Ministry of Education, Youth and Sport
Kingdom of Cambodia

Data Collection Survey on Human Resource Development for Industrialisation in the Education Sector in the Kingdom of Cambodia

Final Report

July 2016

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.
MOHRI, ARCHITECT & ASSOCIATES, Inc.
INTEM Consulting, Inc.

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Contents

List of Figures

List of Tables

Abbreviations and Acronyms

ACC	Accreditation Committee of Cambodia
ACTS	ASEAN Credit Transfer System
ADB	Asian Development Bank
AEC	ASEAN Economic Community
AQAN	ASEAN Quality Assurance Network
ASEAN	Association of Southeast Asian Nations
AUN/SEED-Net	ASEAN University Network, Southeast Asia Engineering Education Development Network
CBT	Competency Based Training
CDC	Council for the Development of Cambodia
CDPF	Capacity Development Programmeme Fund
CIDA	Canadian International Development Agency
CJCC	Cambodia-Japan Cooperation Center
CQF	Cambodian Qualification Framework
DOE	District Office of Education
DP	Development Partner
ERC	Education Research Council
ESP	Education Strategic Plan
ESWG	Education Sector Working Group
EU	European Union
FR	Final Report
GDP	Gross Domestic Product
GER	Gross Enrolment Ratio
GMAC	Garment Manufacturers Association in Cambodia
ICR	Inception Report
IDP	Industrial Development Policy
ILO	International Labour Organization
IMF	International Monetary Fund
INSET	In-service Training

ITC	Institute of Technology of Cambodia
JBAC	Japanese Business Association of Cambodia
JDS	Japanese Grant Aid for Human Resource Development Scholarship
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JICA SV	JICA Senior Volunteer
JOCV	Japan Overseas Cooperation Volunteer
JTWG	Joint Technical Working Group in Education
KOICA	Korea International Cooperation Agency
LBE	Labouratory Based Education
MoEYS	Ministry of Education, Youth, and Sport
MLVT	Ministry of Labour and Vocational Training
MoP	Ministry of Planning
NEA	National Employment Agency
NER	Net Enrolment Ratio
NIE	National Institute of Education
NPIC	National Polytechnic Institute of Cambodia
NSDP	National Strategic Development Plan
NTB	National Training Board
NTTI	National Technical Training Institute
ODA	Official Development Assistance
PBL	Project Based Learning
POE	Provincial Office of Education
PPI	Preah Kossomak Polytechnic Institute
PRESET	Pre-service Training
PTC	Provincial Training Center
PTTC	Provincial Teacher Training College
QIP	Qualified Investment Project
RS	Rectangular Strategy
RTTC	Regional Teacher Training Centre

RUPP	Royal University of Phnom Penh
SEC	Southern Economic Corridor
SEZ	Special Economic Zone
SIDA	Swedish International Development Cooperation Agency
SRU	Svay Rieng University
STEM	Science, Technology, Engineering, and Mathematics
STEPSAM1	Secondary School Teacher Training Project in Science and Mathematics
STEPSAM2	Science Teacher Education Project
STEPSAM3	Project for Education Resource Development in Science and Mathematics as the Lower Secondary Level
STVET	Strengthening Technical and Vocational Education and Training
SWAP	Sector Wide Approach
TEC	Teacher Education College
TEPS	Teacher Education Provider Standard
TPAP	Teacher Policy Action Plan
TPAP TF	Teacher Policy Action Plan Task Force
TTC	Teacher Training College
TTD	Teacher Training Division
TVET	Technical and Vocational Education and Training
TVETSDP	Technical and Vocational Education and Training Sector Development Programme
UBB	University of Battambang
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United Nations Children's Fund
VSO	Voluntary Service Overseas
VVOB	Flemish Association for Development Cooperation and Technical Assistance
WB	World Bank

Exchange Rate 1 Riel＝0.025260 Yen
1 US Dollars＝102.28 Yen
July 2016

1. Introduction

1.1 Background and Objectives of the Survey

The Japan International Cooperation Agency (JICA) started the assistance to Cambodia in 2000 with the "Secondary Teacher Training Project in Science and Mathematics", or STEPSAM1 (2000-2005), a technical cooperation project on teacher training in upper secondary math and science education. Since then, JICA has been continuously supporting teacher development and lesson improvement in mathematics and science in Cambodia and expanded its assistance to primary and lower secondary education through STEPSAM2 (2008-2012) and STEPSAM3 (2013-2016), in which JICA has also supported Ministry of Education, Youth, and Sport (MoEYS) developing policy papers on teacher education, such as Teacher Policy (TP) and Teacher Policy Action Plan (TPAP). Furthermore, JICA has made significant contributions to higher and technical education through the Cambodia-Japan Cooperation Center (CJCC) Project, the Project for Educational Capacity Development of Institute of Technology of Cambodia (ITC), and the ASEAN University Network (AUN) / Southeast Asia Engineering Education Development Network (SEED-Net) Project, all of which helped to produce industrial workforce in Cambodia.

In this context, H.E. Hang Chuon Naron, the minister of MoEYS, and JICA Cambodia Office had a meeting in July 2015, and agreed that JICA would conduct a comprehensive survey in the education sector of Cambodia so as to help MoEYS accelerate the implementation of Industrial Development Policy (IDP) 2015-2025 through a maximum use of technical cooperation, grant aid, and Yen loan. In particular, the establishment of Teacher Education Collages (TECs) by 2020 (which was viewed as one of the most important, challenging issues in the above TPAP), was a key component, wherein, MoEYS asked JICA for technical support as well as the provision of facilities and equipment. However, as each of the requests from MoEYS has not yet been realised, there was a necessity to prepare concrete and feasible plans through collabouration among MoEYS, JICA, and other development partners (DPs).

Thus, this survey was conducted to make specific recommendations that support Cambodia's current efforts to develop an industrial workforce and promote education reform, based on the analysis of issues around education subsectors involving basic education, engineering education, and technical education.

1.2 Survey Schedule

The field survey was conducted over a period of about three months, from 12th February to 13th May 2016[1]. The Study Team conducted sub-sector surveys (of basic education, higher education, and technical education) in line with forming a consensus on the draft programme proposals with the Cambodian side. In particular, in proposing the draft programme proposal, the Study Team implemented consultative meetings by the sub-sectors several times and flexibly adjusted, based on the opinions of the Cambodian side.

[1] The survey particularly that of basic education sector was extended to 18th July 2016 to update the status of Teacher Education Provider Standard (TEPS) which Teacher Policy Action Plan Task Force (TPAP TF) team had finalized. TEPS is regarded as an important document which is closely related to the quality education to be provided by Teacher Education College (TEC) which the Study Team is proposing as one of the possible programs in the near future.

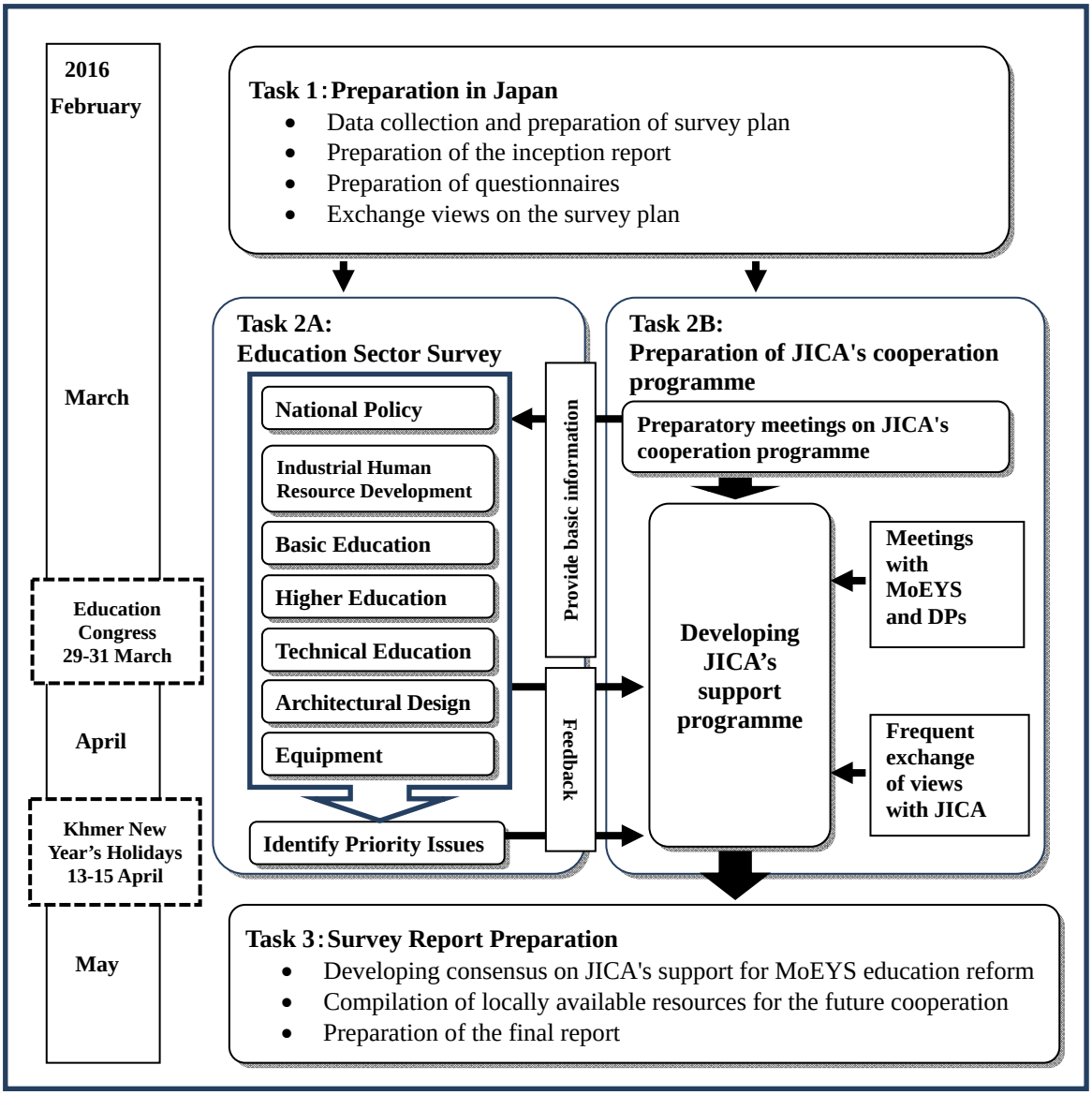


Figure 1-1: Flowchart of Survey Schedule

1.3 Study Team

The Study Team was made up of 17 specialists, inclusive of 2 education specialists from JICA and 15 international consultants whom specialised in basic education, higher education, technical education, industrial human resource development, architecture, and facilities and equipment. The team was headed by Mr. Koji Takahashi, Team Leader, PADECO Co., Ltd., and comprised other consultants from PADECO, Mohri Architect & Associates, Inc., and INTEM Consulting, Inc. The members and their subject matter expertise are shown in Table 1-1.

