned with the National Research Agenda).
- Collaborative research activities conducted with research institutions abroad from one side, and with non-governmental organizations and private companies and relevant policymakers in Cambodia. Involvement of policymakers and public institutions will be key to foster the transfer of knowledge from the labs to policymaking and provide evidence-based policymaking particularly in the domains of health and agricultural research (translational research).

[7] EDF promotes economic diversification, innovation and decent job creation. EDF supports i) capacity upgrading (support SMEs and start-ups on training, mentoring, market access, product development and legal issues; ii) networking between SMEs; iii) entrepreneurial culture promotion; iv) seed funding (in the form of matching grants and co-investments available to start-ups and SMEs (www.edf-cambodia.com/).

- Attracting senior researchers abroad to strengthen the capacity of Cambodian research teams, including the senior researchers.
- Financing the participation of junior and senior Cambodian researchers in international research networks is particularly key to access global knowledge and research networks and to benefit from the experience in conducting research of more senior researchers.

The national research fund would be administered by an agency under the supervision of MISTI and steered by the NCSTI regarding the funding priorities (aligned with the National Research Agenda). In practical terms:

- A platform will be provided for researchers to monitor and access funding opportunities.
- Specific guidelines and procedures on the use of research grants will be drafted and disseminated on the platform.

Enabling the research ecosystem and providing incentives to conduct research

To support an enabling ecosystem that builds the capacity of researchers and the attractiveness of the research career, a series of action shall be taken:

- Include a module on research management and research methodologies in Master and PhD curricula.
- Set up academic cooperation with top-ranking universities abroad to strengthen universities' research management capacity (institutional level).
- Introduce and enforce a performance review mechanism for researchers in public research institutions, and for researchers, professors and assistant professors in universities, including criteria related to research activities (number of papers published in peer-reviewed and/or international indexed journals).
- Endorse an incentive system for researchers, professors and assistant professors, including attractive PhD grants and reward programmes, to make research careers desirable (vis à vis private sector).

3.3.3 Policy mix

Table 6 provides a summary of the combined measures to be adopted.

Table 6 – Policy mix: Research

Pilar	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
Strengthening research capacities and the quality of research in public research	2021–2022	• Mandate the NCSTI to set up the National Research Agenda and monitor its implementation	• Set up academic cooperation with top-ranking universities abroad	• Explicitly include research in base funding for universities • Establish a national research fund for

Pilar	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
institutions and universities		• Design a National Research Agenda • Include research in the missions of universities (pilot) • Design an incentive system for researchers corelated to their research performance		universities/centres of excellence • Establish a programme (fellowships) to attract international researchers to Cambodia
	2023–2030	• Develop sectoral roadmap for priority sectors (ICT, agriculture, health) • Define roadmaps for each university/centre of excellence • Establish a national programme for accreditation of research institutions	• Establishing a dialogue with policymakers (for translational research) • Establish research training for MSc and PhD students	• Introduce attractive incentive system (PhD grants, reward programmes) for researchers • Continue programmes previously started

3.4 Increasing the collaborations and networking between stakeholders within the National Innovation System: rolling out the quadruple helix approach

3.4.1 Policy targets

Innovation comes from exchanges of ideas and people across organizations, economic sectors and technological domains. Intermediary organizations, knowledge broker institutions, and place-based innovations play a key role in that regard to build the linkages across the key innovation stakeholders: universities and public research institutions, start-ups, local SMEs, large foreign corporations, policymakers and private investors (e.g., Venture Capital funds managers). The objective is to set up and roll out an ecosystem that enables collaborations across actors to generate new ideas and innovations and foster the absorption of innovations and new technologies by the private sector. The roll-out shall target the whole country, not only the capital city, to avoid creating an “innovation divide”.

The following are the specific targets to guide investments in STI and the implementation of this Policy and to measure progress.

