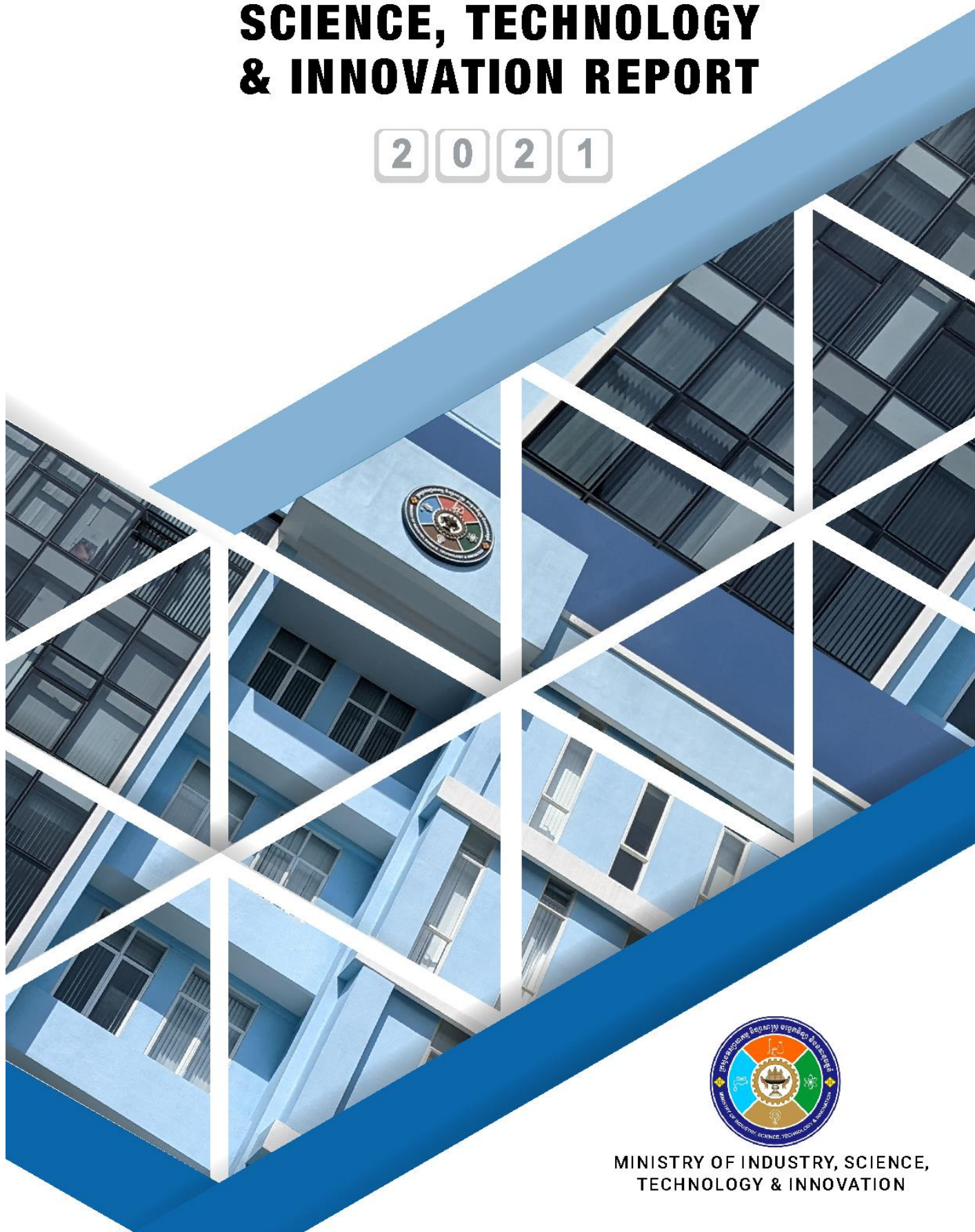


**Kingdom of Cambodia**

NATION | RELIGION | KING

# **SCIENCE, TECHNOLOGY & INNOVATION REPORT**

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**MINISTRY OF INDUSTRY, SCIENCE,  
TECHNOLOGY & INNOVATION**

Ministry of Industry, Science, Technology & Innovation

Phnom Penh, Cambodia

Website: <https://www.misti.gov.kh>

First eBook Edition: 2022

ISBN: 978-9924-9556-6-5 (Khmer version)

ISBN: 978-9924-9556-5-8 (English version)



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## Foreword

Science, Technology & Innovation (STI) has been set as a core part of the national development in achieving Cambodia's vision 2030 and 2050, under the supreme leadership of **Samdech Akka Moha Sena Padei Techo HUN SEN, Prime Minister of the Kingdom of Cambodia**. With the strong commitment in structuring STI, Ministry of Industry of Science, Technology & Innovation (MISTI) and National Council of Science, Technology & Innovation (NCSTI) were established to coordinate and direct the inter-ministerial bodies for relevant cross-cutting nature of work. The approval of National Policy on STI 2020-2030 by the Royal Government of Cambodia in 2019 is the first foundation of government endeavor to promote STI ecosystem in the country. Besides, the General Department of Science, Technology & Innovation of MISTI has developed the Cambodia's STI Roadmap 2030 laying out the directive strategies for governmental ministries and relevant institutions on actions to be taken in the short and medium terms until 2030. The Cambodia's 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 MISTI overseeing and coordinating the implementation of the National STI Policy by all relevant ministries.

Alongside of direction and goals set in the Cambodia's STI Roadmap 2030, this report aims to provide an overview and latest update of legal and policy frameworks and development related to STI till 2021. The report also discussed the demand and supply sides of STI sector, which is a critical part of the national innovation system. I hope that this report could be beneficial to a wide range of public readers including policymakers, academia, private sectors, and development partners for their works and understanding the status of STI in Cambodia.

Last but not least, I would like to take this opportunity to thank the secretariat of NCSTI, especially contributors and editors who had contributed and produced this STI Report 2021.

Phnom Penh, 04 May 2022

**Senior Minister**

**Minister of Industry, Science, Technology  
& Innovation**

**and Chair of National Council of Science, Technology  
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## List of abbreviations

ASEAN	:	Association of Southeast Asian Nations
AVI	:	Asian Vision Institute
CCC	:	Cambodia Chamber of Commerce
CCFTA	:	Cambodia-China Free Trade Agreement
CDC	:	The Council for the Development of Cambodia
CKFTA	:	Cambodia-Korea Free Trade Agreement
COSTI	:	Committee on Science, Technology and Innovation
DGHE	:	Directorate General of Higher Education
D/MIE	:	Department of Policy Monitoring Inspection and Evaluation
EPO	:	European Patent Office
FDI	:	Foreign Direct Investment
GDP	:	Gross Domestic Product
GD/STI	:	General Department of Science, Technology & Innovation
GIS	:	Geographic Information System
GO-SPIN	:	Global Observatory of STI Policy Instruments
GPS	:	Global Positioning System
HEIs	:	Higher Education Institutions
HEIP	:	Higher Education Improvement Project
ICT	:	Information and Communication Technology
IPOS	:	Intellectual Property Office of Singapore
ISCED	:	International Standard Classification of Education
JPO	:	Japan Patent Office
KPI	:	Key Performance Indicator
LDC	:	Least Developed Country
LiDAR	:	Light Detection and Ranging
M&E	:	Monitoring and Evaluation
MAFF	:	Ministry of Agriculture, Forestry and Fisheries
MCFA	:	Ministry of Culture and Fine Arts
MISTI	:	Ministry of Industry, Science, Technology & Innovation
MLMUPC	:	Ministry of Land Management, Urban Planning and Construction
MLVT	:	Ministry of Labour and Vocational Training
MoE	:	Ministry of Environment
MFAIC	:	Ministry of Foreign Affairs and International Cooperation
MoH	:	Ministry of Health
MoI	:	Ministry of Interior
MoInfo	:	Ministry of Information
MoJ	:	Ministry of Justice
MoP	:	Ministry of Planning
MoT	:	Ministry of Tourism
MoWRAM	:	Ministry of Water Resources and Meteorology
MoEYS	:	Ministry of Education, Youth and Sport
MPTC	:	Ministry of Posts and Telecommunications
MPWT	:	Ministry of Public Works and Transport
MRD	:	Ministry of Rural Development
NCSTI	:	National Council of Science, Technology & Innovation
NDESC	:	National Digital Economy and Society Council

NIS	:	National Innovation System
NISTI	:	National Institute of Science, Technology & Innovation
OCM	:	Office of the Council of Ministers
PPP	:	Public-Private Partnership
PCT	:	Patent Cooperation Treaty
QIP	:	Qualified Investment Project
R&D	:	Research and Development
RGC	:	Royal Government of Cambodia
RCEP	:	Regional Comprehensive Economic Partnership
SIPO	:	State Intellectual Property Office
SMEs	:	Small and Medium Enterprises
SNEC	:	Supreme National Economic Council
STEM	:	Science, Technology, Engineering and Mathematics
SSCA	:	State Secretariat of Civil Aviation
S&T	:	Science and Technology
STI	:	Science, Technology & Innovation
TVET	:	Technical and Vocational Education and Training
UNCTAD	:	United Nations Conference on Trade and Development
UNESCAP	:	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
WIPO	:	World Intellectual Property Organization
WTO	:	World Trade Organization

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## 1. Introduction

### 1.1 Background

The Royal Government of Cambodia (RGC) has employed the Rectangular Strategy-Phase IV as the latest national development agenda. The strategy emphasizes mainly Growth, Employment, Equity and Efficiency (RGC, 2018). Obviously, the country envisions the need of Cambodia to be upper-middle-income country by 2030 and high-income country by 2050. Science, Technology & Innovation (STI) is one of fundamental pillars to achieve the vision. Recently, The RGC has structured the sector to be with Ministry of Industry of Science, Technology & Innovation (MISTI) through Royal Decree No. នស/រកម/0320/009 dated on 26 March 2020. In addition, new ratified structure of National Council of Science, Technology & Innovation (NCSTI) is made for General Department of Science, Technology & Innovation (DG/STI) of MISTI as secretariat to coordinate and direct the inter-ministerial bodies for this cross-cutting nature of work. The nascent development of STI ecosystem in the country has captured public attention and senior leaders to put more efforts to reach the set vision of socio-economic development. For instance, “contributing to human resource development through the transfer of technology, knowledge and know-how, particularly the development of digital skill as well as the enhancement of STI through collaboration with businesses and direct investment from abroad, which would contribute to narrowing the digital gap and developing digital economy in the region,” was said by **Samdech Akka Moha Sena Padei Techo HUN SEN, Prime Minister of the Kingdom of Cambodia**, at the Closing Ceremony of the ASEAN Business and Investment Summit 2021 under the theme of "Building Our Sustainable Digital Future" on 25 October 2021.

In principle, the National Innovation System (NIS) is the key framework to assess the development status of STI ecosystem. The specific indicators need to be identified from the beginning for the ease of monitoring and evaluation (M&E) of the progress of the development. Balancing demand and supply sides in STI sector are critical and to be considered with sufficient support of policy framework and infrastructure as seen in Figure 1.1 . Particularly, the sufficiency of both quality and quantity of Science, Technology, Engineering, and Mathematics (STEM) must be ready for business side viz industries or small-medium enterprises (SMEs) that demand high skill labour.

The endorsement of National Policy on STI 2020-2030 by **Samdech Prime Minister** in 2019 is the first foundation of government support to promote STI ecosystem in the country. With this continuous support from government, the Cambodia's STI Roadmap 2030 was laid out to direct strategy for governmental ministries and relevant institutions on actions to be taken in the short and medium terms until 2030. The Cambodia's STI Roadmap 2030 operationalizes the National STI Policy by setting clear objectives, defining a set of key actions within a time frame and specific targets to achieve by 2030. It gives a clear role to MISTI to oversee and coordinate the implementation of the National STI Policy across ministries (MISTI, 2021). There are five pillars which are important to implement the National STI Policy (Figure 1.2). These key pillars are to be strengthened with following short description:

- **Governance:** Mandates of MISTI having NCSTI as national coordinating body for guiding inter-ministries related job must be enforced for the cross-cutting nature of STI activities.
- **Human Capital:** Human resources of both quality and quantity in STEM must be produced for top priority sectors for socio-economic development.
- **Research and Development (R&D):** Investment in research and development must be made on time for knowledge creation to support the demand of private sector.
- **Collaboration:** breaking the silo ensuring synergizing working environment among government institutions, academia, and private sectors.

- **Ecosystem:** nurturing favorable ecosystem having both local and foreign investments from synergy of sufficient and high skill labour, attractive investment policies, and critical infrastructure.