Table 1-1: Study Team Members

	Title	Name
1	Team Leader/ Educational Issues Analyst (1)	Mr. Koji Takahashi
2	Deputy Team Leader/ Educational Issues Analyst (2)	Mr. Kenichi Tsunoda
3	Teacher Training College Analyst (1)	Dr. Norio Kato
3	Teacher Training College Analyst (2)	Mr. Koji Takahashi
4	Engineering Education Analyst	Mr. Nobuhiro Setoguchi
5	Educational Administration and Policy Analyst	Assoc Prof. Yuto Kitamura
6	Analyst for Human Resource for Industry Analyst	Ms. Kyoko Yoshikawa
7	Higher Education Analyst	Prof. Yasushi Hirosato
8	Teacher Training Curriculum Analyst	Prof. Masayuki Ando
9	Technical Education Analyst	Mr. Sok Chan Rithy
10	Architectural Design/Facility Planning (1)	Mr. Takeshi Takeshita
11	Architectural Design/Facility Planning (2)	Mr. Hisafumi Michikawa
12	Architectural Design/Facility Planning (3)	Dr. Kaoru Matsumiya
13	Educational Equipment Assistance Planning	Mr. Tomohiro Tamaki
14	Education Data Specialist	Ms. Megumi Shiota

2. National Strategies and Development Policies

2.1 National Strategic Development Plan 2014–2018

Along with the recent rapid economic growth, the government of Cambodia has set forth the National Strategic Development Plan 2014-2018 which advocates preferential policies in four major fields, namely agricultural promotion, infrastructure development, utilization of the private sector and employment, and human resource and capacity development[2]. Additionally, the government has come up with the Cambodia Industrial Development Policy 2015-2025 which promotes the shift from labour-intensive industry to skill-based industry by 2025. The government has taken the strong leadership to put the strategic policy forward and formed the working groups within the ministries inclusive of MoEYS. The MoEYS and the Ministry of Labour and Vocational Training (MLVT) are mainly in charge of developing the skills and human resource policies and action plans particularly in the field of Science, Technology, Engineering, and Mathematics (STEM).

2.2 Industrial Development Plan 2015–2025

Cambodia's major industry is still the garment sector, whose factories are mostly located in Phnom Penh[3]. The labour-intensive model of the industry is dominant in such a sector, relying on its cheap labour-cost and rich labour-force. 60% of the factories are responsible for the CMT (Cut, Make, and Trim) process, and serve as sub-contractors, while only 20% provide completed products in-house. Likewise, other industry sectors provide lower valued services with the same trends.

The Cambodian government approved the Industrial Development Policy 2015-2025 in March 2015 (officially announced in August) to tackle the aforementioned issues, with which Cambodian industries are currently faced. IDP aims at transformation and modernisation of the Cambodian industry base, from a labour intensive-based to a skill-based industry. IDP is proposed, in order to achieve the long-term goal of Cambodia to become a middle income country by 2030. It clarifies the prioritised industrial sectors as 1) new, high-valued, and creative industries, 2) SME providers of medicine, architectural materials, wrapping, furniture and technical equipment, 3) agricultural products providers, 4) challenging industries, and 5) ICT, energy, heavy industries, cultural and traditional handicraft industries, and green technologies.

IDP furthermore set forth 119 policies and action plans with clear demarcation of responsible ministries, goals, and timelines. All ministries inclusive of MoEYS have started various activities under the newly established working groups under the governments' strong leadership. Table 2-3 shows the policies and action plans related to human resource development. MoEYS and MLVT are responsible for these plans to improve the professional capacity and knowledge of human resources for industrial development, particularly focusing on the STEM field. IDP also aims to encourage an investment friendly system by revising the current Investment Law, reviewing the conditions of Qualified Investment Project (QIP), and setting up the Special Economic Zone (SEZ) Law and so forth. Additionally, decreasing the Electricity charges, step by step, stabilization of electricity supply, and increasing its coverage are also mentioned as the supporting policy.

[2] The four fields are so called "quadrangular strategies which the government of Cambodia aims at strengthening in parallel

[3] Garment sector industries occupy 55% out of the whole export values of the country in 2014 and 68% of those factories locate in Phnom Penh, while 13% in Khandal province ("*Labour Standards in global Supply Chains*", "*A Programme Action for Asia and the Garment Sector, Cambodian Garment and Footwear Sector Bulletin*", ILO 2015).

2.3 Education Strategic Plan 2014–2018

Education Strategic Plan (ESP) 2014-2018, the most significant policy document of the MoEYS, has established the 10 important education indicators, emphasizing the expansion of early childhood care development (ECCD), improvement of internal efficiency and quality in basic education, and, quality improvement in higher education. Development Partners involved in the education sector are required to plan and implement their programmemes in a way that is consistent with ESP.

The education budget has constantly increased in recent years and additional allocation to the primary education is planned. However, compared to other neighboring countries, Cambodia still records the lowest level in the expenditure for the education sector against GDP ratio (2.6% in 2013). Cambodia is yet required to increase the economic investment into the education sector along with the increase of government income from macro economic growth.

2.4 Japanese Assistance to the Human Resource and Education Sector in Cambodia

2.4.1 Past Assistance Records

Japan has provided Cambodia with assistance for human resource development over previous decades. The recent projects in 2015 are listed in Table 2-1 below. As seen in the table, the listed projects match the strength of Japanese education and cover the STEM subjects promoted by the government of Cambodia. This survey followed such trends and proposed appropriate project plans by describing the fundamental design of the education and human resource development in line with the structural shift of the industrial sector in Cambodia.

Table 2-1: Japan's Assistance to Human Resource Development

Development Target：Enhancing Private Sectors	
Human Resource Development Projects	
Project Name	**Types**
Project for Institutional Capacity Development of CJCC for a Center of Development and Networking for Business Human Resources	Technical Cooperation
Project for Improving TVET Quality to Meet the Needs of Industries	Technical Cooperation
Project for Educational Capacity Development of ITC	Technical Cooperation
The Project for Improvement of Facility and Labouratory Equipment in ITC	Grant Aid
AUN/SEED-Net Project Phase3	Technical Cooperation
Capacity Development of TVET's Trainers of MLVT Phase II	Third Country Training
Strengthening Employment Services, Career Guidance and Labour Market Information	JICA Knowledge Co-Creation Programme (Group and region focus)
Project for Strategic Strengthening of Small and Medium Enterprise (SME) Support System	Technical Cooperation
The Project for the Improvement of Educational Equipment of the Department of Geo-Resources and Geotechnical Engineering of ITC	Grant Aid
Pilot Survey for Disseminating SME's Technologies for Tsubame-Sanjo Brand Tools	Public-Private Partnerships
Volunteering on Vocational Training Fields	JOCV/SV
JICA Knowledge Co-Creation Programmes on vocational training fields	JICA Knowledge Co-Creation Programme etc.
Skills Evaluation System Promotion Programme (SESPP)	MHLW Technical Cooperation
The Projects for Human Resource Development for Food Production Industries in ASEAN Developing Countries.	Multi-development Assistance

Development target：Improving Education Quality	
Improving Science and Mathematics Education Projects	
Project Name	**Types**
The Project for Educational Resource Development in Science and Mathematics at the Lower Secondary Level	Technical Cooperation
The Project for Human Resource Development Scholarship	Grant Aid
JICA Partnership Programme on Science and Mathematics Fields	JICA Partnership programme
Volunteering on Science and Mathematics Fields	JOCV/SV
JICA Knowledge Co-Creation Programmes on science and mathematics fields	JICA Knowledge Co-Creation Programme etc.
Others	
Project Name	**Types**
The Project for Expansion of Lower Secondary Schools in Phnom Penh	Grant Aid
Grant aid Programmes on Science and Mathematics Fields	Grant Aid
JICA Partnership Programmes on Science and Mathematics Fields	JICA Partnership Programme
Other Volunteering on Education Sector	JOCV/SV

Source: Ministry of Foreign Affairs (2015), Projects plans for Kingdom of Cambodia

2.4.2 Japanese Advocacy of Industrial Human Resource Development in Asian Countries

Japanese Prime Minister, Mr. Shinzo Abe, has proposed the "Initiative on Human Resource Development for Industrial Improvement" to promote the cooperation for developing the industrial human resources in Asian countries in the ASEAN-Japan top-level conference in Kuala Lumpur, Malaysia on 22 November 2015. The initiative aims at developing fundamental industries and human resources to follow in Asian countries, in order to lead the world politics and economy in the 21st century. Specifically, the following 2 points were mentioned:

1. The Government of Japan will assist developing countries to develop human resources in the area of practical technology, design and development, innovation, management and planning, basic education (particularly in the field of science and mathematics), and administrative officers involved with industrial policies.
2. It will support the development of a financial system for small and medium sized industries, aiming at investing 40,000 industrial human resources in Asia within three years[4].

2.5 Development Partners' Assistance to the Education Sector in Cambodia

2.5.1 Donors Coordination in the Education Sector

In Cambodia, MoEYS and MLVT are in charge of the education sector. Basically, MoEYS is responsible for Early Childhood Care Education (ECCE), basic education (primary and lower secondary) and upper secondary, but, both MoEYS and MLVT are responsible for technical and vocational education and training (TVET). The issue here is the unclear demarcation of the ministries; meanwhile, many development partners (DPs) have supported the education sector with both ministries. Therefore, it is crucial to coordinate the ministries and DPs involved, to oversee efficiencies of the international assistance.

[4] www.mofa.go.jp/mofaj/files/000112832.pdf

To solve this issue, the Education Sector Working Group (ESWG) was established, and all of the development partners inclusive of NGOs have participated in regular meetings and have exchanged updates. Furthermore, the Joint Technical Working Group in Education (JTWGE) is responsible for discussions and updating among the DPs and Cambodian ministries. In coordination, the TVET Coordination Working Group (TVET-CWG) was established in 2013.

2.5.2 Development Partners Assistance Records

The main DPs in the education sector are ADB, EU, VVOB, UNICEF, World Bank, Sweden, and VSO, whose assistance is mainly in ECCE and basic education. ADB and KOICA have assisted the TVET sub-sector, while World Bank and France have assisted in the higher education sub-sector. UNESCO's contribution is substantial, as it has hosted workshops and seminars on education policies ad-hoc and ESWG, and co-hosted the JTWGE with MoEYS. The NGO Education Partnership (NEP) has been established to coordinate many NGOs. NEP has participated in national and international NGOs, implementing activities reflecting the educational policies at the grassroots level. The British embassy in Cambodia has directed the activities implemented in the STEM sector.

Table 2-2: Assistance in Cambodian Education Sector by Development Partners

DPs/ Ministries	Project Title	Summary	Period/Year	Amount (Mil)
ECCE and Basic Education Sub-Sector				
ADB/ MoEYS	Third Education Sector Development Programme)	Targets the lower secondary education and aims at improvement of access (school construction, rehabilitation, additional construction of lower secondary school attached with primary school), quality (SIG[5] and improvement of science and mathematics education), Strengthening the financial administration and governance (improvement of school management).	2013～17	USD 30
Sweden/ MoEYS	Inclusive Quality Early Childhood Development and Basic Education)	Co-financing of the UNICEF project	2014～16	USD 4.5
	Education Programmeme Support School Improvement Grant	Assistance of school activities in ECCE and upper secondary education schools, aims at improvement of access, completion rate, and school management capacity.	2013～16	SEK 155
	In addition, co-financing to other development partners activities is planned.			
VSO	Improve the Quality of Teaching & Learning	Improvement of teaching capacity in PRESET and INSET at PPTC, child centered approach, strengthening the coordination between PTTC and practice school (inclusive of dispatch of advisor to TTD).	2013～17	-
	Strengthen Education Management	Strengthening the system and the capacity of education management at POE and DOE level	2015～16	USD 0.73
VVOB/ MoEYS	Learning outcomes in primary education	Targets the 18 PTTC nationwide. Aims at improvement of teaching capacity of science and mathematics subjects at PPTC, PCK capacity development of PTTC instructors, improvement of teaching practice, strengthening monitoring and management capacity of training.	2014～16	EUR 3