- By 2023, University-Industry Linkage Offices are operational in five universities across the country, and by 2030, 50 per cent of universities have set up such an office.
- By 2030 all relevant BSc and MSc degree programmes include internships in industry (two months). By the end of 2022, 50 MSc students will have already completed such an internship.
- By 2022, the Government approves a technology and innovation park and cluster policy, and by 2023, the Government is supporting the pilot phase of three national innovation parks and clusters linking local SMEs to large corporations and TVET institutions, universities and researchers, and investors. The national innovation parks and clusters will be fully operational by 2025.

3.4.2 Description of actions and instruments

The actions and instruments proposed sets three directions (table 7).

Table 7 – Increasing the collaborations and networking between STI stakeholders

Making universities and research institutions more open to the private sector	1. Set up University-Industry Linkage Offices with three missions: - Education: design curricula addressing private sector need. - Research: fostering scientific collaboration with private sector. - Innovation: transfer of knowledge and access to laboratories.
Rolling out incubation and acceleration facilities across provinces to support start-ups and SMEs scale-up	2. Deploy incubation and acceleration facilities in the provinces (not only in the capital) that support innovative start-ups. 3. Support incubation facilities at universities for entrepreneurial students and professors.
Piloting technology and innovation and clusters to generate knowledge transfers between large firms, SMEs, and higher education and research institutions	4. Conduct a feasibility study for creating a science and technology parks and clusters programme. 5. Pilot the set-up of three technology and innovation parks by 2023.

Increasing the opening of universities and research institutions to the private sector and entrepreneurial activities (towards entrepreneurial universities)

Linkages between higher education institutions and research institutes and the private sector in the domain of research and innovation, and education are still traditionally weak. There is still room for engaging universities and research institutions into joint exchanges, knowledge dissemination and transfer, and joint collaboration with the private sector.

In the short term, Government will seek to support the set-up of **University-Industry Linkage Offices** in a selected number of universities (particularly the most research-

intensive universities and public research institutions) to establish closer links with business federations, chambers of commerce and individual SMEs and large corporations.

The University-Industry Linkage Offices will serve three main purposes.

- In education, the Offices will facilitate the co-design of curricula, the participation of teachers with a private sector experience to the training courses delivery (providing operational skills). Offices will be also in charge of setting up student internship programmes in industry and services of at least two months for BSc and MSc students.
- In research, the Offices will bridge the cultural gaps and build trust between academia and the private sector. The organization of matchmaking events, tech-events, Open Laboratory Days (dedicated to private sector) and other events will be key in that regard. Secondly, the Offices will collect ideas existing in the research departments that may be of interest for the private sector to initiate collaborative projects involving academic and private sector organizations.
- In the domain of innovation, the Office will facilitate the transfer of knowledge to companies. For that purpose, the Offices will provide support on intellectual property rights to academics and private companies willing to collaborate, and access for businesses to research and technological equipment (laboratories and prototyping material) available at the universities and research institutions.

The Government will also encourage the set-up of **joint laboratories between universities, public research institutions and the private sector**, notably with large corporations.

In the longer term, the Government will promote and support the concept of the **Entrepreneurial University**.[8] This can be presented through two key dimensions: i) universities can take an entrepreneurial response to address the pressures and challenges they face as described above; and they can renew themselves to better align with their environment, and inculcate entrepreneurial thinking through governance structures and managerial policies and practices (e.g., opening the board of universities to private sector representatives); ii) universities can create an ecosystem, within which the development of entrepreneurial mindsets and behaviours are embedded, encouraged, supported, incentivized and rewarded.

Rolling out incubation and acceleration facilities across provinces (not only the capital) to support start-up creation and the scale-up of SMEs

Cambodia has recently seen the emergence of several incubation and acceleration facilities and programmes. These usually comprise pitching competitions along with a component of business development over a short period of time and office space provision. However, these programmes are mostly concentrated in the capital city, are few and not specially targeted on innovative (technology-based/non-technology-based) start-ups, and do not connect start-ups within a larger innovation environment (universities, large corporations, SMEs, etc.). In addition, MEF has supported the set-up of a Techo Startup Centre, while MPTC has supported a digital start-up centre.