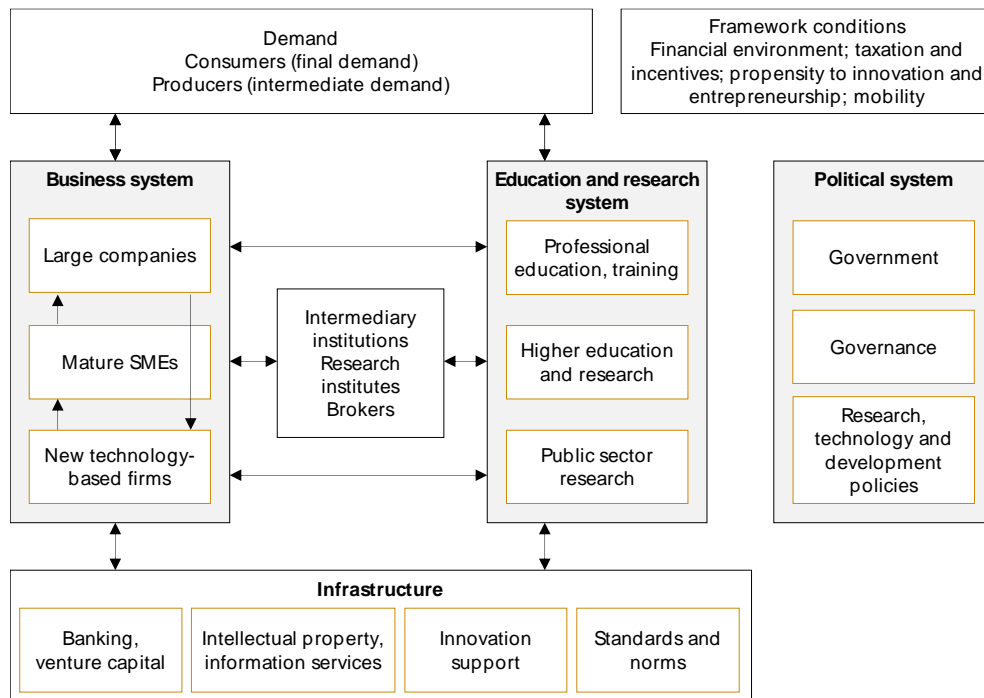


Figure 1.1. National innovation system framework (Kuhlmann and Arnold, 2001)

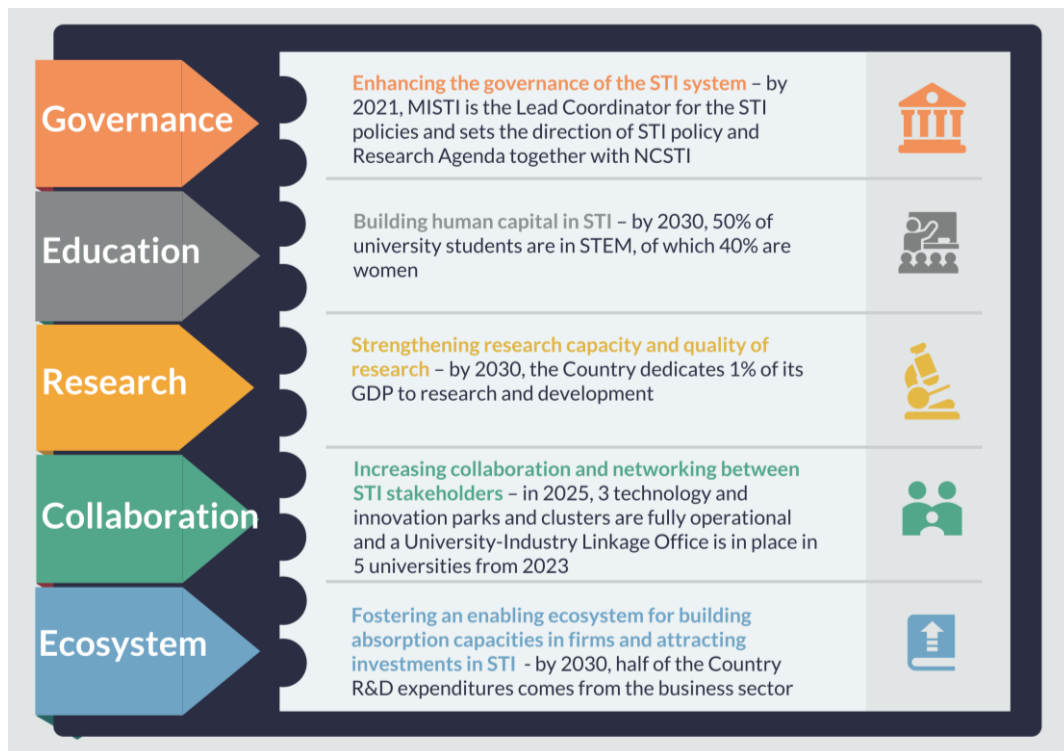


Figure 1.2. Summary of Cambodia's STI Roadmap 2030 (MISTI, 2021)

The roadmap also highlights the important indicators to realize by 2030 in order that the vision of government is achieved. The main indicator for 2030 are summarized in the Figure 1.2. The indicators look relatively ambitious, however, they are critical for achieving our ambitious vision becoming upper-middle income country by 2030 and high-income country by 2050. The infographic roadmap (Figure 1.2) reveals obviously the requirement efforts from relevant stakeholders to collectively work together for the common goal to graduate least developed country (LDC). The M&E framework is also being developed by The General Department of Science, Technology & Innovation (GD/STI) of MISTI to monitor the progress of the roadmap implementation.

The strong commitment of government in STI structuring is seen in the last few years. The decision of the Kingdom in establishing MISTI during pandemic is an undeniable dedication to STI. In addition, other regulatory instruments are also adopted within 2021. In collaboration with other relevant national institutions, MISTI is developing the National Research Agenda to identify and prioritize research topics in the sectors and Global Observatory of STI Policy Instruments (GO-SPIN) for inventorying the first ever STI system in the country. These two documents will be another concrete policy tools to support government institutions in implementing the STI activities. One of the most important tools is Cambodia Digital Economy and Society Policy Framework 2021-2035 (RGC, 2021). The policy aims at harnessing the potential of Information and Communication Technology (ICT) and digital technologies for increasing production, economic efficiency, and civilized society. This typical nascent development ecosystem is a positive sign of STI progress. Despite this opportunity, there are number of challenges faced during the development. They include investment in R&D, enforcement of legal framework, promoting STEM education, and the triple helix model. The more detail of strengths and weakness of NIS of Cambodia is given in the (Figure 1.3) below.

These challenges are overcome through synergized efforts among STI players. The theory explains that critical tools are positively made available in order to drive NIS. These could be relevant policies, procurement programs, regulations, legal systems, and management systems. In general, trading system and collaboration are fundamental keys to success in national innovation in addition to good university, strong intellectual property right system, and proper investment in R&D. Table 1 provides comprehensive tools for supporting NIS. It is, however, noted few advanced innovation communities such as “Taiwan, China” or “South Korea” are still under investigation to confirm by innovation theorist if the tools in table 1 are relevant (Taylor, 2016).

Table 1. Important tools affecting National Innovation System (Taylor, 2016)

Financial	Antitrust Policy	Govt. Procurement Programs	Science Policy
Defense Policy	Industrial Relations	Environmental Regulations	Labor Policy
Space Policy	Food Policy	Govt. Budget Procedures	Energy Policy
Exchange Rate Regimes	Legal Systems	Health Policy	Lands Management
Zoning Laws	Telecoms Policy	Transportation Policy	Tech Transfer Policy
Agricultural Subsidies	Tax Policy	Safety Regulations	Immigration Policy

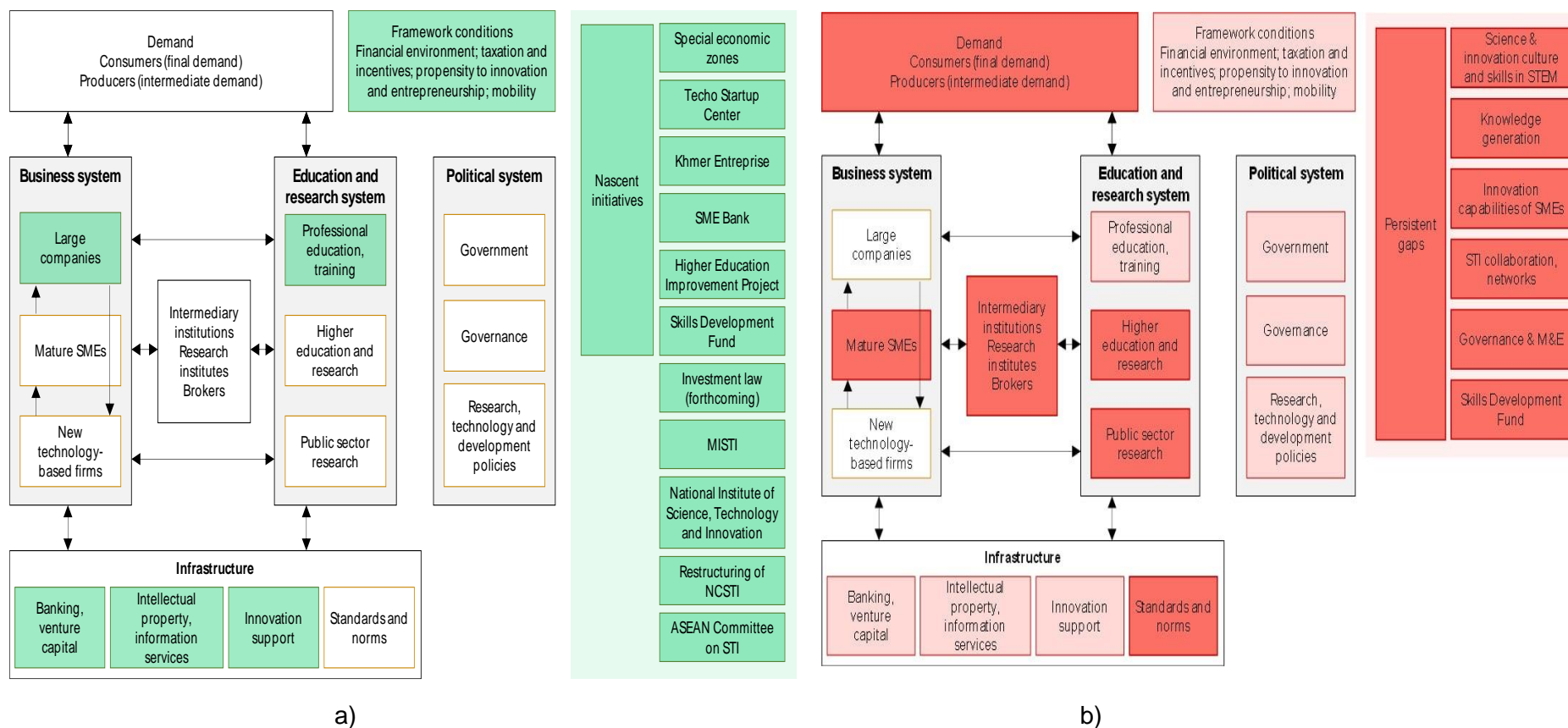


Figure 1.3. National innovation system of Cambodia, a) Strength, b) Weakness (MISTI & UNESCAP, 2021)

## **1.2 Purposes**

The overall objective of this STI 2021 report is to bring latest information on its development till 2021. The main specific objectives are to i) report new development of STI between 2020 and 2021, ii) bring new information and relevant data of relevant stakeholders, specifically on human resource supply for STEM sector, and iii) highlight the status of STI investment by government institutions. The ultimate objective is to provide some insights on development status of STI and reflect if our vision 2030 and 2050 is achievable through efforts committed by relevant institutions.

## **1.3 Approach and scope**

Our analysis in the report is conducted based on the direction given by National Policy on STI 2020-2030. The Cambodia's STI Roadmap 2030 with the stated indicators are the basis of the evaluation. The data and information given by NCSTI member institutions in 2021 are used for analysis and recommendation. The way forward attaining vision of upper-middle income country by 2030 and high-income country by 2050 is given at the end of the report.

## **2. Demand of STI in economic structure**

From 2009 to 2019, the economic structure of Cambodia has undergone significant change (O'Neill, 2021). The growth rate of agriculture sector has fallen, and the growth rate of industry and service industries has rebounded. This structural change and growth pattern affects not only the economy, but also affects the labour market. Latest data showed that the economic structure of the main key sectors including services, industry and agriculture have respectively gained 41.60 %, 36.40 %, and 22.00 % of GDP in 2019, respectively (UNCTAD, 2021). This economic structure has clearly indicated that the use of technology is growing in the country in terms of industry and services sectors. Besides, Cambodia's young and dynamic population may become a well-being or burden for the country. Stimulating the development depends on the opportunity for these young people to attain good education and build the capacity as part of the country's skilled workforce (World Population Review, 2021). Traditionally, the share of employment in each sector varies from year to year. As shown in Figure 2.1, employment share of agriculture sector showed the largest, followed by that of service and industrial sectors from 2009 to 2017. Remarkably, the share employment in service sector showed the largest portion in 2018 and 2019. However, the employment in service and industry sectors has increased while agriculture sector showed a decreased trend from 2009 to 2019. Hence, the high-quality labour force in industrial transformation and services should be taken into account to sustain economic growth. To measure labour quality, the education level and health status of a country's workers are usually considered as indicators in the economic context. The labour force by gender in 2020 indicates 51% of male and 49% of female have been employed in all sectors in Cambodia (UNCTAD, 2021).