[5] School Improvement Grant

DPs/ Ministries	Project Title	Summary	Period/Year	Amount (Mil)
UNICEF/ MoEYS	Inclusive Quality Early Childhood Development and Basic Education)	Support the capacity development of education administration, schools, and communities to assure the access to basic education for disadvantaged and disabled children.	2014～17	USD 6.7
World Bank/ MoEYS	Cambodia Global Partnership for Education	Improving the access to ECCE, improving the access to basic education and quality improvement for disabled children (coordination among developed counties, international agencies, public sector, and NGO).	2014～17	USD 38.5
World Bank/ MoEYS	ECCD for Floating Villages Project	Implementation of education services for pre-school children families and communities in Floating Village	2016～19	USD 2.7
Upper Secondary Education, TVET Sub-Sector				
ADB/ MoEYS	Upper Secondary Education Sector Development Programme	Targets upper secondary education, aims at access improvement (school construction, upgrading lower secondary schools), quality improvement (strengthening science and mathematics education, improvement of recourse centers), and strengthening planning and implementation capacity.	2016～21	USD 45
KOICA/ MoEYS	The Project to Develop Technical Education at the Upper Secondary Level in Cambodia	Preparing a master plan to GTHS nationwide, preparing and implementation of curriculum in the 5 important area of TVET.	2013～15	USD 2
SEAPC-C/ MoEYS	Banteay Meanchay Arise	Christian NGO (South East Asia Prayer Center of Cambodia) assists teachers and TVET training for less than one year, targeting at general high schools in nine districts of Banteay Meanchay province.	2015～	USD 1.125 (USD 0.125 per school)
Higher Education Sub-Sector				
World Bank/ MoEYS	Higher Education Quality and Capacity Improvement Project)	Quality improvement of teaching methodology, that of research and management capacity, and implementation of piloting projects to decrease dropout of disadvantaged students, targeting at about 40 % of higher education institutes	2010～17	USD 23
France/ MoEYS	Support to the Royal University of Law and Economics	Assist for the courses of law, economics, and politics.	2006～16	EUR 3.0
	Support to the Institute of Technology Cambodia	Capacity building in the area of science and engineering	2006～17	EUR 2.1
Others (Education Sector in General)				
European Union/ MoEYS	Capacity Development Partnership Fund II	Improvement of policy and planning, financial administration, implementation, monitoring and evaluation capacity in education sector (implemented by UNICEF)	2014～17	EUR 7.8
	Education Sector Reform Contact	Financial assistance of implementation of ESP 2014-18	2014～17	EUR 68.5
Sweden/ MoEYS	Capacity Development Partnership Fund II	Pooled funding for EU/UNICEF projects	2015～16	USD 4.1

DPs/ Ministries	Project Title	Summary	Period/Year	Amount (Mil)
UNICEF/ MoEYS	Capacity Development Partnership Fund II	Improvement of policy and planning, financial administration, implementation, monitoring and evaluation capacity in education sector (implemented by UNICED, financial support by EU).	2014～17	EUR 7.8
NEP/ MoEYS	90 local NGOs and 40 international NGOs are participated in, responsibe for policy dialogue and discussion with MoEYS, aims at reflecting NGO's activities on MoEYS policy and planning and make their assistance more effective.			
UNESCO/ MoEYS	In charge of co-chairperson of ESWG with MoEYS, and technical assistance on education policy and planning			
United Kingdom	Implementation STEM education advocacy, preparing booklets on STEMs, and implementation of STEM Activity Day			

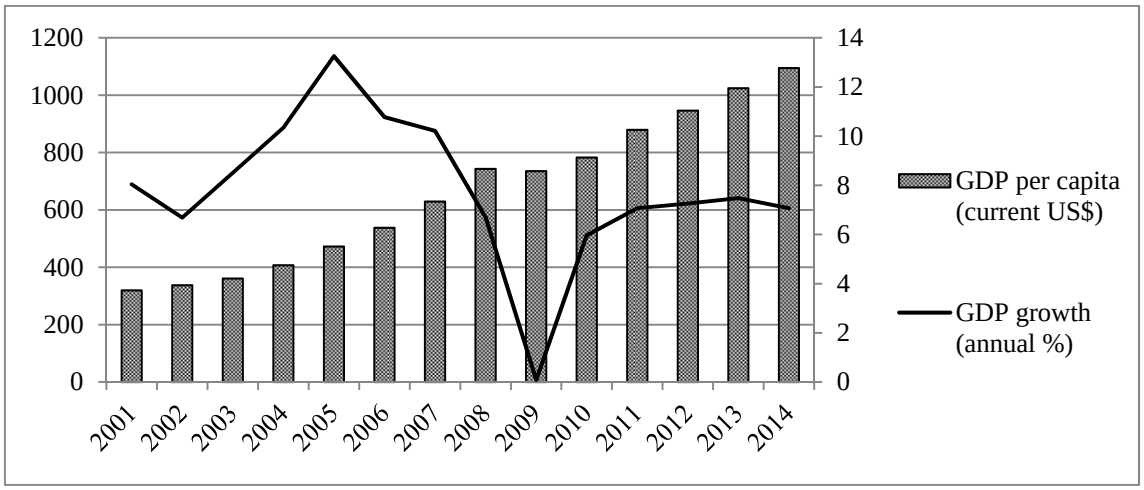
Source: The Cambodia ODA Database 2015, Council for the Development of Cambodia: http://cdc.khmer.biz/index.asp, UNESCO: http://www.unesco.org/new/en/phnompenh, NEP: http://www.nepcambodia.org/, UNICEF:hearing by the study team, VSO: http://www.vsointernational.org/fighting-poverty/where-we-work/cambodia (accessed on 7 April 2016)

3. Socioeconomic Circumstance and Development Policy

3.1 Socioeconomic Circumstance

Cambodia has been one of the poorest countries in Asia for a long time. However, in recent years, the country has achieved rapid economic growth, with the GDP growth rate constantly exceeding 10% from 2004 to 2007. Under the influence of the world recession in 2008, GDP growth dropped to 0.1% in 2009 due to the downturn in demand for garments in the developed world. However, the Cambodian economy recovered in 2010, recording a GDP growth rate of 6.1%. As of 2011, the growth rate continues to exceed 7.0%[6]. The landscape of Phnom Penh is drastically changing, with the construction of a new airport, national roads, shopping malls and many new commercial buildings.

GDP per capita has also continued to grow, from USD 319 in 2001 to USD 782 in 2010, reaching a milestone of USD 1,000 in 2013. Cambodia aspires to be an "upper-middle-income country" by 2030 and a "high-income county" by 2050. In 2016, it is on the verge of a "lower-middle-income economy" from a "lower-income economy"[7], according to the definition by World Bank.



Source: Study Team, data from World Bank, World Development Indicator

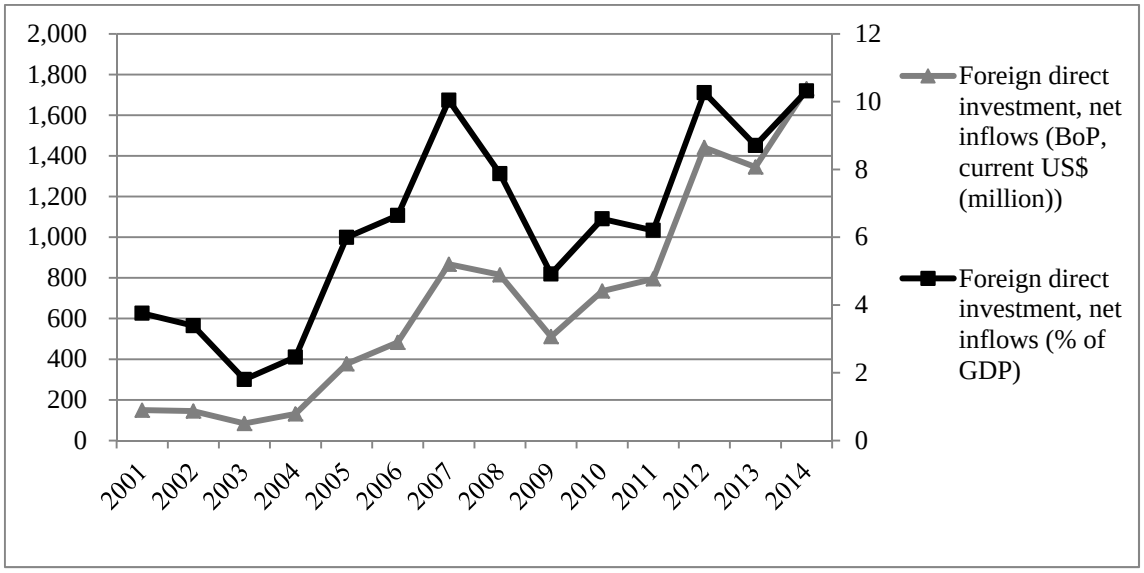
Figure 3-1: GDP Growth and GDP Per Capita from 2001 to 2014

In Cambodia, since the domestic investment resource has been scarce, Foreign Direct Investment (FDI) has led economic growth[8]. After the civil war, the RGC has been actively attracting foreign investors to Cambodia to promote the market economy. There are five major reasons why Cambodia has been a viable investment destination for foreign firms; 1) cheap and abundant labour force, 2) investment incentives for foreign firms, 3) stable macro-economy, 4) geographical advantage of being located on Southern Economic Corridor, and 5) comparative advantage towards neighboring countries in terms of political and social stability due to long-term administration. Among them, the abundant cheap labour force is the primary reason why many foreign firms invest in Cambodia, despite the increasing minimum wage.

[6] IMF World Economic outlook (http://www.imf.org/external/pubs/ft/weo/2012/02/pdf/text.pdf)

[7] World Bank categorizes countries into 1) high-income economy (more than USD 12,736), 2) higher-middle-income economy (USD 4,126 – 12,735), 3) lower-middle-income economy (USD 1,046 – 4,125), 4) lower-income economy (below USD 1,045) according to GNI.

[8] JETRO (2016) Introduction to Cambodian Economy, JICA (2012) Data Collection Survey for Formulation of Industrial Policy for the Kingdom of Cambodia



Source: Study Team, data from World Bank, World Development Indicator

Figure 3-2: FDI to Cambodia and Its Percentage of GDP

In December 2015, a Sub-Decree on the Establishment and Management of the Special Economic Zone was issued. Since then, an increasing number of foreign manufacturers have invested in the Special Economic Zones (SEZ). With the betterment of the SEZs' infrastructure, the SEZ has gradually become a platform of growth for foreign manufacturers. RGC offers tax incentives for firms in the SEZ, which has attracted an increased number of firms to invest in the SEZ. In recent years, the SEZ have contributed to the diversification of the industry base in Cambodia, increasing the manufacture of parts, metallics, and electronics in the SEZs, while in previous years, the base consisted of garments and plastics. (See Chapter 5 for details on SEZ.)

On the other hand, in the provinces, agriculture remains the main source of income. Nonetheless, the working population in agriculture sector is decreasing. Currently, 80 % of Cambodians live in rural areas.

According to ADB and ILO (2015), the ratio of Cambodian nationals that earn less than USD 1.25 per day decreased from 30.8 % in 2007 to 10.1% in 2011. However, 40% of the people earn less than USD 2 while 72% of the people earn less than USD 3[9]. This group is economically vulnerable and has not yet benefited from the economic growth.