[8] See https://heinnovate.eu/sites/default/files/heinnovate_concept_note.pdf.

The Government shall ensure the deployment of **incubation facilities in three selected provinces**, as a pilot before scaling up at the national level.

- These facilities will be developed and hosted within universities and research institutions to facilitate (i) access to labs, fabrication laboratories, testing and prototyping equipment by the private, and (ii) the creation of start-ups and spin-offs by students, professors and researchers.

They will be established in partnership with and with the support of local business associations and business federations to make sure market demands and client needs are effectively addressed.

- As far as possible, incubation facilities will seek the support from and will build collaboration with large corporations in the province to foster open innovation approaches between start-ups and larger firms and to increase innovation uptake and technology absorption by entrepreneurs.

The Government shall facilitate and support a "**training the mentors" programme** that will be proposed to local incubation facilities managers in the three selected provinces. The design of the training programme will involve management teams of the existing incubation facilities (e.g., start-up centre) and an international incubation and acceleration programme to support the adoption of the best international standards.

Piloting technology and innovation parks and clusters to foster collaborations and technology/knowledge between large firms, SMEs and higher education/research institutions across provinces

While the long-established (2005) special economic zones (SEZs) have attracted significant levels of foreign investment into Cambodia that would not have been present otherwise, and have created jobs, evidence suggest that SEZs are classic enclaves linked to the international economy but not to the domestic economy.[9] Knowledge transfer, technology transfer from large corporations and subcontractors' networks with local stakeholders and across the value chain remain low.

A first action is to pilot a **feasibility study of creating technology and innovation parks** (by the end of 2022), possibly linked to (or established in) SEZs to foster collaboration on specific value chains across the different actors of the value chain (backward/forward). Such technology and innovation parks shall gather SEZ firms and non-SEZ firms with local universities, research organizations, policymakers and investors and, similarly to cluster approach, will provide network managers to facilitate collaboration across the tenants. In addition, depending on the needs, laboratories and testing facilities, and co-working and conferences centres will be provided for.

The objective will be to foster the transfer of knowledge from international to local firms, strengthen collaboration along the value chain, and define joint initiatives, for instance creating incubation facilities into SEZs to support local entrepreneurs establishing their business on technologies and licenses used by large corporations.

[9] Peter Warr, Jayant Menon (2015). Cambodia's special economic zones, Asian Development Bank, ADB Economics, Working Paper Series, October. Available at www.adb.org/sites/default/files/publication/175236/ewp-459.pdf.

In a second stage, based on the outcomes of the feasibility study, the Government may **pilot a programme supporting three technology and innovation parks**, providing the necessary training and funding to support a team of cluster managers, including through international partners.

3.4.3 Policy mix

Table 8 provides a summary of the combined measures to be adopted.

Table 8 – Policy mix: Collaboration and networking

Pilar	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
Increasing the collaborations and networking between stakeholders within the National Innovation System	2021–2022	• Feasibility study for an innovative cluster and technology and innovation parks policy/programme linked to SEZs	• Pilot the set-up of University-Industry Linkage Offices within five universities • Support a “train the mentors” programme to increase the number and quality of entrepreneurship mentors in existing incubation and acceleration facilities	• Deploy incubation facilities and programmes in provinces connected with local universities or chambers of commerce
	2023–2030	• Based on the outcomes of the feasibility study, pilot three technology and innovation parks starting from 2023, and operational by 2025	• Set up University-Industry Linkage Offices in at least 50 per cent of universities • Promote the entrepreneurial university concept across the higher education system • Set up internship programmes in industry and services of at least two months for BSc and MSc students. • Organize and manage the access for private sector to research and technological equipment (“technological	• Provide funding for scaling university-industry collaboration • Provide funding for parks and cluster managers

Pilar	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
			platforms") available at the universities and research institutions. • Promote open innovation approaches between large corporations in SEZs with SEZ firms and local firms (non-SEZ firms), TVET institutions and universities	