In terms of external trade performance, Cambodia (UNCTAD, 2021) has shown an upward trend from 2005 to 2020. It was estimated that the export value in 2020 would be twice that of 2015. However, due to the continuous growth of imports, the trade balance has been at a loss, and the gap has widened rapidly since 2015. Compared to 2015, the trade balance was expected to fall by 50% in 2021, which is a good sign that the import trade is lower than export trade. The major export commodities in 2020 are knitted or crocheted apparel & clothing accessories at USD 5.2 billion, jewelry at USD 3 billion, footwear at USD 1.1 billion, and leather products at USD 1 billion, where the top-1<sup>st</sup> exported target country is United State (US) (HKTDC, 2021). Besides, the major import commodities are mineral fuels at USD 1.9 billion,

vehicle at USD 1.7 billion, machinery and mechanical appliances at USD 1.2 billion, and electrical machinery and equipment at USD 1.2 billion, which mostly are imported from China. Additionally, the statistic report (UNCTAD, 2021) describes the export structure of ASEAN countries and others countries that rely on manufactured goods in 2020. These are examples of the exported manufactured goods countries include China, Cambodia, Vietnam, Singapore, Malaysia, and Thailand holding 94%, 87%, 86%, 78%, 73% and 72%, respectively.

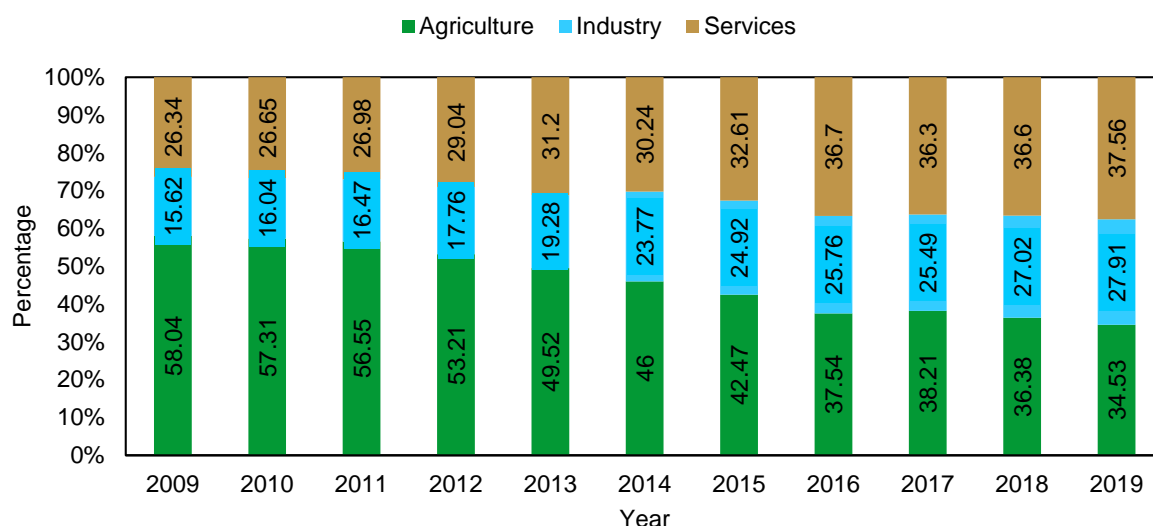


Figure 2.1. Distribution of employment by economic sector (Data source: World Bank, 2021)

Despite a stable growth of approximately 7% prior to Covid-19 pandemic, Cambodia's economy has experienced an unprecedented drop, leading to the inflation rate of -4% throughout 2020 (Asian Development Bank, 2020). The sector having been severely affected by the pandemic is tourism, while the experts argued it would take few years for recovery (Asian Development Bank, 2020). The government has realized that Cambodia's economy cannot rest heavily on these traditional drivers. The government has seen the growth opportunities in adapting and adopting Industry 4.0 in order to promote digital economy as presented in Adaptation and Adoption of Industry 4.0 in Cambodia by upgrading its industrial value chains, diversifying its economic structure, and creating new capabilities for innovation (UNDP, 2020).

In short, STI will be critical for Cambodia to accomplish its ambitious vision by 2050 of becoming a high-income and innovation-driven country. STI are driving forces for promoting economic growth, enhancing the accessibility of the labour market, strengthening the logistics supply chain, and opening up new markets for enterprises. Cambodia has formulated a five-year development strategy to strengthen the added value and competitiveness of the agriculture, industry, and services sectors, including garments, rice, and tourism products. The strategy aims to improve the skills of factory workers, promote high-value-added domestic and foreign investment, and diversify export markets.

### 3. Legal and policy frameworks

In response to the impact of COVID-19 and to get back on the track toward the country's vision in socio-economic development, the RGC has set out clear goals and strategies for policy implementations. For instance, NCSTI endorsed two policy documents, namely the Science, Technology, and Innovation Ecosystem of Cambodia and the Cambodia's Science, Technology & Innovation Roadmap 2030 (Cambodia's STI Roadmap 2030). The former aims



to provide evidence-based inputs for developing the STI Roadmap or other STI policies, while the latter aims to direct STI development and implementation for inclusive and sustainable socio-economic development (MISTI, 2021). The recent progress on legal and policy frameworks related to STI are described in the following.

### **National Research Agenda**

With technical assistance of United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), MISTI is developing the National Research Agenda in order to support the implementation of Cambodia's STI roadmap 2030 (MISTI & UNESCAP, 2021). National Research Agenda aiming at providing clear picture of potential research areas, funding policy and mechanisms, and stakeholders are being developed. The National Research Agenda will help to identify key stakeholders in Cambodia's research ecosystem; to promote potential research in the areas in STI in order to underpin the inclusive and sustainable socio-economic development; and to feature the ecosystem of research funding. the National Research Agenda is expected to be finalized and launched in 2022.

### **Global Observatory of Science, Technology and Innovation Policy Instruments (GO-SPIN)**

With the support of United Nations Educational, Scientific and Cultural Organization (UNESCO), MISTI is conducting the study on the GO-SPIN Country Profile for Cambodia which will provide decision-makers, parliamentarians, universities, private sector, specialists, and the general public with a wide-ranging set of diverse information on STI ecosystem in Cambodia. The outputs of study will serve as one of the main policy documents for STI actors to shape and spur NIS in Cambodia. Through a participatory and inclusive approach, MISTI and UNESCO are working closely with all STI stakeholders to finalize the GO-SPIN Country Profile for Cambodia by 2022.

### **Public-Private Partnership Law**

The partnership between public and private sectors has been identified as an inevitable component for development. To promote the partnership, the Public-Private Partnership (PPP) Law finally was promulgated on 18 November 2021. In article 1, the law aims to enhance the PPP mechanism in organizing and implementing public infrastructure and service projects with effectiveness, efficiency, sustainability, transparency, accountability, and justice that make a tremendous contribution to socio-economic development in the Kingdom of Cambodia by 1) identifying the responsible stakeholders for managing and implementing the PPP projects systematically, 2) formulating a framework for developing, implementing, managing, monitoring, and evaluating the projects, 3) establishing the measures, methodology, legal procedure, and structure for managing and implementing the procurement in the public-private project framework; 4) featuring the mechanism in support of financing and incentivizing the public-private investment projects. In the article 2, the law has come into effects for development management and public-private project implementation in the sectors that are in compliance with the Article 8 of the law in order to build public infrastructure and/or providing the public services.

### **The New Investment Law**

The new Investment Law was promulgated on 15 October, 2021. The law aims to create, "an open, transparent, predictable and favorable legal framework to attract and promote quality, effective and efficient investments by Cambodian nationals or foreigners for socio-economic development in the Kingdom of Cambodia". The law provide guarantee and incentives to the investment projects have the following characteristics: 1) contributing to skills training, R&D, and innovation, 2) nurturing the growth of SMEs and providing support to SMEs via skills

training, staff incentives and investment in machinery or production equipment, 3) establishing large industrial parks, STI parks, and commercial hubs, 4) promoting more active participation by the private sector in the development of physical infrastructure, 5) promoting the logistics and digital industry sectors, and 6) contributing to environmental management and protection and biodiversity conservation (DFDL, 2021). To attract foreign direct investment (FDI), it is important to quickly introduce needed regulations and arrangements for implementing the newly introduced Investment Law by considering the improved external demand conditions. For instance, a sub-decree on the implementation of this new law, including several necessary regulations and arrangements such as the registration and application procedures of an investment project and the special procedures for work permit and employment application, remain to be put into action. In addition, the new Investment Law may also help improve labour productivity and incentives system which offers skills training, housing, nurseries, health facilities, and transportation services to labour forces. Incentivizing to research, development, innovation, and machinery modernization may also promote new technology adoption and transfers. Moreover, the new Investment Law may also provide opportunities to some investment activities which have high potential for the national economic development. The provision of value-added tax exemption for the purchase of locally produced inputs for Qualified Investment Project (QIP) may promote backward linkages between the FDI-led manufacturing exports sector with the domestic SME sector. In addition, dissemination of the new law, as well as of the recently ratified Cambodia-China Free Trade Agreement (CCFTA) and the Regional Comprehensive Economic Partnership (RCEP), and the recently signed Cambodia-Korea Free Trade Agreement (CKFTA) to investors are the needed to be taken into action to increase awareness and understanding of the law and those trade agreements (World Bank, 2021).

### **Cambodia Digital Economy and Society Policy Framework 2021–2035**

In June 2021, by intending to accelerate an inclusive and sustainable post-pandemic growth, the RGC has introduced the Cambodia Digital Economy and Society Policy Framework 2021–2035, representing the long-term vision in orienting the development and process of a digital transformation with an approach based on clearly defined steps, revolving around the private and public sector's needs, resources, and capabilities. The RGC identified three specific responsibilities to address: 1) supporting and promoting the ecosystems conducive to innovation and investment, 2) enhancing trust in the digital system, and 3) promoting the infrastructure development for connectivity, technology, network/data, and physical connectivity. The RGC identified two foundation elements for a digital economy and society: 1) infrastructures and 2) digital reliability and confidence. The RGC identified three pillars of a digital economy: 1) digital citizens, including digital leadership, a pool of digital talent human resources; 2) digital government, including public services, improving digital performance, and data-based governance; and 3) a digital business, including elements such as enterprise digital transformation, entrepreneurship, startup ecosystems, and digital value chains (RGC, 2021). The RGC also has established the National Digital Economy and Society Council (NDESC) to build a foundation of a digital society to drive new economic growth on September 8th, 2021. The NDESC is designated as the secretariat of the government to lay a concrete foundation for digital adoption and transformation across all social actors – including the state, citizens and businesses. NDESC is to lead, coordinate and enhance the building and development of a vibrant digital socio-economic ecosystem that stimulates new economic growth and improves social welfare. NDESC has key roles and responsibilities related to digital economy and society development, such as setting vision and principles, orienting, advising, mobilizing financial, technical and human resources, and promoting law enforcement.

## **Technology Transfer Law**

Seeing the need of legal and procedure of the technology transfer in Cambodia, GD/STI of MISTI has been working on the technical parts and drafting this law. Overall, this law aims to manage and promote all kind of technology transfer activities within and outside of Cambodia as following: 1) to promote the new technology transfer and innovation between institutions, natural person, and institution and natural person in order to modernize the industrial sector and other sectors in Cambodia; 2) to protect the rights, obligation, and the interests of institutions, organizations, natural person, legal entities, and practitioners that take part in technology transfer in Cambodia; 3) to legally prevent and protect the inventors/institutions or technologies created by inventor/institutions; 4) to enhance the technology management and transfers for fostering the economy, society, culture, and environment. This draft is expected to be reviewed and finalized in 2022 for further actions by upper level of managements.

## **Standards Law**

The Law on Standards of Cambodia (the “Standards Law”) was adopted by the National Assembly on 25 April 2007, approved by the Senate on 28 May 2007, and promulgated by Royal Kram No. NS/RKM/0607/013, dated 24 June 2007. The law was one of the legal instruments required to be passed by Cambodia in accordance with its World Trade Organization (WTO) accession. According to article 2, the purpose of this law is 1) to improve the quality of products, services and management; 2) to raise and rationalize production efficiency; 3) to ensure fair and simplified trade; 4) to rationalize product use; and 5) to enhance consumer protection and public welfare. The scope of this law shall cover all the activities related to standardization, quality assurance and related activities within the whole territory of the Kingdom of Cambodia.

## **Metrology Law**

Law on Metrology of the Kingdom of Cambodia was promulgated on 11 August 2009. The purpose of this law shall, assure a good and fair trade, create the correct use of metrological instruments, assure the best interest of suppliers and users of products goods and services, assure the improvement of the quality of goods, products, services and management, determine the identification and removal of technical barriers to trade and harmonization of trade transaction within the framework of legal metrology, create the credible environment for the use of metrological instrument in trade activities and other business in health, security and environment, facilitate the development of science and technique for economic development. The law shall cover the implementation of manufacturing, importation, installation, use, repairs, maintenance, and the exposure for sale of metrological instruments within the kingdom of Cambodia.