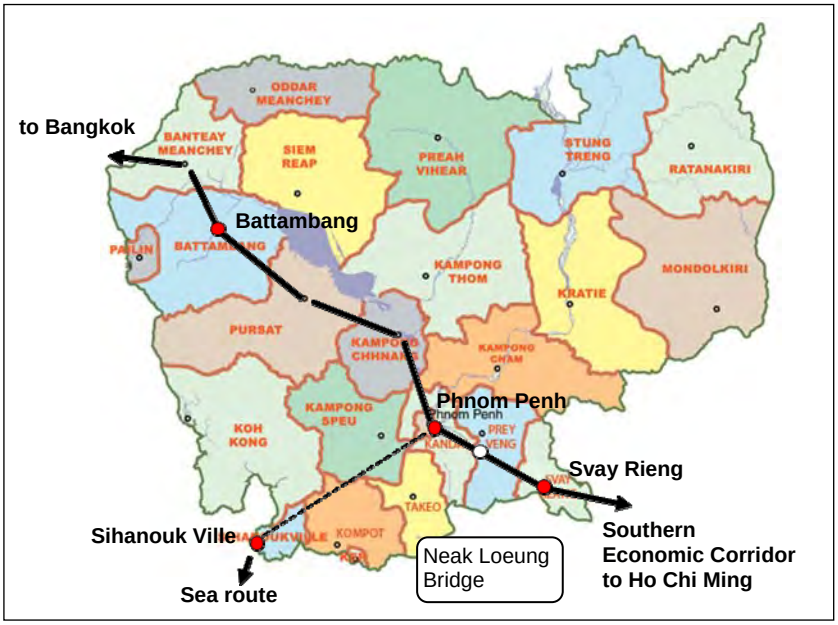
In sum, the income gap is getting bigger[10].

3.2 Regional Integration and Cambodia

Cambodia is located in between Thailand and Vietnam, which forms the big industrial clusters in South East Asia. Benefiting from this advantageous geographical location and its cheap and abundant labour force, Cambodia has played a significant role within the regional supply chain by mainly assuming labour-intensive work. For example, parts assembled in Cambodia are sent to mother factories in Thailand or Vietnam and shipped to Japan or China from the port in Southern Ho Chi Minh or exported directly to Japan and Europe from Sihanouk Ville Port. The strategic location between Thailand and Vietnam is one of the biggest comparative advantages for Cambodia over other countries assuming labour-intensive work in the region.

[9] ADB-ILO (2015). Cambodia: Addressing Skill Gap – Employment Diagnostic Study.
[10] According to OECD, the income gap can hinder the economic growth.

Furthermore, improvement in Cambodia's infrastructure, such as the Economic Corridor, is accelerating Cambodia's regional integration. In April 2015, the construction of Neak Loeung Bridge was completed, with the use of a Japanese grant, and opened the Southern Economic Corridor (Figure below). The Southern Economic Corridor goes through Svay Rieng Province, which has many SEZs on the border with Vietnam, and Banteay Meanchey Province, which has a Japanese-Cambodian SEZ on the border with Thailand and Battanbang, the second biggest city in the country. Phnom Penh is located between Bangkok and Ho Chi Minh on the Southern Economic Corridor. Japanese ODA is contributing to strengthen the transport capacity and improve the transport effectiveness of the Southern Economic Corridor.



Map: Ministry of public works and transportation, http://www.mpwt.gov.kh/map.html ?lang=en

Figure 3-3: Cambodia and the Southern Economic Corridor

In December 2015, the ASEAN Economic Community (AEC) was launched with the aim of liberalization of trade and integration of market in order to accelerate the economic growth of the region. AEC aims at establishing a "single market and production base", by encouraging free movement of goods, services, investment, resources and skilled labour, in order to strengthen the role of ASEAN as a production base in the global supply chain.

With the launch of AEC, the previous import duties removed by 2010 in ASEAN-6[11] will also be removed in Cambodia, Laos, Myanmar and Vietnam by 2018. According to the result of the questionnaires conducted by JETRO (2015) for Japanese companies doing business in Asia and Oceania, simplification of custom clearance and removal of import duties were ranked at the top of the list of expectations from the launch of AEC by Japanese firms in Cambodia[12].

Furthermore, it is anticipated that the firms in the region will optimize the regional supply chain, which may lead to the development of clusters, by industry sector, or, country, and to the restructuring of production bases. The AEC will make it easier for firms to establish an international division of labour, which might possibly accelerate the "Thailand + 1", and move

[11] Brunei, Indonesia, Malaysia, Philippines and Singapore
[12] JETRO (2015) Survey on Business Conditions of Japanese Companies in Asia and Oceania

labour-intensive processes from Thailand, where labour cost is increasing, to Cambodia, Laos, or Myanmar[13].

AEC also encourages the free movement of skilled labour. Member countries will work on a mutual recognition agreement of a professional certificate for eight occupations i.e. engineers, nurses, architects, accountants, medical doctors, dentists, surveyors, and tourism industry, to promote cross-border movement of these professionals. It also means that the Cambodian skilled labour will face tougher competition with other nationals in the region.

3.3 Challenges of the Cambodian Economy

As stated before, a cheap and abundant labour force and an advantageous geographical location are the major reasons why the foreign manufacturers were attracted to move their labour intensive operations to Cambodia. The Cambodian economy has led by utilizing FDI and has achieved rapid growth in recent years. However, the sectors focusing on the labour-intensive industry are now facing challenges and limits to growth. This section looks at the major challenges of the Cambodian economy.

3.3.1 Weaker Comparative Advantage as Investment Changes Direction in light of Increased Minimum Wage

The minimum wage for workers[14] in Cambodia is increasing dramatically. In May 2013, it increased from USD 61 to USD 80 and it has kept increasing up to USD 100 in February 2014, and up to USD 128 in January 2015. It has already been decided that the minimum wage for 2016 will be USD 140. In other words, the Cambodian workers' wage has more than doubled in three years. Unions are claiming that it should go up even further to USD 177.

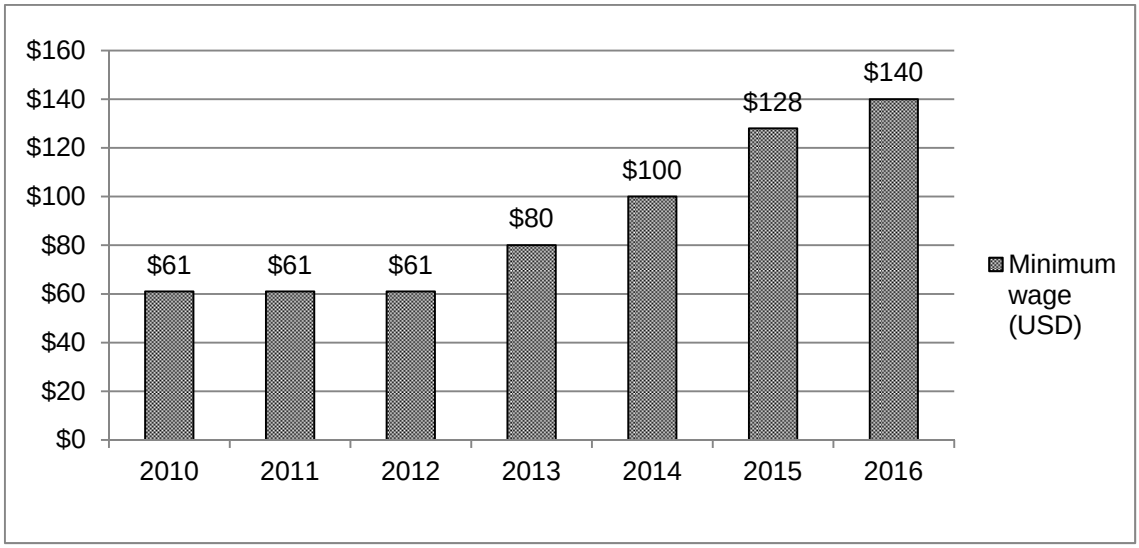
According to JETRO (2015), the percentage of increase in minimum wage in Cambodia last year was the most in the 20 countries/regions of Asia and Oceania[15]. The same survey indicated that 58.8% of surveyed firms pointed to the increase in labour costs as a cause of decreasing profit. The advantage of Cambodia as an investment destination is weakening, at least in terms of minimum wage.

One of the reasons for the decreasing benefit due to increasing minimum wage is that the Cambodian economy is USD-based. For example, in neighboring Vietnam, a competitor of Cambodia in garment manufacturing, the economy and labour costs are based on the local currency (dong). Therefore, if the exchange rate of the dong decreases against the USD, the increase in labour costs will be canceled out. However, in Cambodia the minimum wage is USD-based. As a result, the gap between the minimum wage in Cambodia and Vietnam is getting smaller.

[13] World Bank (2015) Cambodia Economic Update October 2015 and other analysis reports from research institutions

[14] The minimum wage is supposed to be for workers in garment and footwear but other industries also use it as a reference since it is the only minimum wage agreed by Government and unions in Cambodia.

[15] JETRO (2015) Survey on Business Conditions of Japanese Companies in Asia and Oceania

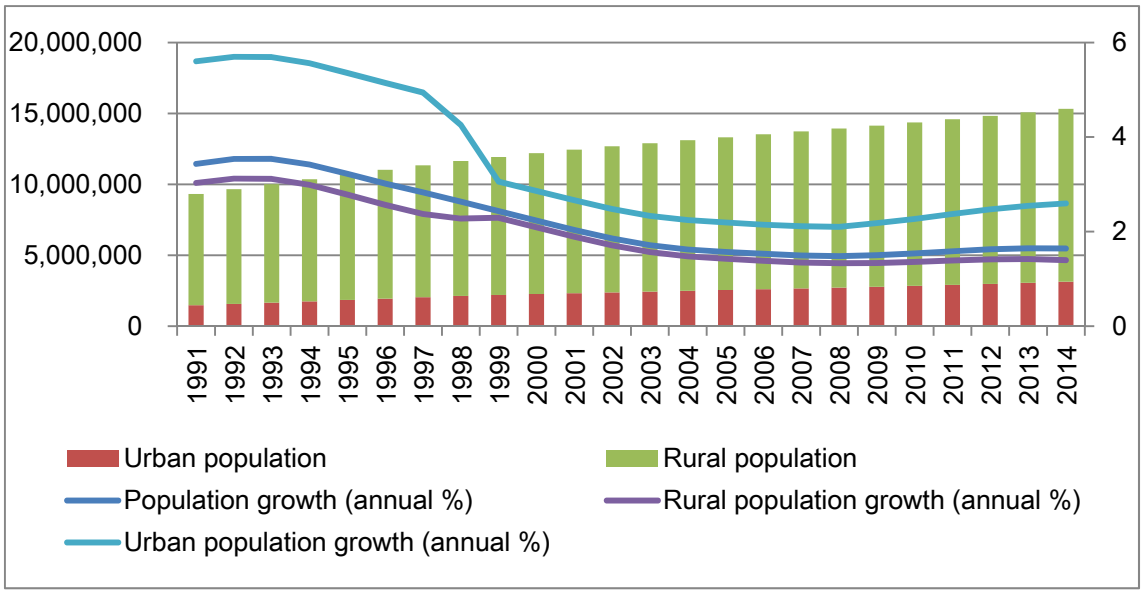


Source: JETRO (2016) Introduction to Cambodian Economy, p148

Figure 3-4: Minimum Wage in Cambodia

3.3.2 Decreasing Working Population due to Change in the Demographic Phyramid

As described before, an abundant young labour force has been one of the primary reasons why foreign firms invest in Cambodia. After the end of the civil war, the population has been steadily increasing. The increment rate exceeded 3 % in the first half of 1990, which provided a young labour force to the labour market. However, in 2002, the increment rate dropped under 2% and was 1.64% in 2014 (see figure below). According to the project conducted by UNDESA (2012), the increment rate will stay around 1% for the next 10 years[16].