3.5 Fostering an enabling ecosystem for building absorptive capacities in firms and attracting investments in STI

3.5.1 Policy targets

In the Industrial Development Policy (2015–2025), the Government of Cambodia envisages a transformation and modernization of Cambodia's industrial structure from a labour-intensive industry to a skill-based industry by 2025, linking with global value chains, integrating into regional production networks and developing clusters, while strengthening competitiveness and improving the productivity of domestic industries, and marching towards developing a modern technology and knowledge-based industry. The STI Roadmap 2030 will help to realize this vision by enhancing the capacity of SMEs to innovate and absorb technologies, know-how and high skillsets through technology transfer and facilitating access to finance. It also offers incentives to attract FDI to STI and supports connection and collaboration with local SMEs, in addition to the provision of a human workforce with skills for innovation (section 3.2.).

The following are the specific targets to guide investments in STI and the implementation of the National STI Policy and to measure progress:

- Overall investment in R&D is 1 per cent of GDP by 2030 (of which 0.5 per cent of GDP will come from the private sector) compared to 0.12 per cent of GDP in 2015.
- Cambodia's scores in the Global Innovation Index are above the average of member of the Association of Southeast Asian Nations by 2030.
- By 2023, a technology transfer mechanism and law are developed and fully deployed.
- By 2023, the intellectual property regime is enforced by appropriate mechanisms (such as protection strategies).

3.5.2 Description of actions and instruments

The role of MISTI will be paramount in ensuring the development of new schemes supporting innovation capabilities and technology absorption within firms and in ensuring they are aligned with the national STI Strategy 2020–2030. The actions and instruments proposed focus on three directions (table 9).

Table 9 – Fostering an enabling ecosystem for building absorptive capacities in firms and attracting investments in STI

Enhancing innovation capacities of SMEs	1. Introduce support schemes such as technology services, support services directed at scaling up, innovation management courses and coaching programmes. 2. Establish innovation and entrepreneurship competitions and awards. 3. Develop a technology transfer law to promote technology transfer from universities to the private sector, between sectors, and from foreign to local firms, and facilitate the diffusion of sophisticated technologies to strengthen innovative capacities. 4. Create an enforcement body for the intellectual property, certification and standards regime in practice.
Increasing availability and access to innovation financing for SMEs	5. Provide investment readiness fora (networking events, pitching events) for investors and SMEs. 6. Develop sub targets for the SME bank and EDF towards development of innovation capabilities and technology uptake. 7. Conduct an SME access to finance market gap analysis focused on innovation.
Attracting and incentivizing FDI to invest in STI and collaborate with local SMEs	8. Propose to introduce in the new Investment Law a specific incentive package to attract specifically international investors in tech-based sectors, invest in R&D and transfer of tech and know-how to local SMEs.

Enhancing innovation capacities of SMEs

The ability of SMEs to innovate (to adapting to the changing conditions and to the needs of its customers) is critical for its long-term competitiveness and for its survival. The Government shall establish **support services schemes targeted at SMEs** that provide technology services, consultancy services for scaling up (such as investment, legal and tax consultations), innovation management training and coaching programmes, as well as innovation and entrepreneurship competitions. In addition, the technology transfer law shall be established to promote the transfer of technology, know-how, high skillsets and talent **from universities**, the private sector and abroad to provide beneficial externalities for economic development, especially to SMEs to enhance their innovative capacity.

The second action will be to enhance and **enforce intellectual property rights, as well as certification and standards regimes**, notably through i) supporting enforcement of existing regulations to secure and incentivise more innovation generation and technology

transfer; and ii) information and communication campaigns on intellectual property rights and certificates/standards through business associations.

A third action will be to provide **special import tax exemptions to local firms that import equipment for laboratories** to carry out research and innovation activities.

Increasing the availability and access to innovation financing for SMEs

A first action aims to **enhance investment and investor readiness** in the country to close gaps in the access to finance:

- Provide forums (conferences, networking events) to increase the readiness of investors (commercial banks, venture capital funds and so on) to invest in innovative SMEs and in technology investments made by SMEs.
- Create investment readiness events to train SMEs on company finance management and preparing to pitch to investors, to improve the financial literacy of SMEs and SMEs managers, for instance.
- Connect incubators and acceleration programmes and facilities with investors to eventually engage investors as mentors or strategic partners of SMEs.