## **Intellectual Property Laws**

Cambodia earned its membership in the World Intellectual Property Organization (WIPO) in 1995, and the 10th member of ASEAN in 1999. Cambodia became a member of the WTO in 2004, leading to becoming a signatory in the Agreement of Trade-Related Aspects of Intellectual Property Rights. The membership into Madrid Protocol for International Trademark Registration was offered in 2015, while Patent Cooperation Treaty (PCT) was offered in 2016. Lately, Cambodia signed Memoranda of Understanding for granting and recognition of patent with Singapore (Intellectual Property Office of Singapore – IPOS) in 2016, Japan (Japan Patent Office – JPO) in 2016, European Patent Office – EPO in 2017, and China (State Intellectual Property Office – SIPO) in 2018. Moreover, Cambodia signed the Geneva Act of the Lisbon Agreement on Appellations of Origin and Geographical Indications on March 09, 2018.

The membership of Cambodia into these international bodies, WTO in particular, has led to the development of various IP-related laws as follows: 1) Law on Management of Quality and

Safety of Goods and Services (2000); 2) Law on Trade Marks, Trade Names, and Acts of Unfair Competition (2002) ("Trade Mark Law"); 3) Law on Patents, Utility Model Certificates and Industrial Designs (2003) ("Patent Law"); 4) Law on Copyright and Related Rights (2003); 5) Law on Management of Seeds and Breeders' Rights (2008); and 6) Law on Geographical Indications of Goods (2014). These laws are embedded with four objectives:

- a. Improve the capability and capacity within the Cambodian economy to provide and use intellectual property services to support Cambodia's economic development.
- b. Improve the capability and capacity within the RGC to deliver intellectual property policy, services and enforcement to support Cambodia's agricultural, commercial, industrial and cultural sectors and the tourism industry.
- c. Improve awareness and understanding within the broader population of the economic role of intellectual property to support the increasing use of the intellectual property system by Cambodian businesses.
- d. Develop and maintain Cambodia's intellectual property legislation with international standards to meet Cambodia's economic and social needs.

## **4. Human resources**

A nation can only prosper if it has enough and human resources. In order to have qualified human resources, individuals must go through a proper education system supporting by the government. The RGC has worked hard to improve and develop its education system and set out various policies to promote this sector. To expand its human capital to meet the market demand, Cambodia has tried to put in place important policies and strategic plans, especially to supply the labour market and sector's needs. Therefore, this section describes the progress of human resources of students at different levels ranging from formal education (e.g., general and higher education) and non-formal education (e.g., TVET).

### **4.1 High school level**

According to the data obtained in the last five years (2016-2020), the number of student's enrollment has been increased yearly, especially the number of student's enrollment in grade 11 and 12. The number of students in grade 11 increased by an average of 6884 per year. On the other hand, the number of female students accounted for 4,575 (approximately 53% of the total number) students per year in average (Figure 4.1). This means number of female students are relatively higher than male students.

In term of the total number of student's enrollment in grade 12, it is observed that the number of students has been increasing from 2016 to 2020 with an average of 5,260 students per year (Figure 4.1). Female students make up an average of 52% of the total number of students. On the other hand, the number of female students has also increased, an average of 3,788 per year.

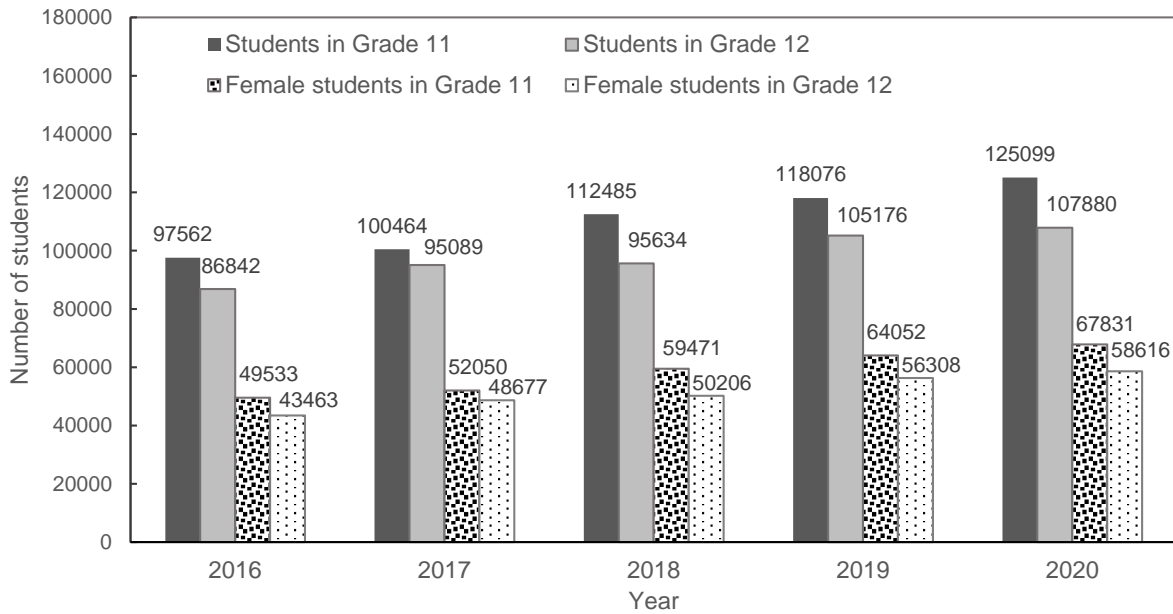


Figure 4.1. Students' pool in high school

The percentage of STEM's pool in grade 11 from 2016 to 2020 is illustrated in Figure 4.2. It is observed that the majority of the students enrolled in STEM subject which accounted for 67.4% in average between 2016 and 2020. The trend of STEM students in grade 11 has decreased from 82% in 2016 to 62% in 2020 while non-STEM students showed the opposite trend (Figure 4.2). In terms of gender in STEM students in grade 11, female STEM students slightly increased from 35% in 2016 to 56% in 2020 (Figure 4.3). It should be noted that the number of total students in grade 11 and 12 were collected from at the beginning of year.

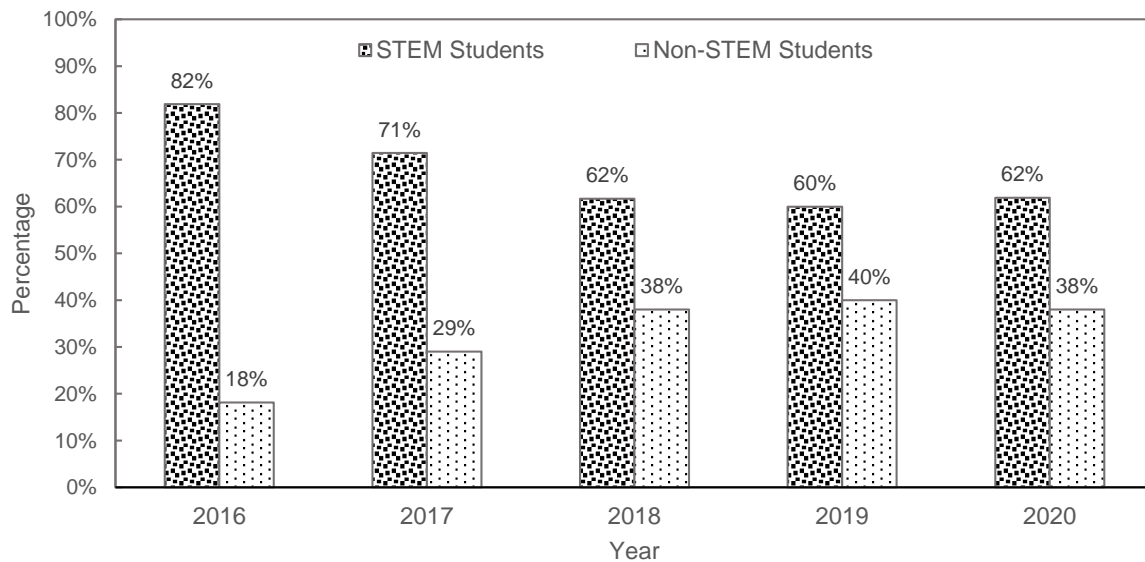


Figure 4.2. Proportion of the STEM and non-STEM students in grade 11

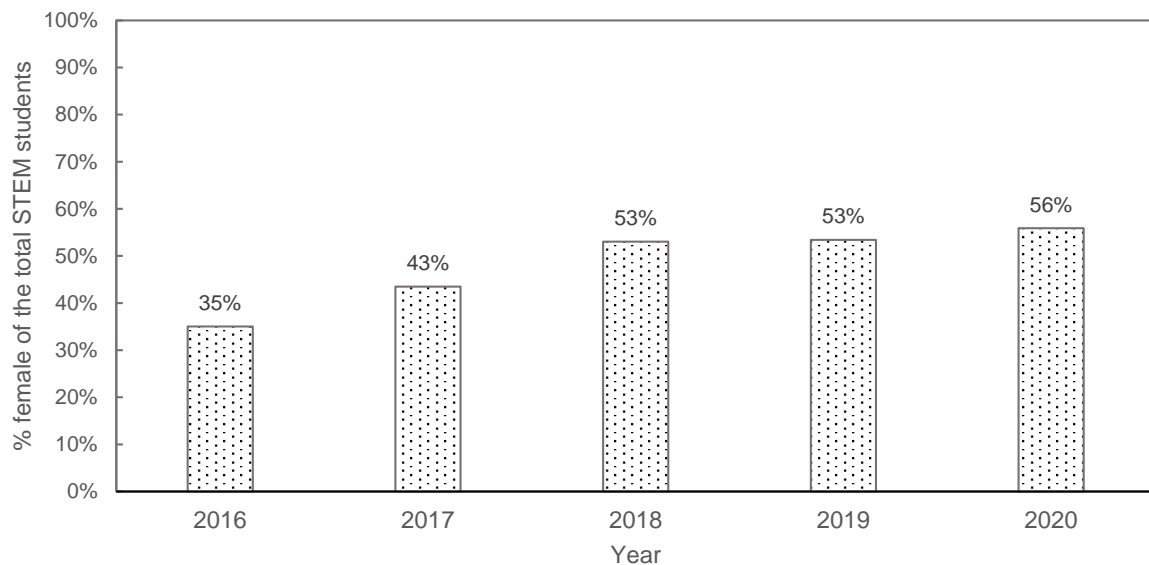


Figure 4.3. Proportion of female of the total STEM students in grade 11

In annual average, the majority of the students in grade 12 is in STEM subject which accounted for 53.8% between 2016 and 2020 (Figure 4.4). However, the proportion of STEM students in grade 12 showed a decreasing trend and has shifted from 80% in 2016 to 36% in 2020 (Figure 4.4). The interest of students in non-STEM subject has increased and shared around 20% in 2016 and 64% in 2020 (Figure 4.4). In terms of gender balance in STEM students of grade 12, the proportion of female of the total STEM students increased annually and reached balance in 2018 and 2019 and was slightly higher in 2020 (60%) (Figure 4.5). It should be noted that the percentage of STEM students were calculated based on the total number students collected during/after the middle of each year.

Considering the target reaching 50% STEM graduate of which 40% is female by 2030 set in the Cambodia's STI Roadmap 2030, achieving this target is still a concern for the STI players as the STEM students pool both in grade 11 and 12 showed a decreasing trend and this requires more attention and call for a concerted effort from relevant stakeholders to leverage interest or enrollment in STEM subject at the high school level.