Source: JICA Study Team using the data from World Bank, World Development Indicator

Figure 3-5: Increment Rate of Population in Cambodia

[16] United Nations, Department of Economic and Social Affairs (UNDESA) (2012) *World Urbanization Prospects: The 2011 Revision.* New York

The demographic pyramid is also rapidly changing. In the 1998 Census, 54% of the population is under 19, while 45.7% of population is under 20 in the 2008 Census and is decreased to 40% in 2013. According to ADB-ILO (2015),[17] though Cambodia currently enjoys a demographic dividend, this window of opportunity is expected to start closing in 2045. If this tendency goes on, it will be difficult to continue providing a cheap labour force and the Cambodian economy will have no choice but to transform from labour-intensive industries.

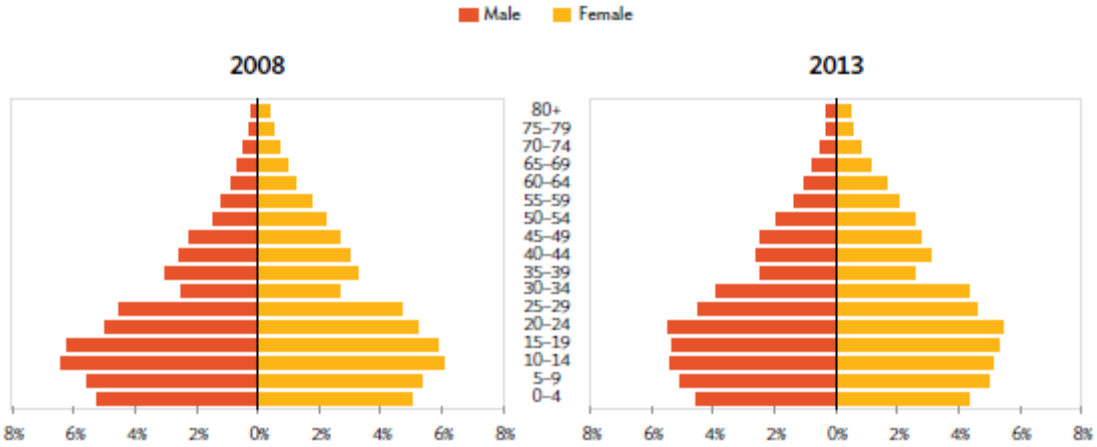


Figure 3-6: Demographic Pyramid in Cambodia (2008 and 2013)

3.3.3 Low Productivity of Workers

As shown in the table below, Cambodia ranked at the bottom in regards to productivity of employees in ASEAN. It is far below the average (USD 7,800) of ASEAN. ADB-ILO (2015) points out that productivity in industry has not been improved in 15 years and it is slowing the economic growth of Cambodia. On the other hand, other countries which provide labour-intensive production bases in the region have improved productivity. For example, in Myanmar, reform by the former President contributed to improve the productivity and now is almost at the same level of the regional average and is better than Cambodia. Given the increasing minimum wage mentioned in the previous section, there is a risk that foreign firms would withdraw from Cambodia if productivity does not improve. Therefore, the improvement of productivity and transformation from labour-intensive industries should be the priority of Cambodia.

Table 3-1: Productivity of an Employee in 2013

Country	Cambodia	Myanmar	Laos	Vietnam	Thailand	Singapore
Productivity (1,000 US$)	4.9	7.7	8.4	8.4	24.5	121.9

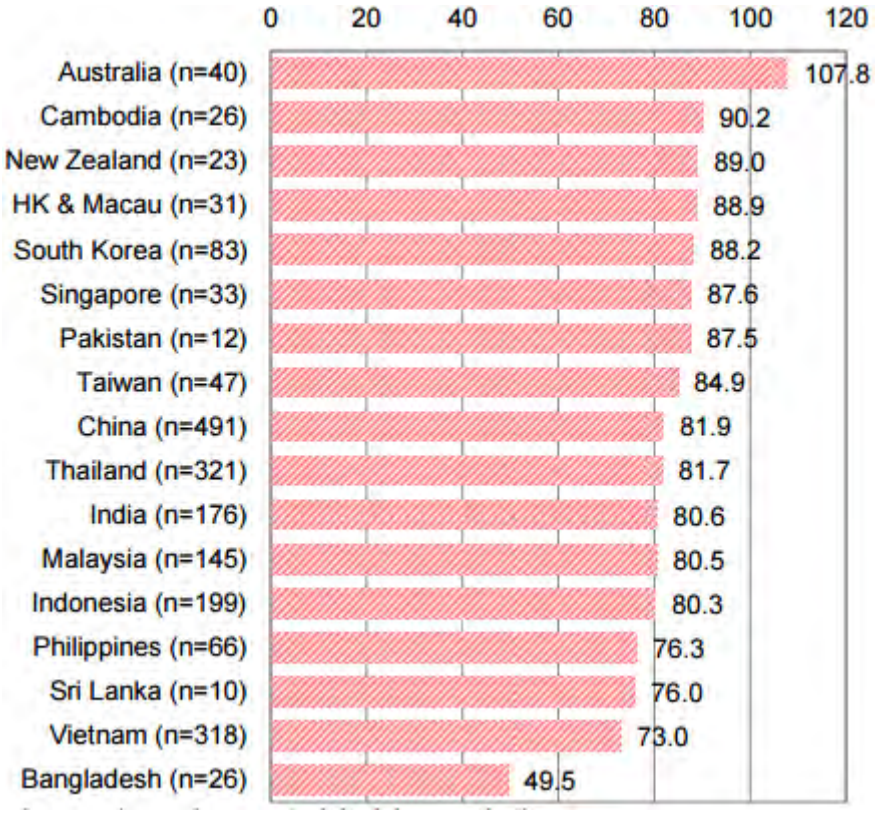
Source: JICA Study Team using the data on APO (2015)[18]

ADB-ILO points out that those who are already in the labour market have relatively weak educational attainments. Their subsequent peers entering the labour market will be better educated, but will be successively smaller in number. Therefore, to improve the productivity of the working population as a whole, significant efforts will be required. In order to do so, it is imperative to enhance the quality of school teachers.

[17] ADB-ILO (2015 Cambodia Addressing the Skill Gap – Employment Diagnostic Study
[18] Asian Productivity Organisation (2015). APO Productivity Databook 2015. APO, Tokyo http://www.apo-tokyo.org/publications/ebooks/apo-productivity-databook-2015/ (April 10 2016)

3.3.4 Higher Production Cost due to Unavailability of Parts and Raw Materials at the Local Level

According to JETRO (2015)[19], more than 70% of the Japanese firms surveyed, pointed out that difficulty of local procurement of parts and raw materials is a managerial problem. According to the same survey, for local production costs in comparison with production costs in Japan, which is taken as 100%, Cambodia ranked second (90.2%) after Australia (107.8%) and the production costs were more expensive than New Zealand (89.0%), Hong Kong and Macau (88.9%), South Korea (88.2%) and Singapore (87.6%). The figure increased drastically from 61.8% in 2014.



Source: JETRO (2015) Survey on Business Conditions of Japanese Companies in Asia and Oceania

Figure 3-7: Local Production Costs in Comparison with Production Costs in Japan, which is Taken as 100

One of the causes of high local production costs is the unavailability of raw material and parts at the local level. Only 9.2 % of parts and raw materials were procured in Cambodia, ranking it at the bottom of the 20 countries and regions in Asia and Oceania. It was far below the regional average and was below Laos, Cambodia's neighboring competitor. Given that regional integration is proceeding with eliminated tariffs and betterment of infrastructure, it is expected that strengthening Science, Technology, Engineering and Mathematics (STEM) human resources in terms of quality and quantity, and, at the same time, developing supporting industries in the country.

[19] JETRO (2015) Survey on Business Conditions of Japanese Companies in Asia and Oceania

3.3.5 Unstable and Costly Power Supply Compared to Neighboring Countries

Cambodia is dependent on the import of electrical power from Thailand and Vietnam. Therefore, the electricity tariff is 1.5 to 3 times higher than in neighboring countries, which keeps foreign investors from coming to Cambodia and hinders automation of the production line. Electricity tariffs depend on the transmission cost of the power so it differs province by province. For example, in Bavet where many SEZs are located, the electricity tariff is a little bit less than the double of Phnom Penh. Furthermore, because this province imports its electricity from Vietnam, when the demand for electricity in Vietnam increases, the transmission to Cambodia decreases, and, this leads to an unstable supply of electricity. JICA is supporting the improvement of transmission lines in Svay Rien Province, aiming to switch from the Vietnam imported power, to power which is domestically generated inside of Cambodia. IDP also aims at reducing electricity tariffs for industry along with increasing coverage and reliability.

3.3.6 Lack of STEM Human Resources

ADB-ILO (2015) argues that the number of students in the higher education institution increased from 93,000 in 2005 to 245,000 in 2011 (38% are female students). Only 4% of them major in engineering, medical science or science. In the post graduate courses, less than 10% major in STEM[20], and, highlights an imbalance in the students' major.

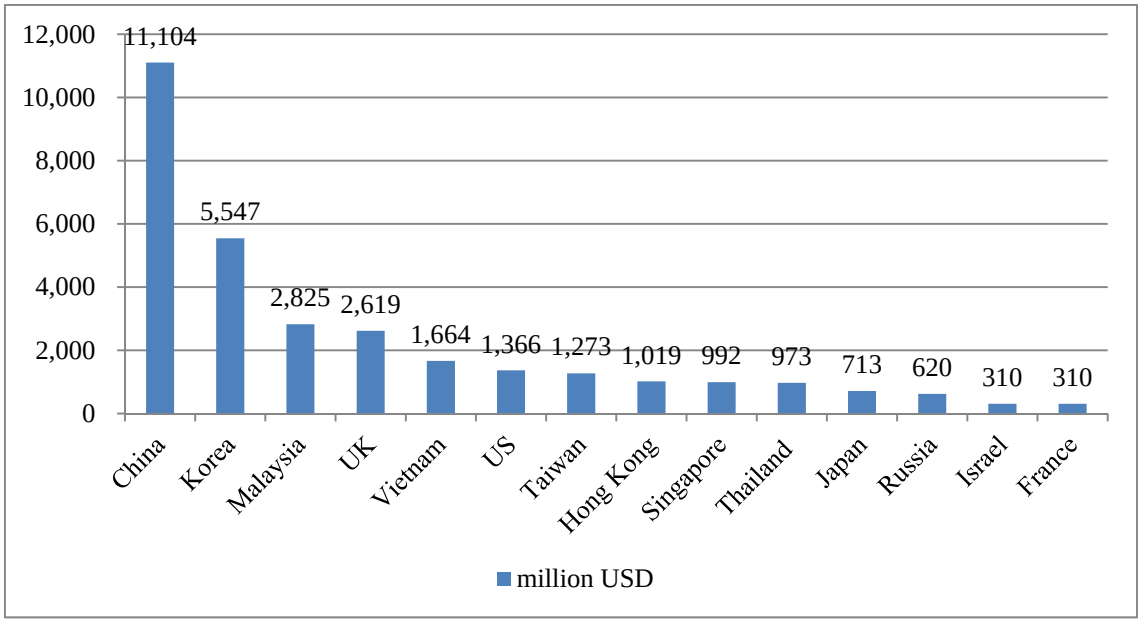
Lack of STEM-related courses in the Universities is causing the major shortfall of engineers, which is hindering diversification and modernisation of the industry structure of Cambodia. As described in Chapter 7 and 8, the schools which provide STEM-related courses are concentrated in Phnom Penh, which is one of the causes of the delay in industrial development in the provinces. In the labour-intensive industries, factories do not require a large skilled labour force, whereas, firms with automated lines need engineers and technicians. Currently, due to the lack of a skilled labour force, they are forced to spend a significant cost in sending foreign engineers to Cambodian factories, or in training local engineers in the factories overseas.