A second action aims at **providing funding instruments for SMEs** to innovate and invest in the adoption of technologies.

- The SME Bank and EDF will be rolled out at a national scale, promoted and targeted towards investments in existing SMEs that invest in innovation activities and adopt technologies, particularly in agroprocessing, manufacturing and digital economy. MISTI will work in coordination with MEF.
- Based on a first review of the investment portfolio of the SME Bank and EDF, a gap analysis of access to innovation finance will be conducted with the private sector to eventually design new funding instruments to fill-in remaining innovation financing gaps through grant or financial instruments (loans, guarantee or equity).

In the meantime, the Government shall continue to support measures that facilitate the formalization of start-ups and SMEs, so that they can access publicly funded support.

Attracting and incentivizing foreign direct investors to collaborate with local SMEs, and to transfer technologies and know-how

The Investment Law provides a package of incentives for FDI to a “Qualified Investment Project”, endorsed by the Council for the Development of Cambodia. Investment incentives include a 0 per cent corporate income tax up to nine years (depending on the merit of the investment project), special depreciation facilities and import duty exemption on machinery, equipment, production inputs, raw material and accessories.

The Investment Law is under revision by the Government. MISTI will coordinate with MEF and the Council for the Development of Cambodia to propose the introduction into this Law of a specific incentive package to attract international investors that: i) are in technology-based sectors, ii) invest in R&D activities or technology and knowledge transfer activities; iii) commit to collaborate with local SMEs and local suppliers by transferring technologies and know-how; and iv) collaborate with local higher education institutions and public research institutions (training programmes, R&D).

3.5.3 Policy mix

Table 10 provides a summary of the combined measures to be adopted.

Table 10 – Policy mix: Enabling ecosystem

Topic	Time frame	Regulatory instruments	Social and cultural instruments	Financial instruments
Enhancing an enabling ecosystem to support innovation absorption capacities of SMEs and attraction of STI investments	2021–2022	• Broaden the mandate of the SME Bank to support research and development and innovation investments of SMEs • Include incentives in the Investment Law to attract foreign direct investors that invest into added value activities and doing research, and/or that collaborate with local firms and with local universities and public research institutions • Develop a technology transfer law to promote technology diffusion, especially to SMEs to enhance innovative capacities	• Establish innovation and entrepreneurship competitions • Establish courses and coaching programme(s) for entrepreneurs • Establish courses and coaching programme(s) for innovation management • Provide technology and services for scaling up • Increase investment readiness • Enforce intellectual property regime in practice	• Focus existing and newly established funding schemes, such as the EDF and the SME Bank towards innovation • Conduct an SMEs access to finance market gap analysis focused on innovation
	2023–2030		• Continue communication and awareness activities around entrepreneurship and innovation	• Design new funding instruments addressing innovation financing gaps (seed and early stage, particularly)

Appendix

List of organizations consulted

Ministry of Industry, Science, Technology & Innovation (MISTI)
-General Department of Science, Technology & Innovation
-National Institute of Science, Technology & Innovation
-General Department of Industry
-General Department of SMEs and Handicraft
-General Department of General Affairs
-Institute of Standards of Cambodia

Advisory Board Members of National Council of Science, Technology & 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 Labor 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 National 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 Resource Institute (CDRI)

Kirirom Institute of Technology (KIT)

Asian Vision Institute (AVI)

Impact Hub Phnom Penh

Small World Venture

Amru Rice Co., Ltd.

GGear Group Co., Ltd.

ISI Group

Mong Reththy Group Co., Ltd.

The Royal Group Company

Bongloy Payment PLC

Japan International Cooperation Agency (JICA)

Asian Development Bank (ADB)

World Bank

ISBN 978-9924-9556-1-0