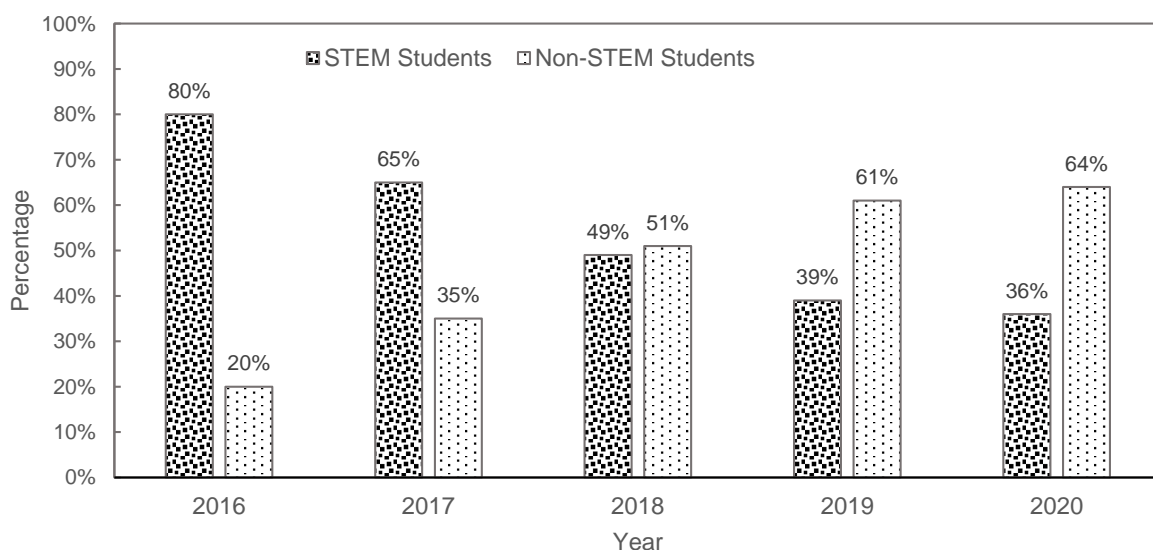


Figure 4.4. Proportion of the STEM and non-STEM students in grade 12



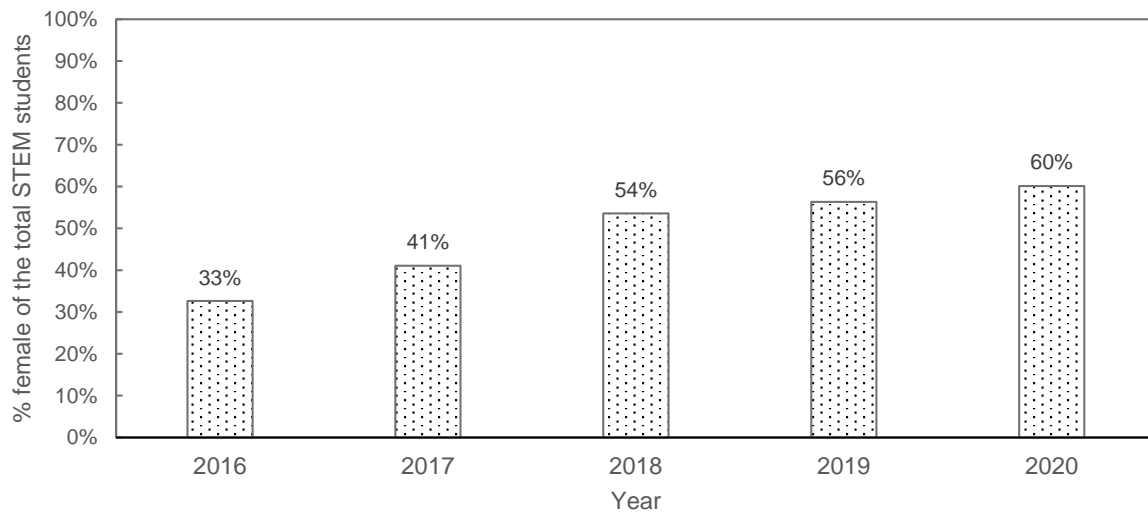


Figure 4.5. Proportion of female of the total STEM students in grade 12

The number students who completed grade 12 gradually increased yearly between 2016 and 2019, but slightly higher in 2020 (Figure 4.6). Compared to the total number of students in grade 12, the number of students who completed grade 12 ranged from 48% to 60% between 2016 and 2019 and was 87% in 2020, while the number of female students who completed grade 12 (2016-2020) ranged between 51% and 73%. During the year of 2020, the COVID-19 has disrupted education sector worldwide including Cambodia and students were unable to attend the classes physically but have to adopt online learning. Students and teachers were facing difficulties and challenges in adopting online learning and teaching system during that time. Therefore, the Ministry of Education Youth and Sport (MoEYS) decided and allowed the grade 12 students, who had applied for high school diploma exam, to automatically pass without grading. This is one of the reasons why higher percentage of students who completed in 2020. Moreover, the result also reflected the students who failed the exam or dropped out ranged between 40% and 52% in between 2016 and 2019, respectively.

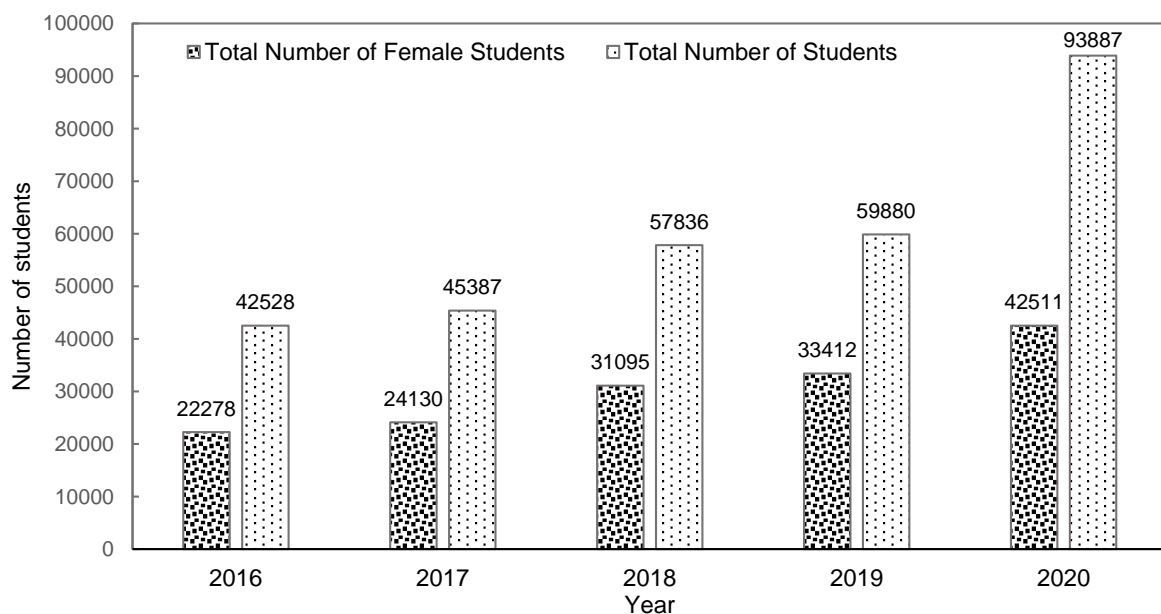


Figure 4.6. Number of graduated students from grade 12

## 4.2 Undergraduate level

The students who graduated from high school continue to enroll either an associate degree (2-3 years) or bachelor degree (4-5 years) at the university. According to the data from Ministry of Labour and Vocational Training (MLVT), between 2016 and 2019, the number of students graduating with an associate degree increased by an average about 1,000 students per year, but declined in 2020 while female students graduating with an associate degree accounted for 29% of the total students in average.

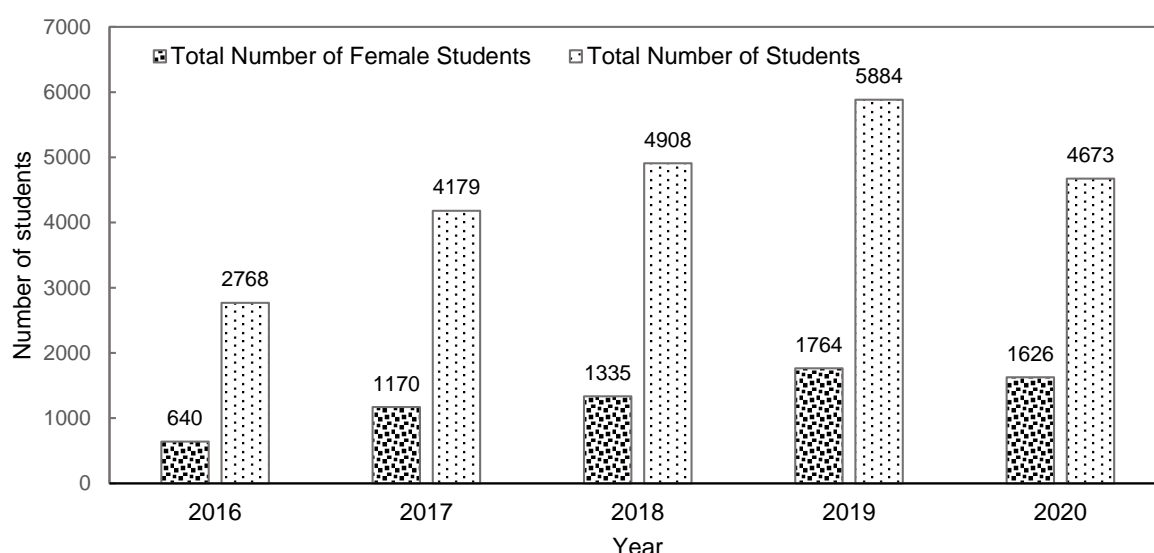


Figure 4.7. Number of graduated students from an associate degree (Data source: MLVT)

The total number of students studying bachelor degree has increased annually from 43077 in 2016 to 52076 in 2020 while the number of STEM students has relatively increased from 2016 to 2019 and slightly decreased in 2020 (Figure 4.8). In general, it is observed that the number students who enrolled in the STEM related subjects was approximately one third of the total students, with an average of 13437 students per year between 2016 and 2020 (Figure 4.8).

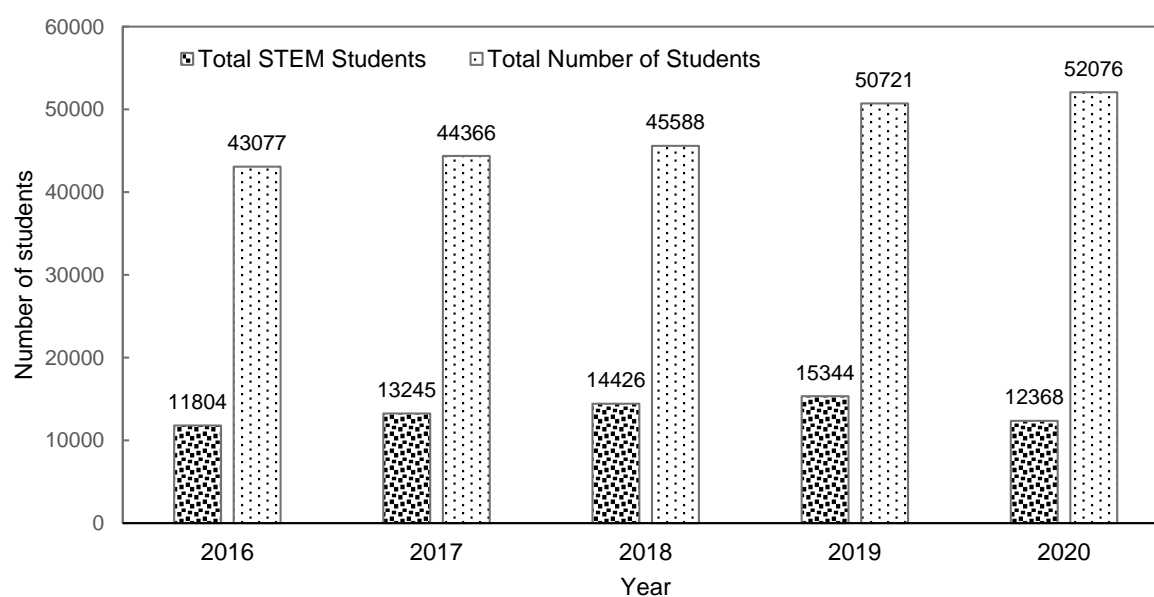


Figure 4.8. Number of students studying at bachelor level

Compared to the total graduated students in non-STEM subjects, the number of STEM students graduating from universities was still low (Figure 4.9). The average number of graduated STEM students accounted for 2886 per year between 2016 and 2020 (Figure 4.9). It should be noted that the obtained data of students in bachelor degree did not contain total number or percentage of female students. Thus, the share of female students was not discussed or described in this section.

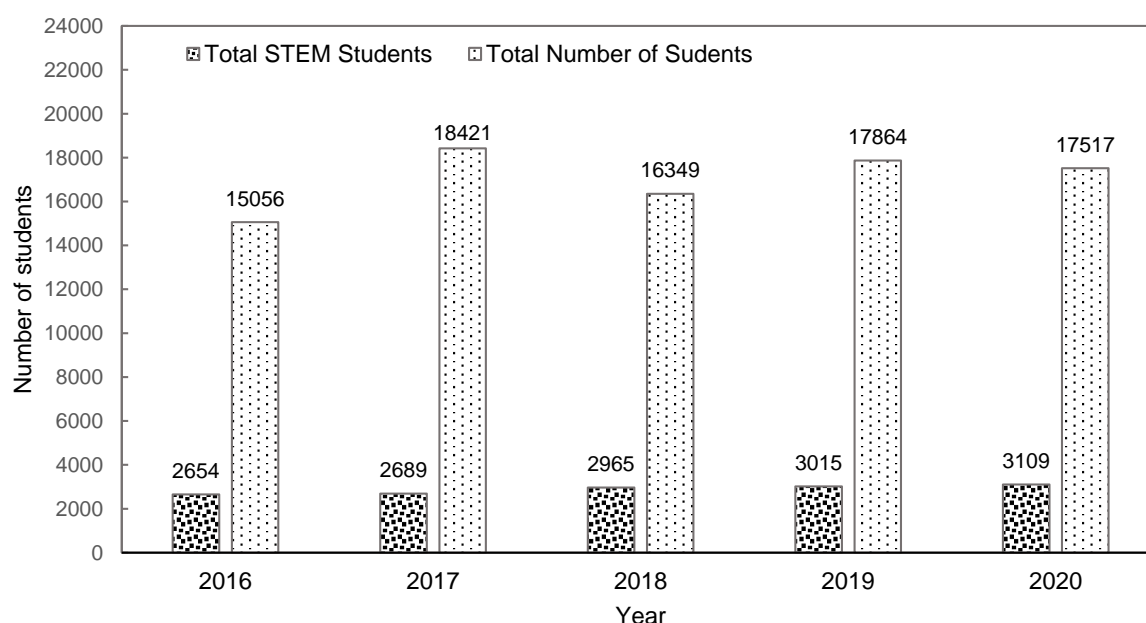


Figure 4.9. Number of graduated students with a bachelor degree

In terms of percentage, STEM students studying at the universities fluctuated between 24% and 32% while the graduated STEM students ranged between 15% and 18% of the total students between 2016 and 2020, respectively (Figure 4.10). Based on this historical data and trend, the percentage is still distant from target indicator set in Cambodia's STI Roadmap 2030.