3.4 Foreign Direct Investment (FDI) to Cambodia

As noted before, FDI has led to the rapid economic growth of the country. RGC intends to attract foreign firms which have many benefits to Cambodia such as technical transfer and creation of employment opportunities. As shown in Figure 3-8, in terms of FDI from 1994 to 2014 to Cambodia, China topped investments with USD 11,104 million, followed by Korea (USD 5,547 mil), Malaysia (USD 2,825 mil), UK (USD2,619 mil), and Vietnam (USD 1,664 mil). Japan ranked eleventh with USD 713 million. On the other hand, regarding the FDI to SEZ from 1994 to 2014, Japan topped investments with USD 306 million. It means that 42% of the Japanese investment to Cambodia during that time was directed to the SEZ.

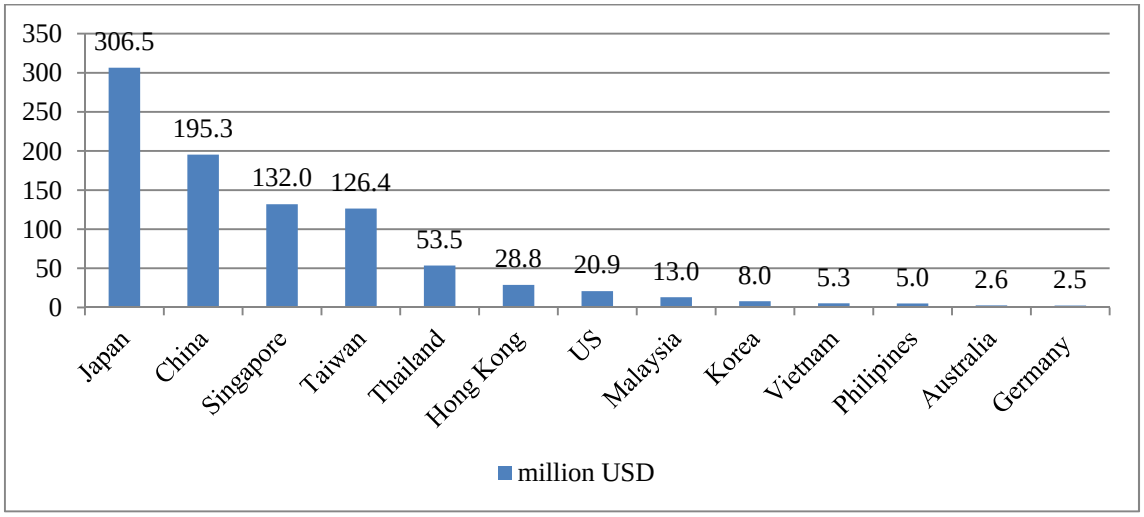
According to JETRO (2016), the overall FDI to Cambodia in 2010 exceeded USD 20 billion, and increased to USD 50 billion in 2011, whereas, in 2014 it decreased 9.5%, compared to the previous year, to USD 11 billion. The number of investment projects also decreased from 163 to 147. It is noted that the investment is directed to more diverse sectors, such as machine, metal, and electricity[21].

[20] from document made for Education Congress (MoEYS)
[21] JETRO (2016) Introduction to Cambodian Economy, p41-43



Source: JETRO Phnom Penh Office

Figure 3-8: FDI (Million USD) by Country (1994 – 2014) for Inside and Outside the SEZ

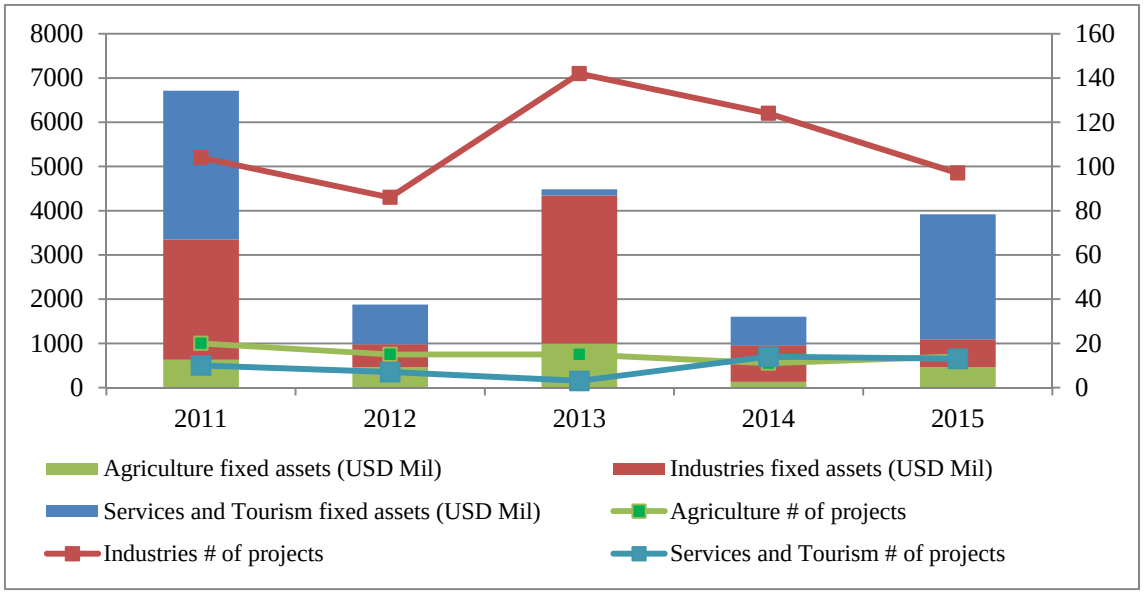


Source: JETRO Phnom Penh Office

Figure 3-9: FDI Amount to Inside the SEZ by Country (1994 – 2014)

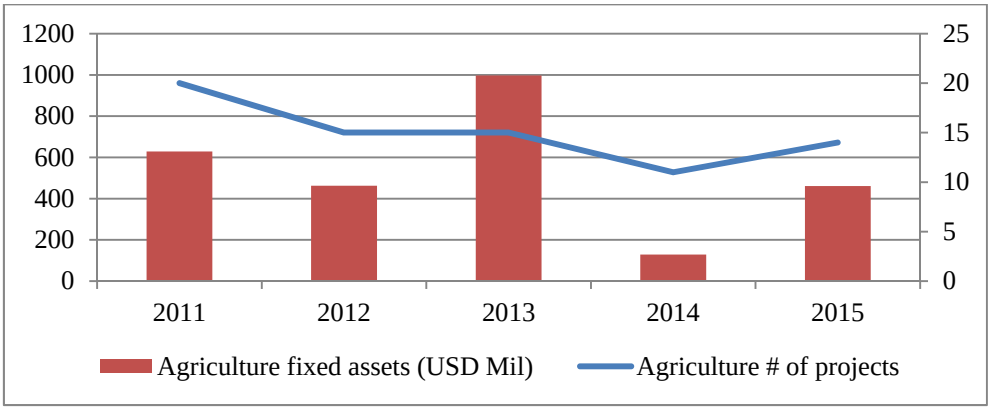
As shown in the figures below, the number of investments in the industrial sector exceeds the investment in other sectors. However after 2013 when the minimum wage started to increase, both the number of investments and the fixed assets are decreasing (Figure 3-12). On the contrary, the fixed asset of investments to the tertiary industries has been dramatically increasing[22].

[22] Note that investment in this statistics includes investment from Cambodian company and is not exclusively from foreign direct investment.



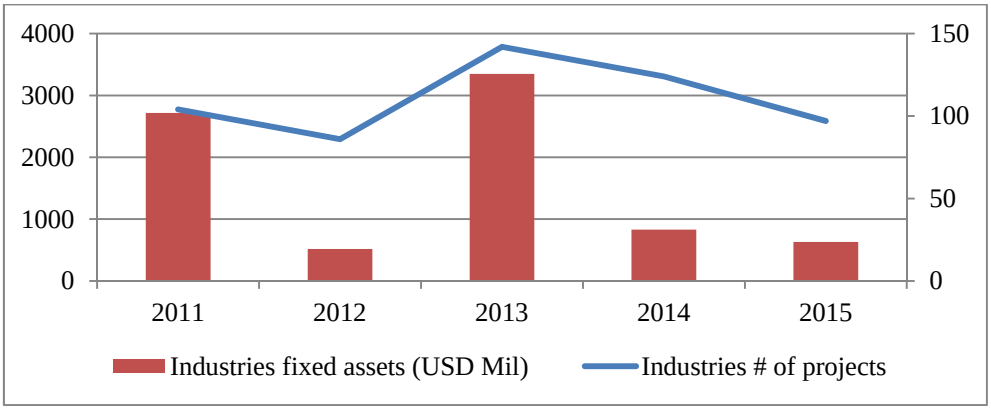
Source: National Bank of Cambodia, Economic and Monetary Statistics

Figure 3-10: Investment to Cambodia (by Sector, 2011-2015, Approval-basis)



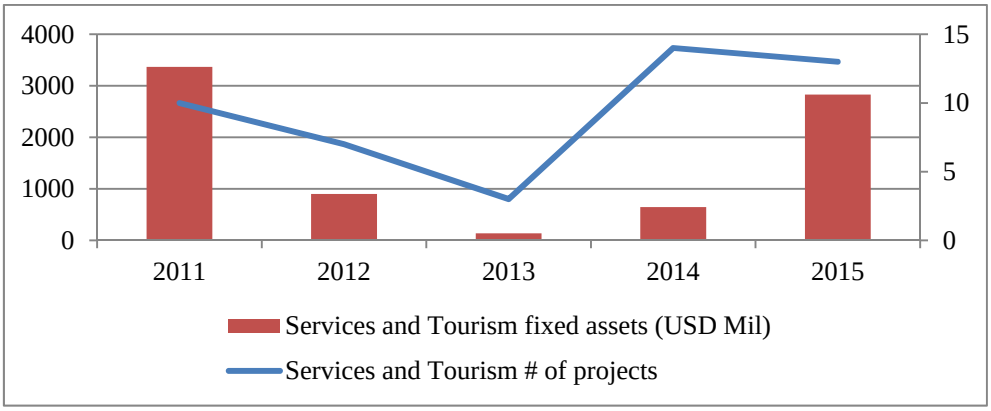
Source: National Bank of Cambodia, Economic and Monetary Statistics

Figure 3-11: Investment to Agriculture (Approval-basis)



Source: National Bank of Cambodia, Economic and Monetary Statistics

Figure 3-12: Investment to Industries (Approval-basis)

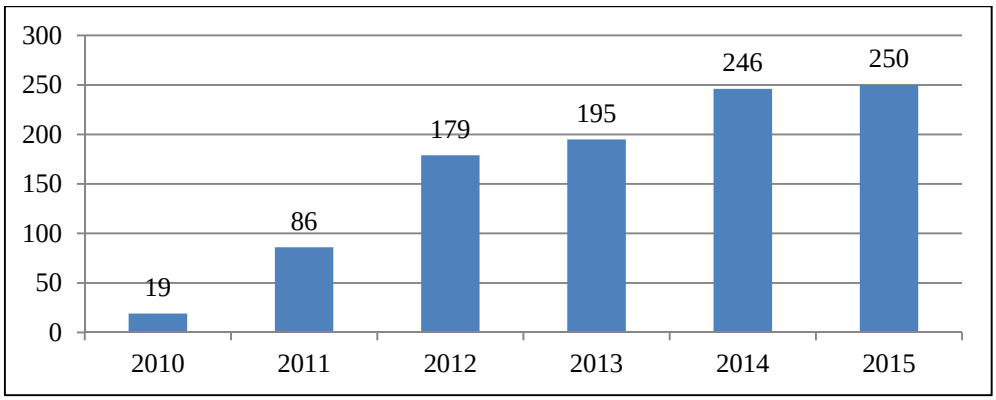


Source: National Bank of Cambodia, Economic and Monetary Statistics

Figure 3-13: Investment to Services and Tourism (Approval-basis)

3.5 Japanese Investment to Cambodia

The number of Japanese companies registered to the Ministry of Commerce has increased since 2011 and was 250 in 2015. The reason is the increasing number of companies in the tertiary industries providing services such as consulting, retail, tax and accounting, legal services, real estate, construction, logistics and restaurants to manufacturers that started operation in Cambodia from around 2010 and to the AEON Mall which started its business in 2012.



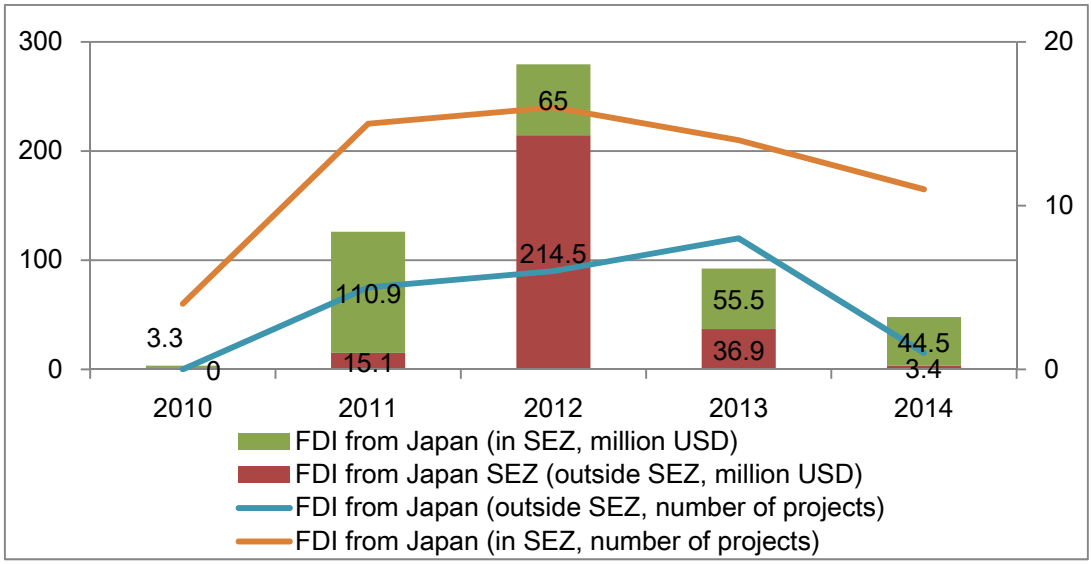
Source: JETRO Phnom Penh Office

Figure 3-14: Number of Japanese Firms Registered to the Ministry of Commerce

The figure below shows the number of Japanese investment projects to Cambodia which were categorized as Quality Investment Projects (QIP)[23] from 2010 to 2014. The investment amount in 2012 stands out due to the USD 200 million investment for the AEON Mall. If this investment is not taken into account, the Japanese FDI to Cambodia is decreasing. The investment trend is slowing down oweing to a weaker yen against the dollar and the sharp increase in the Cambodian minimum wage[24].

[23] Incentives to investment projects to certain sectors that meet specific requirements. Incentives include tax exemption and tax deduction. The sectors qualified to QIP are manufacturing, modern market or trade center, training and educational institutes, international trade exhibition center and convention halls

[24] JETRO (2016) Introduction to Cambodian Economy



Source: JETRO (2016) Introduction to Cambodian Economy

Figure 3-15: Japanese FDI to Cambodia[25]

The number of members on the manufacturing Committee of the Japanese Business Association of Cambodia (JBAC) has increased slightly from 33 in 2013, to 47 in 2014, to 49 in 2015. In addition to the increasing minimum wage, the difficulty in hiring skilled labour, the relatively costly electricity tariff, and unstable power supply in the provinces, has resulted in an adverse effect on the Japanese investment to Cambodia.

The Japan Cambodia Public-Private Sector Meeting was established in 2009 as a platform for Cambodian ministries and Japanese companies to discuss challenges in regards to the trade and investment environment in Cambodia. In this meeting, the situation on electricity tariffs, wages of workers, the legal system, and export / import procedures were discussed.

In summary, it was concluded that Cambodia has achieved rapid economic growth which has been led by FDI. In the manufacturing industry, an increasing number of labour-intensive manufacturers came to Cambodia, mainly because of a cheap and abundant labour force and advantageous geographical location. The SEZ was a platform for foreign manufacturers and contributed to the diversification of the industry base.

Nonetheless, the rapid increase in the minimum wage and the reduced increment rate of the overall population now brings about a new paradigm for Cambodian Economy. The current model of industrial development to foreign manufacturers featuring a cheap abundant labour force is facing its limit. Besides, the Cambodian economy is facing challenges with the lowest labour productivity in the region, unavailability of parts and raw materials at the local level, and a costly and unstable electrical power supply. With the emerging presence of neighboring countries that can assume the labour-intensive process, such as Myanmar, investment to the industrial sector in Cambodia is decreasing and overall Japanese investment to Cambodia is also slowing down. With the accelerated regional integration under the launch of AEC, it is envisaged that firms will restructure their supply chain in the region. For Cambodia to continue to be relevant in the region, it has to further strengthen its competitiveness against neighboring countries. In order to do so, it is strongly expected to prioritise the betterment of workers' productivity, and the improvement of engineers and technicians in terms of quantity and quality.

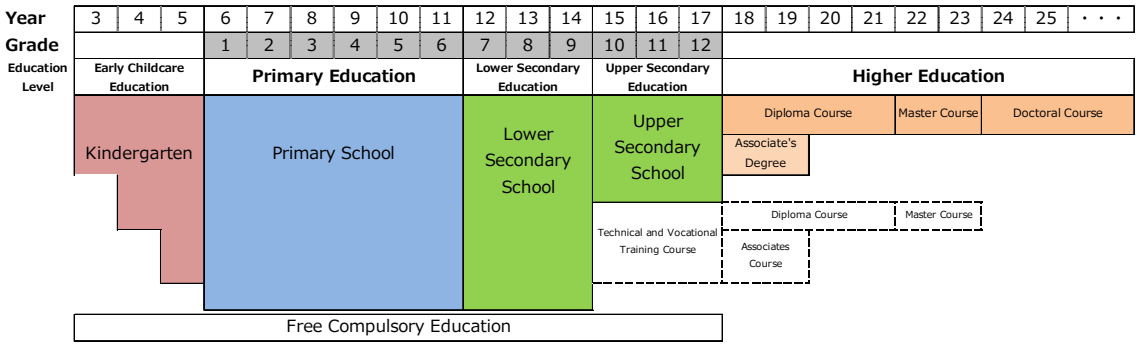
[25] Only QIPs. The figure represents number of approved projects. Note that there are some projects that have not been implemented though they were approved.

4. Educational System

4.1 Educational System

The education system in Cambodia includes early childcare education, primary education, lower and upper secondary education, and higher education. The 12 years primary and upper secondary education system has been in effect since 1996, of which 6 years is primary education, 3 years lower education, and 3 years of upper secondary education[26]. The 9 years primary and lower secondary education is regarded as the basic education period. The Cambodian government provides free early childcare education, primary education, and secondary education through public education institutes, implementing graduate examinations at the last years of lower secondary education and upper secondary education (i.e. Grade 9 and Grade 12 respectively).

After Grade 9, the Cambodian education system has vocational training centers and vocational higher education institutes governed by the Ministry of Labour and Vocational Training (MLVT). In other words, technical and vocational education and the training (TVET) subsector has two responsible ministries that are MoEYS and MLVT. This "double-headed politics" began in 2005 when the responsibility of the TVET subsector had been translated from MoEYS to MLVT, partially owing to political reasons reather than educational reasons. The TVET subsector had thus suffered from the double-headed politics; however, collabouration between the two ministries has gradually begun since a new Minister for Education, Youth, and Sport was appointed in 2013, by setting up Working Groups for discussion among the ministers.



Source: The Study Team created with the reference of MoEYS statistics

Figure 4-1: Education System in Cambodia

4.2 Educational Administration

The new minister for Education, Youth, and Sport, H. E. Dr. Hang Chuon Naron, was appointed after the national election in 2013, and has set 8 areas as prioritised issues MoEYS needs to deal with[27]:

1. Reform of MoEYS
2. Reform of public financial administration of MoEYS
3. Issues of education quality
4. Think-tanks to provide political recommendations and feedbacks
5. Higher education reform
6. Examination reform

[26] 13 years (6-4-3) before 1975, no schools for the age of Pol Pot in 1975-79, 10 years (4-3-3) in 1979-86, 11 years (5-3-3) in 1986-1996.

[27] http://www.phnompenhpost.com/national/meet-man-behind-exams

7. Skills attainment of the Youth, and
8. Reform on physical education and sports.

The education minister established a think-tank named Education Research Council (ERC) just after his appointment, and implemented these reforms with the ERC members who are mostly young and liberal with doctorate degrees attained at universities overseas inclusive of Japan (No.4 listed above). For instance, teachers' license and salary listed as the first ministry reform, the following points were listed in the TPAP framework, tied to various teachers' career opportunities and salaries, in line with newly introduced Teacher Career Pathways (TCP):

- Teachers license of kindergarten, primary, lower secondary school must be provided to Bachelor's degree holders
- Upgrading current teachers to the level of Bachelor's degree holders
- University graduate can become basic education teachers after Pre-Service Training (PRESET) for 1 year.