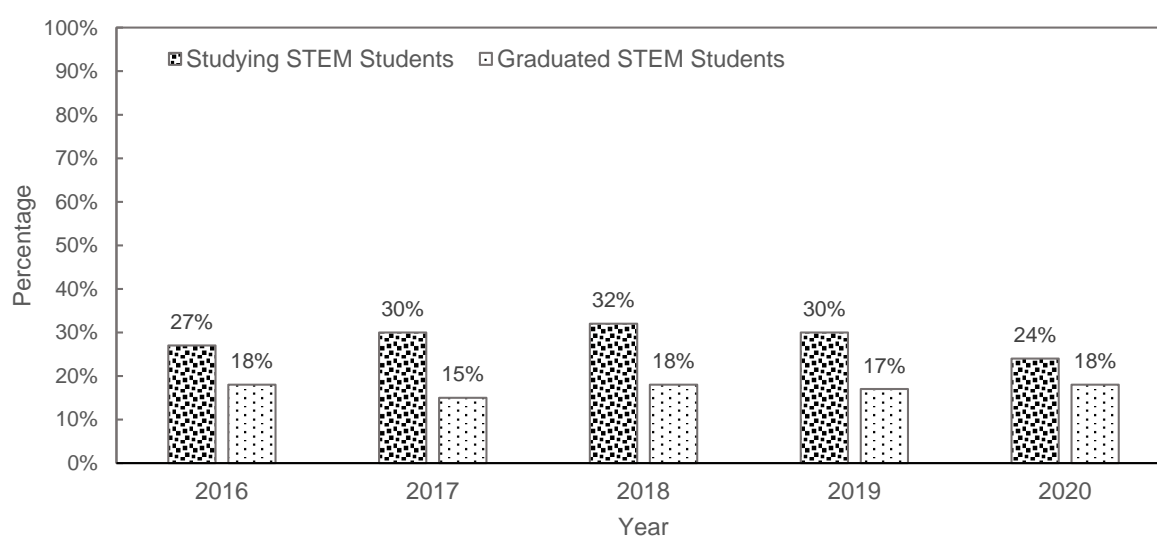


Figure 4.10. Percentage of STEM students studying in and graduated with a bachelor degree

Similarly, according to MoEYS report in 2019, the STEM enrollment in Cambodia's higher education institutions remain significantly low. It was quite challenging for Cambodia to industrialize as set in Industrial Development Plan by 2025 (RGC, 2015; MoEYS, 2017) as well as Cambodia's STI Roadmap 2030 (MISTI, 2021). Statistically, over 40% of 200,000 students enrolling in the academic year 2017-2018 chose to enroll in business-related programs, and only 27% of them chose to undertake STEM programs, of which engineering accounts for 8%, consecutively followed by 7% in ICT, 5% in basic science, 4% in health, and 3% in agriculture (MoEYS, 2019).

### 4.3 Graduate level

Graduate refers to advance level of education beyond bachelor degree or undergraduate level, usually master or doctorate degree. The number students studying in graduate level or equivalent level from 2016 to 2020 in Cambodia are plotted in Figure 4.11. The number of total students who were in graduate schools increased steadily by around 1500 from 2016 to 2019 and decreased significantly in academic year of 2020. The decline was more than 50% which result in number of students dropped from 23256 in 2019 to only 9984 in 2020. In addition, number of female students in graduate school rose from 4119 in 2016 to 5348 in 2019, and dropped to only 2995 in 2020. The decline in number was probably caused by the outbreak of global pandemic (COVID-19) which has started since 2019 and entered Cambodia in early 2020. Compared to total number of students in graduate level, percentage of female students remained steady from 2016 to 2017 at 22% then increased about 1% in 2018, and remained the same in the following year (2019) at 23%. Interestingly, this number increased dramatically to the highest, 30% in 2020. While targeting 50% of university graduates in STEM in the pillar of the roadmap- building human capital in STI by 2030, these percentages are still distant from the target (MISTI, 2021). After all, subject breakdown should be studied in order to have more insight understanding, and specific activities to be done for the leverage of STEM interest by the students in particular and the public as whole.

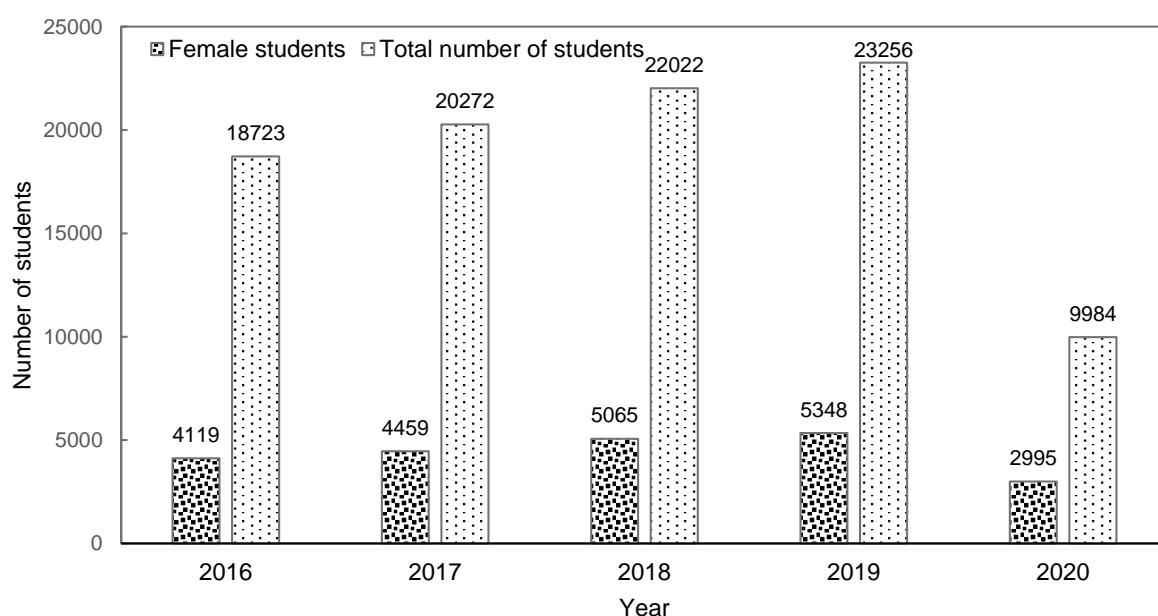


Figure 4.11. Number of students studying in graduate level from 2016 to 2020

The Figure 4.12 and Figure 4.13 illustrate the total number of students, female students, and student majoring in STEM in graduate level from 2016 to 2020. Total number of graduate students studying STEM rose gradually from 1640 in 2016 to 3411 in 2019 before the outbreak of global pandemic, while the number of students decreased to only 1296 in 2020 (Figure 4.13). From this numbers, percentage of graduate students choosing STEM was only about 8.8-13% compared to total number of students. Among those graduate students who are majoring in STEM, only about 10.7-21% is female (Figure 4.13). Though the percentage steadily increase yearly, it is clear that there is still more activities to be done to narrow down the gender gap in STEM subjects.

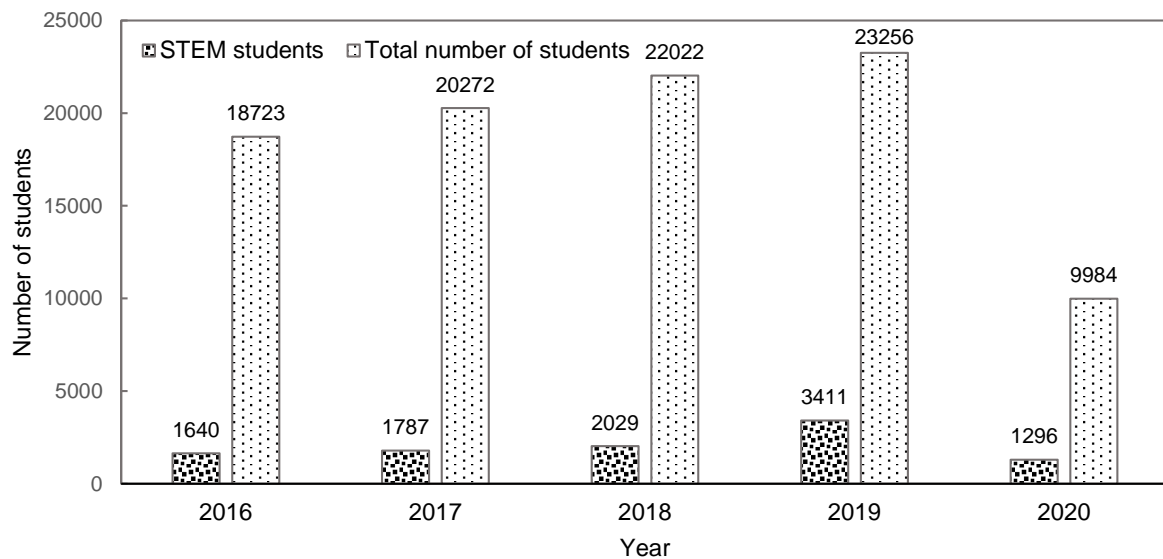


Figure 4.12. Number of STEM students and total students in graduate level

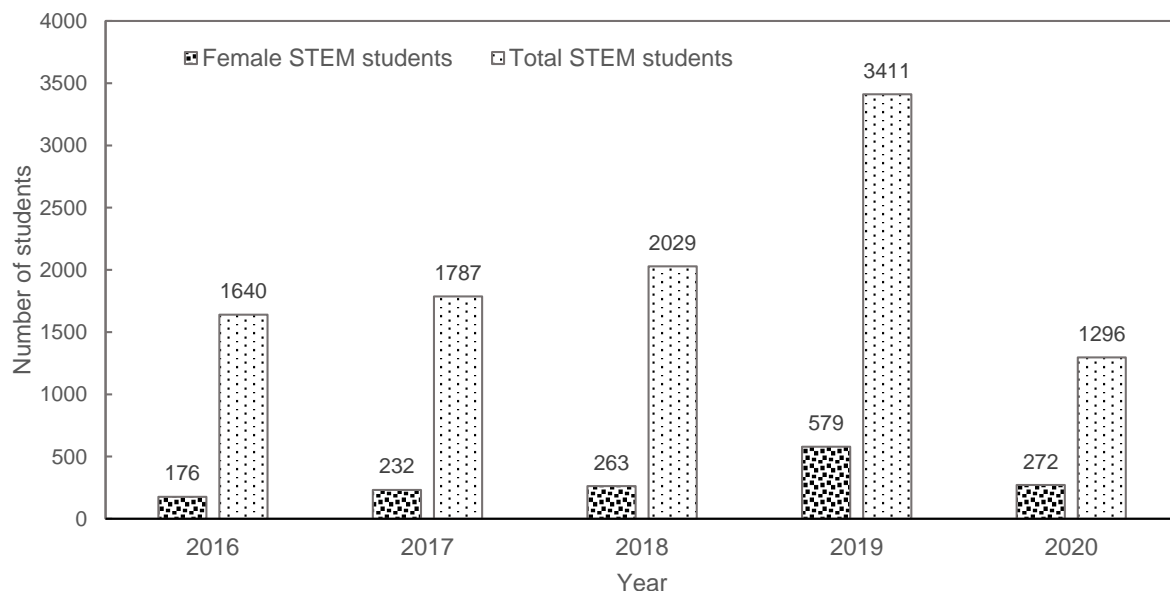


Figure 4.13. Number of female STEM students and number of students in STEM in graduation level

From 2016 to 2020, there were totally 20,094 students graduated with master or doctor's degree (Figure 4.14). The yearly distribution figure of graduated students was fluctuated with a peak in 2019 and the lowest number in 2020. In average, there is only 8% of all graduated students with STEM degree, 16% of which is female.

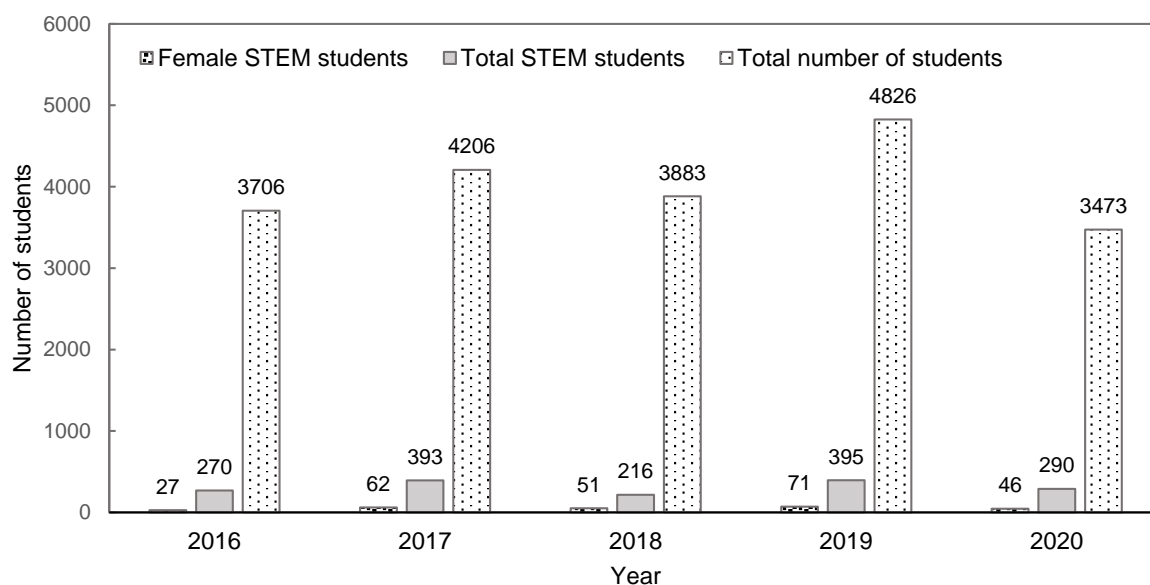


Figure 4.14. Number of students graduated from graduate level from 2016 to 2020

#### 4.4 Non-formal education

Non-formal education (e.g., TVET) aims to ensure that all children, people including those with disabilities or financially difficulties get their rights to a basic education. Non-formal education also provides opportunities for people to access life skills and become literate (Voleak, 2021). From 2016 to 2020, up to 166,904 students graduated from non-formal education (e.g., TVET) throughout the country, with the average 52% of female students compared to total graduated students. Number of students graduated from non-formal education were observed to increase significantly in 2018 and 2019 (Figure 4.15).

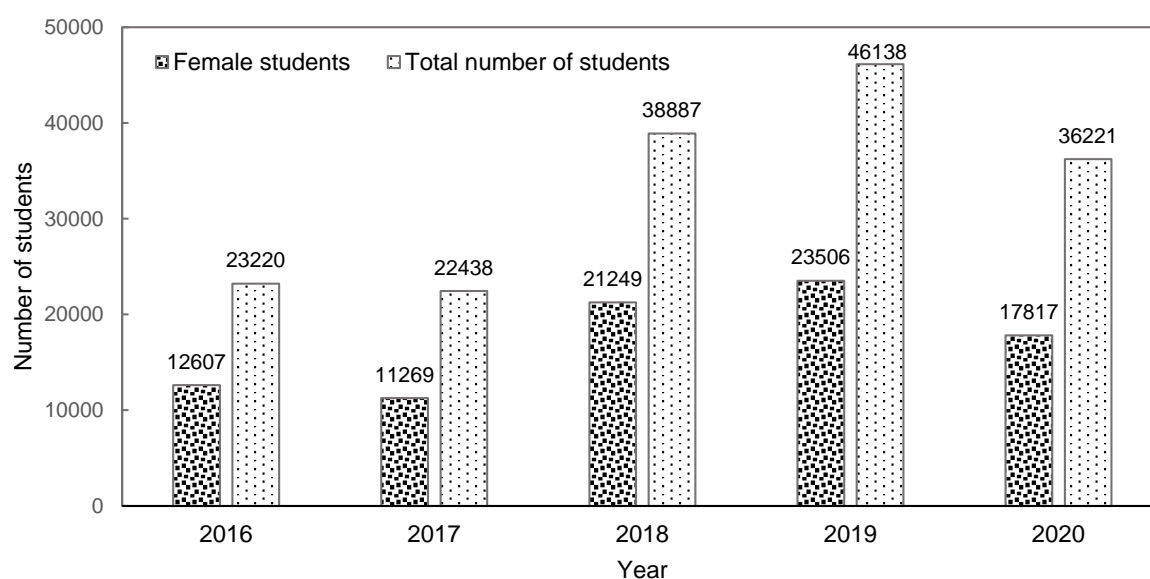


Figure 4.15. Number of female and total students graduated from non-formal education



## 4.5 Science & Technology Human Resource Database

The proper management of the human resource database is essential, whereas the proper inventory method or system can improve profitability and assist strategic human resource planning. Toward the advancement of STI in Cambodia, the Cambodian Science and Technology (S&T) Human Resources Database is established and updated periodically by National Institute of Science, Technology & Innovation (NISTI). As of November 15, 2021, 23 Ministries have submitted the S&T human resources data to NISTI namely: 1) MISTI, 2) Ministry of Post and Telecommunications (MPTC), 3) Ministry of Economy and Finance (MEF), 4) Ministry of Tourism (MoT), 5) Ministry of Agriculture, Forestry and Fisheries (MAFF), 6) MLVT, 7) Ministry of National Defense, 8) Ministry of National Assembly-Senate Relations and Inspection, 9) Ministry of Health (MoH), 10) Ministry of Cults and Religions, 11) Ministry of Culture and Fine Arts (MCFA), 12) Ministry of Mines and Energy (MME), 13) Ministry of Rural Development (MRD), 14) State Secretariat of Civil Aviation (SSCA), 15) Ministry of Water Resources and Meteorology (MoWRAM), 16) Ministry of Foreign Affairs and International Cooperation (MFAIC), 17) Ministry of Civil Service, 18) Ministry of Environment (MoE), (19) Takeo Provincial Hall under Ministry of Interior (MoI), 20) Cambodia Chamber of Commerce (CCC), 21) Ministry of Social Affairs, Veterans and Youth Rehabilitation, 22) Ministry of Public Works and Transportation (MPWT) and 23) Ministry of Planning (MoP). The total number of S&T human resources is 10,885 (24% are female) of which 731 are Doctoral Degree (accounted for 6.72%), 790 are Medical Doctor Degree (accounted for 7.25%) and 1,576 Master Degree (accounted for 14.48%) and 7,788 are Bachelor Degree (accounted for 71.55%). The distribution of the male and female human resources of each degree is presented in Figure 4.16.

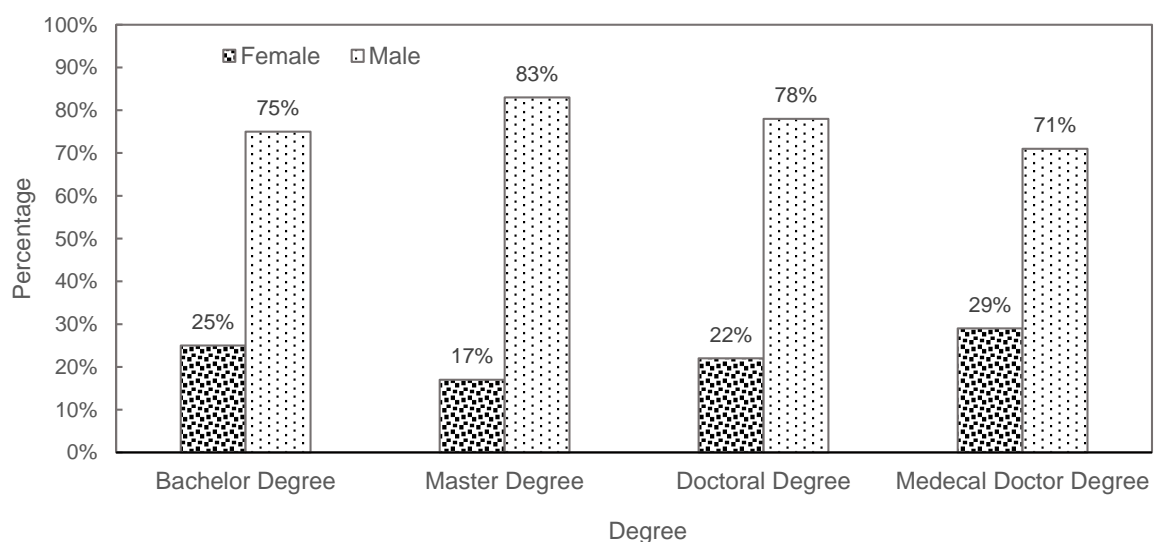


Figure 4.16. Percentage of S&T human resources by graduation degrees and gender

As a framework for assembling, compiling, and analyzing cross-nationally comparable statistics on education, International Standard Classification of Education (ISCED) by the UNESCO is adopted. This classification is designed principally to describe and categorize fields of education and training at the secondary, post-secondary, and tertiary levels of formal education. Three-level hierarchy between broad fields (the highest level), narrow fields (the

second level), and detailed fields (the third level) are used for this ISCED classification. Figure 4.17 presents the number of S&T human resources by fields of education and training.

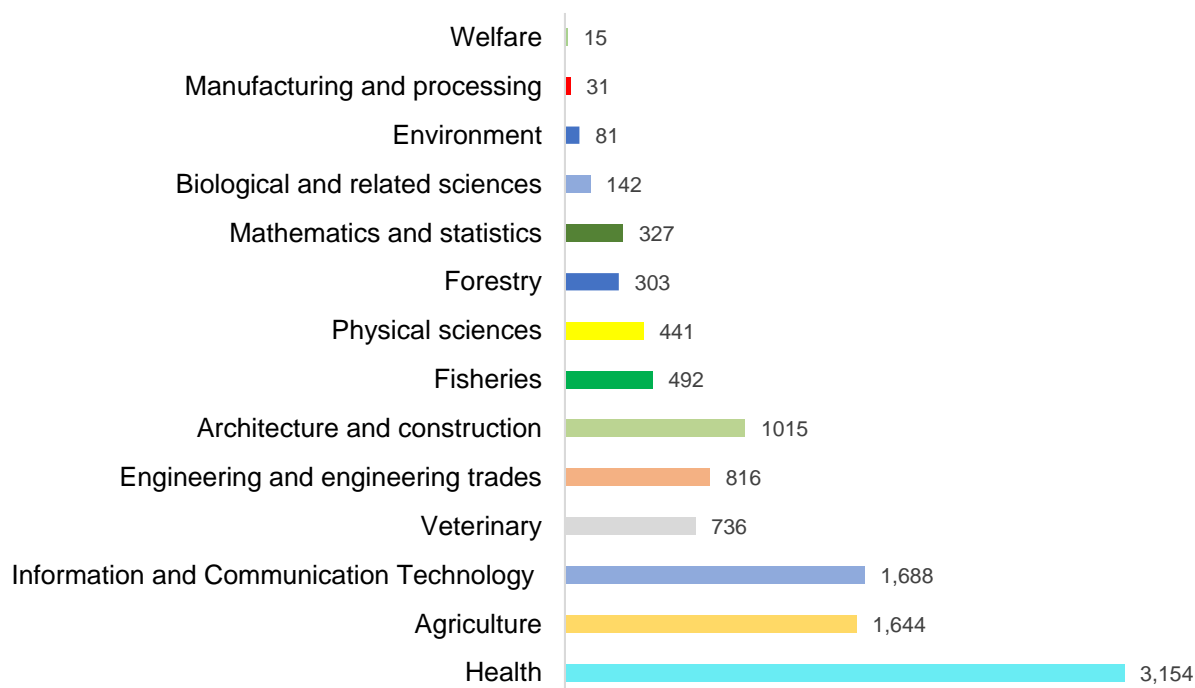


Figure 4.17. S&T human resources by fields of education and training

## 5.1 STI related projects/collaboration

After the establishment of MISTI and NCSTI, the government has mandated MISTI to coordinate activities related STI progress in Cambodia. More than 400 of STI projects/collaboration have been carried out by governmental ministries/institutions, according to the data submitted by NCSTI members over the last five years. The projects/collaboration in STI includes activities related to R&D and application of STI in the implementation of various policies. A large number of projects/collaboration contributed from MOEYS (109), followed by MPTC (74), MCFA (66), MoE (40), MoI (28), MPWT (25), MAFF (22), MISTI (17), MoH (13), MEF (12), CCC (10), MFAIC (9), MLVT (9), MoT (8), SSCA (3), MRD (1), while The Council for the Development of Cambodia (CDC), Ministry of Land Management, Urban Planning and Construction (MLMUPC), Ministry of Information (MoInfo), Ministry of Justice (MoJ), MoP, MoWRAM, Office of the Council of Ministers (OCM), Supreme National Economic Council (SNEC) either have no or haven't submitted information of any projects/collaboration in STI related activities (Figure 5.1). According to the current collected data, the universities under MoEYS are the major contribution in STI development (Figure 5.1). Specifically, numbers of project reflect MoYES's current implementing Higher Education Improvement Project (HEIP) loaned by the World Bank and government budget fund with 92.5 million USD for STEM improvement in the higher education sub-sector. This project aims at addressing high-skill human resources through S&T, and R&D. The second major contribution in STI development has been carried out under MPTC thought capacity building, research, and development fund since 2017. Moreover, MCFA mainly applied and utilized the scientific tools and technology including Geographic Information System (GIS), Light Detection and Ranging (LiDAR) and Global Positioning System (GPS) to perform the archaeological studies and conservation of

the world and national heritage sites in Cambodia. Other ministries have been developing or developed the electronic system for data management, public online services, registration, inspections, websites, e-library, trade and investment management, financial management, customs taxes management, health information management, human resource information management, and etc. It should be noted that the collected data is not covered private sector.

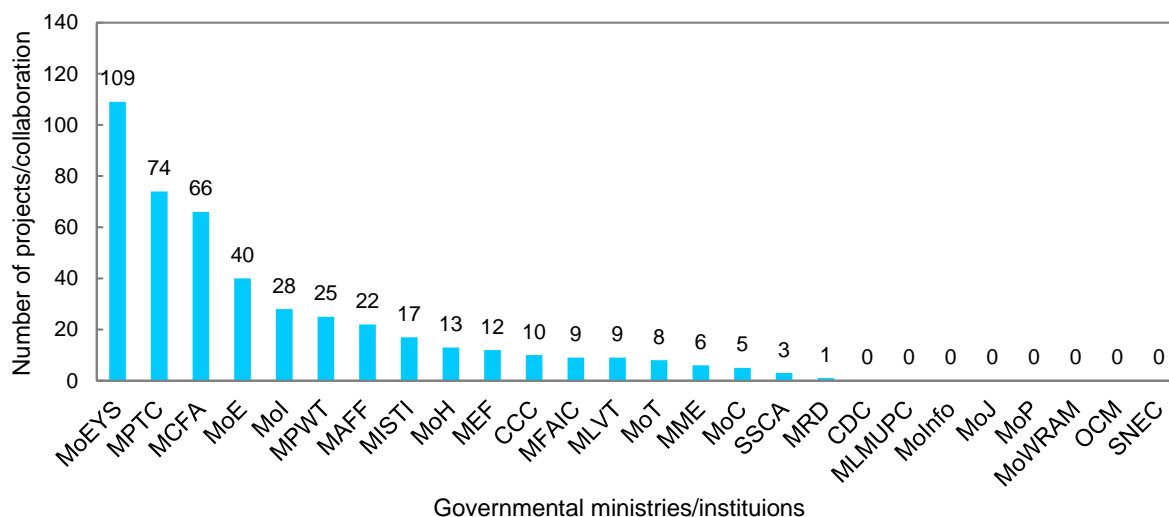


Figure 5.1. Number STI related projects/collaboration. Number zero means the governmental ministries either have no or haven't submitted information of any projects/collaboration in STI related activities

## 5.2 Collaboration with stakeholders

According to the collected information given NCSTI member institutions, there has remarkable amount of projects in collaborating with the development partners, private sectors, non-government organizations and universities for the last five years. Around two third of the total collected projects/collaboration were conducted within the national levels (around 67%) while around one third were both regional (3%) and international (30%) collaboration (Figure 5.2). On the other hand, the projects/collaboration are mostly being implemented and around 30% were completed (Figure 5.2).

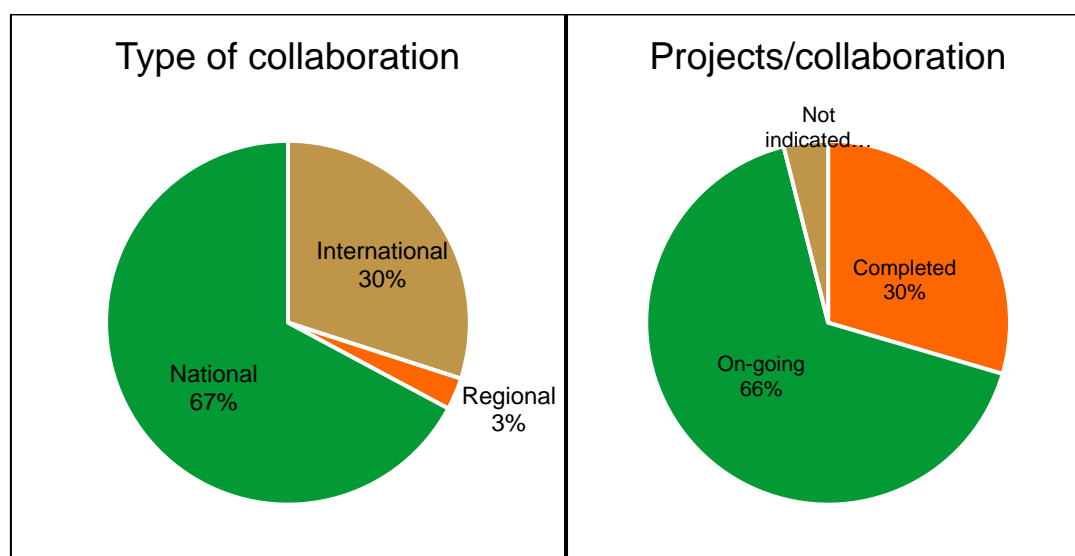


Figure 5.2. Type and status of STI related projects/collaboration

### 5.3 R&D

Not many R&D activities have been found across governmental ministries because R&D is not the core activity of governmental ministries. Most of the R&D projects were conducted at the universities under collaboration projects collected from MoEYS (Figure 5.2). Most of the collaboration projects are implemented under the World Bank Loan Project (e.g., HEIP) and a few projects are collaborated/supported by development/university partners.

It is necessarily important to note that the National Research Agenda is being identified and carried out by MISTI to prioritize what are the research priority to achieve country mission (as described in section 3). The agenda will complement to these existing research activities. The outputs will be used by government and research institutions to guide their research direction. Research ethics has been drafted and consulted through online workshop with various ministries and stakeholders will additionally strengthen the research quality. Under the ASEAN-Committee on Science, Technology, and Innovation (COSTI), the secretariat has been working hard to establish well-structured sub-committees participating from governmental staff and academia to work with regional countries in the ASEAN-COSTI framework, especially in the R&D related activities. For instance, two agenda on combating COVID-19 and digital transformation in manufacturing industries were endorsed by ASEAN Ministerial Meeting on STI in 2021. It is worth reminded that 1% of GDP should be committed in R&D by 2030 in order to achieve indicators set in the Cambodia's STI Roadmap 2030.

### 5.4 M&E system for Cambodia's STI Roadmap 2030

MISTI has issued mandates of the Department of Policy Monitoring Inspection and Evaluation (D/MIE) on 11 August 2020 in a Prakas No.232 of MISTI (MISTI, 2020) which aims 1) to prepare a monitoring and evaluation mechanism and work plans, 2) to define specific indicators (short, medium and long terms) to monitor and evaluate the implementation of STI master plan, projects, action plans and other plans for top level decision makers, 3) to join establishing key performance indicator (KPI) for STI individuals and institutions, 4) to disseminate results of M&E on STI policy, 5) and to raise/collect fund/budget to support the department. It is the right opportunity that M&E has been setup since the establishment of MISTI, while some ministries have not had clear organizational structure to conduct the M&E yet. D/MIE will monitor and evaluate many policy implementations; therefore, Cambodia's STI Roadmap 2030 is one among those that D/MIE will work on.

To secure that Cambodia's STI Roadmap 2030 will be implemented as planned, MISTI (D/MIE) will 1) develop system to monitor the key policy targets, indicators, inputs, activities, and report annually on the progress and performance for discussion at the NCSTI's meeting, 2) establish a partnership between MISTI and the National Institute of Statistics of MoP to exchange more data and statistics on innovation performance by public and private sectors. The partnership activities may include conducting an enterprise innovation survey every three or four years and applying international standard calculation methods, and 3) evaluate and review this roadmap every three or four years and adapt it if necessary. D/MIE has committed and prioritized programs as the followings:

1. Develop M&E framework and system to monitor and evaluate the Cambodia's STI Roadmap 2030 implementation.
2. Develop the M&E Manual for STI actors.
3. Train new staff on the basic understanding of M&E (series of trainings).
4. Tune methods related to M&E framework, M&E plan, M&E system to guarantee the STI policy implementation efficiency and effectiveness.

5. Collect data/information from relevant stakeholders to write Cambodia's STI Roadmap 2030 M&E reports.
6. Conduct regular (monthly, quarterly, bi-annual and annual meetings) management meetings (technical meeting) to monitor the Cambodia's STI Roadmap 2030 implementation.
7. Conduct consultation workshops on report writing (monthly, quarterly, bi-annual and annual reports).
8. Jointly prepare NCSTI meetings (twice per year) to monitor and evaluate the Cambodia's STI Roadmap 2030 implementation.
9. Write semi- and annual reports of Cambodia's STI Roadmap 2030 implementation to submit the MISTI and NCSTI.

Recently, D/MIE has developed result framework including indicators (31), their definitions/descriptions, baselines, targets and relevant stakeholders to monitor and evaluate Cambodia's STI Roadmap 2030. Many meetings and consultation workshops have been conducted to gather the inputs, feedback and recommendations to construct, consolidate and update the result framework reflecting with the targets of the roadmap. All components of the result framework were refined and selected carefully. Furthermore, M&E framework for Cambodia's STI Roadmap 2030 has been developed to regularly collect data from relevant stakeholders through the monitoring and reporting system. The progress reports are to be submitted regularly by related relevant stakeholders (e.g., monthly for MISTI; quarterly, bi-annually and annually for all related stakeholders). The reports will be consolidated by D/MIE, MISTI and finally reported to NCSTI for decision-making. The reporting and data collection will be in the M&E system, which was planned to establish in 2021. D/MIE produced the final draft of the M&E Manual and the working flow of MIE to ensure the smooth operation of M&E system and report the results to the decision-maker/top management on time. In term of capacity building, D/MIE conducted series of workshops (5 times) on M&E System development for STI policy implementation. The workshop aims to disseminate and build capacity of MISTI's staff of all level on M&E system. To ensure achievements and nurture of culture of M&E in the GD/STI, MISTI, the precise annual work plan/annual work plan and budget are to be developed and implemented smoothly under the support of M&E System.

## **6. Concluding remarks and recommendation**

The report provided the latest update on the progress of legal and policy frameworks and development related to STI till 2021. The collected information and data of STI development from the governmental ministries/institutions, specifically on human resource supply for STEM sector, and status of STI projects/collaboration by government institutions were analyzed based on direction given by National Policy on STI 2020-2030 and the Cambodia's STI Roadmap 2030.

To date, the number of S&T human resources having doctoral, medical doctoral, master and bachelor degrees have been inventoried and accounted for 10,885 of which 24% are female. STEM students studying at the universities fluctuated between 24% and 32% while the graduated STEM students ranged between 15% and 18% of the total student between 2016 and 2020. The number of total students at the graduate schools level increased steadily by around 1500 from 2016 to 2019 and decreased significantly in academic year of 2020 due to the impact of COVID-19 pandemics, while percentage of female students compared to total students in graduate level fluctuated between 22% and 30% between 2016 and 2020. On the other hand, the STEM pool at general education is critical for the last five years. The trend of high school students selecting STEM as their future endeavor has shown decreasing from 2016 to 2020. This could be a wakeup call to all relevant STI players to get a closer look in order to raise awareness among youth. Without critical mass in STEM human resources, our

vision to be higher-middle income country by 2030 and high income country by 2050 could be challenging to achieve.

Aside from this, the total number of projects/collaboration being implementing/implemented by governmental institutions were 457 covering activities related to R&D and application of STI in this last five years. Around two third of the projects/collaboration were conducted within the national levels while around one third was both regional and international collaboration projects.

Although some progress has been made and observed, the following recommendations are suggested to be done toward achieving the target as set in the Cambodia's STI Roadmap 2030:

- It is an urgent call for better understanding the importance of STEM and some activities are necessarily to be done immediately to leverage STEM enrollment among youth in higher education, while targeting 50% of university students in STEM in Cambodia's STI Roadmap. This target is still distant to work on.
- GD/STI of MISTI as secretariat of NCSTI to develop R&D system to collect, monitor and manage R&D funds committed by private and public sectors to serve as tool and baseline toward 1% of GDP on R&D fund committed by 2030 as set in the Cambodia's STI Roadmap 2030.
- Per Royal Decree No. ស្តី/រក្ខត្តិ/1020/1073 dated on 10 October 2020, the relevant ministries are required to further collaborate and submit regular and detail STI inputs/information to NCSTI for M&E on the implementation of Cambodia's STI Roadmap 2030 and other STI related policy development and planning.
- GD/STI of MISTI as secretariat of NCSTI mandated to develop immediately M&E System with other line ministries to monitor and evaluate the implementation of Cambodia's STI Roadmap 2030.



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