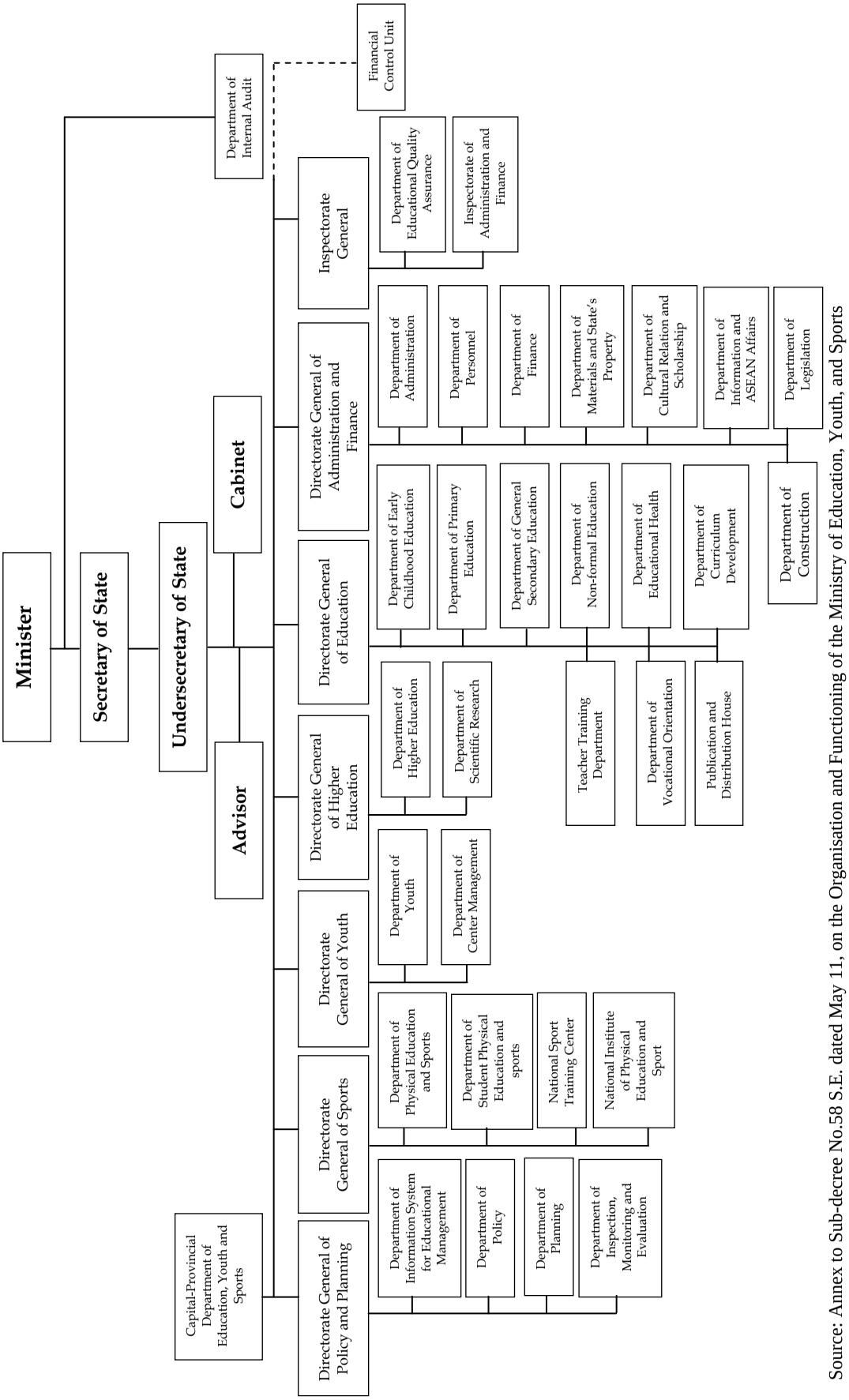
Likewise, reforms on anti-cheating exams almost succeeded with the results of no cheating in the exam of Grade 12 (listed in No.6). As for education quality (listed in No.3), the necessity for curriculum reform has been discussed at quite an early stage which resulted in the announcement of a new curriculum framework in December 2015, after deployment of high level government officials including Directorate Generals to Singapore and the implementation of a series of subsector based working groups.

The minister has eagerly contributed to the sophistication of Cambodian human resources in line with IPD 2015-2025 by improving the engineering education in higher educational institutes to accelerate education for STEM subjects (listed in No.5) and establishing General and Technical High Schools (GTHS) as a provider of human resources to SEZs in the secondary education subsector (listed in No.7) .

As Figure 4-2 indicates, the line of Directorate General of Education (DGE) is responsible for primary and secondary education, while the line of Directorate General of Higher Education is responsible for higher education. The main departments closely related to this Survey are as follows:

- Issue of Teacher Education Collage (TEC): Teacher Training Department (TTD)
- Issue of General and Technical High Schools (GTHS): Department of Vocational Orientation (DVO)
- Issue of Engineering Education: DGHE

The minister specially appointed the responsible governors for the Survey as follows: H. E. Dr. Dy Samsideth, Deputy Director General of Education for the issue of TEC, H. E. Dr. Kry Seang Long, Directorate of DVO for the issue of GTHS, H. E. Dr. Mak Ngoy, Director General of Higher Education. Dr. Dy Samsideth is a member of ERC aforementioned and chairman of Taskforce Team for TPAP implementation also.



Source: Annex to Sub-decree No.58 S.E. dated May 11, on the Organisation and Functioning of the Ministry of Education, Youth, and Sports

Figure 4-2: Structure of MoEYS Cambodia

One of the changes made since H.E. Naron assumed the office of the Minister of Education, Youth, and Sports is the selection of Department Directors. After the retirement of former Directors, such Departments as Education Quality Assessment Department (EQAD), Department of Finance (DOF), and the Teacher Training Division (TTD) have welcomed outstanding and relatively young new Directors, who are in their 40s and 50s and are expected to be the basis for continual MoEYS reform.

The MoEYS annual Education Congress, which is usually organised in March of each year, takes the important role of monitoring, appraisal, and evaluation of the educational administration in Cambodia. The Education Congress, which is attended by more than 1,000 participants including the governmental stakeholders in Education from the Central, Provincial, District and Commune, and Educational institutions, Development Partners and civil society organisations, among others, provides them with the sharing and updating of necessary information in the current education sector and the sessions for determining the priority agenda of the sector for the following year. The report of the annual Education Congress is normally uploaded to the Web page of the MoEYS, both in Khmer and in English, within several days after the close of the Congress each year[28].

4.3 Educational Finance

The past 10-year trend of the MoEYS budget is shown in Table 4-1. As shown in the Table, although the budget steadily increases each year, the percentage or the sharing of the MoEYS budget in the national governmental budget never exceeded a maximum of 19.24%, from year 2000 to 2007.

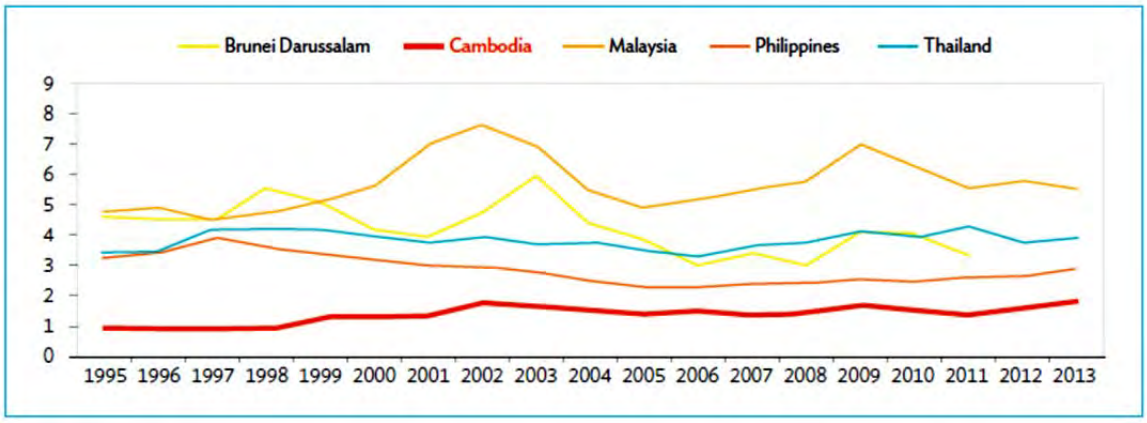
Table 4-1: Trend of MoEYS Budget

Year	National Budget (KHR)	MoEYS Budget (KHR)	% Shared in National Budget	% of Increase from the Previous Year
2006	2,414,255,000,000	442,000,000,000	18.31%	20.52%
2007	2,837,172,500,000	546,000,000,000	19.24%	23.53%
2008	3,441,916,700,000	622,000,000,000	18.07%	13.92%
2009	4,361,066,700,000	742,546,000,000	17.03%	19.38%
2010	5,028,772,900,000	824,879,000,000	16.40%	11.09%
2011	5,504,652,000,000	915,898,300,000	16.64%	11.03%
2012	6,330,657,000,000	1,007,626,400,000	15.92%	10.02%
2013	7,212,573,300,000	1,119,565,500,000	15.52%	11.11%
2014	8,268,703,000,000	1,342,049,000,000	16.23%	19.87%
2015	9,227,161,000,000	1,583,308,400,000	17.16%	17.98%
2016	11,094,839,000,000	2,029,896,900,000	18.30%	28.21%

Source: The Study Team created with the reference of statistics of Department of Finance, MoEYS [2016]

Meanwhile, in terms of Expenditures on Education against GDP, in comparison with neighbouring ASEAN countries, Cambodia remains the lowest (2.6% in 2013), as shown in the following table. Cambodia is expected to further increase its financial investment in the education sector in accordance with the revenue increases benefited from the steady growth in its macro-economy in recent years.

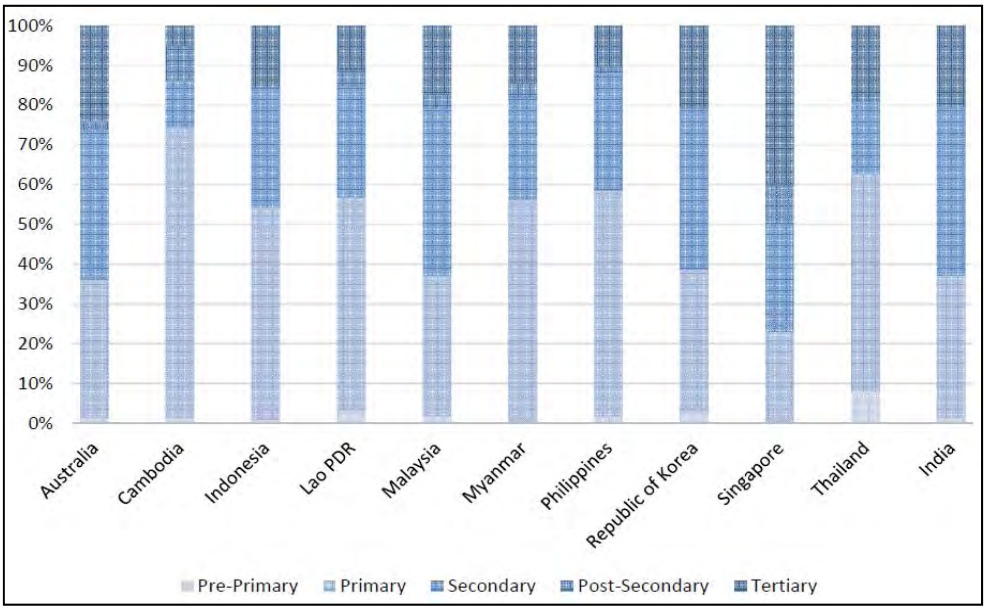
[28] http://www.moeys.gov.kh/en/education-congress-2016/reports.html#.VxIBK3pzqd4 (cited on 10 April 2016)



Source: Cambodia: Diversifying Beyond Garments and Tourism Country Diagnostic Study, ADB, 2015

Figure 4-3: Trend Comparison between ASEAN Countries on Education Expenditure against GDP [1995-2013]

With reference to the Share of Education Expenditures by Sub-Sector, which indicates the sub-sectoral priorities in the education sector of each country, Cambodia allocates nearly 70% to primary education, which is considerably high when compared to the other Asia-Pacific countries. As middle- and high-income countries have a tendency to invest more in the secondary and the higher education sectors, and, if Cambodia wishes to follow them by developing more human resources for industrial development, it would be necessary to increase the investment in the secondary and the tertiary levels.



Source: Education System In ASEAN+6 Countries: A Comparative Analysis of Selected Educational Issues (UNESCO 2014)

Figure 4-4: Share of Education Expenditures by Sub-Sector (%) in Asia Pacific Countries, Selected Years [2007-2010]

5. Industrial Human Resource Needs

In this Chapter, human resource needs for the industrial promotion in Cambodia is analyzed, based on the results of literature reviews and field surveys. As described in Chapter 1, the Ministry of Education requested assistance from JICA in covering basic education, technical education, and engineering education. Regarding the technical education, the assistance is expected to contribute to produce technicians who supervise the production line at the factories in Special Economic Zones (SEZs). Therefore, this Chapter starts with the SEZ, followed by the results of the field surveys.

5.1 The Special Economic Zone (SEZ)

5.1.1 Policies related to the SEZ

Royal Government of Cambodia issued Sub-Decree #148 on the Establishment and Management of Special Economic Zones. The aim of promoting SEZs is to attract foreign manufacturers that are expected to contribute to generate employment, gain foreign currency and to modernise industry. It is also expected to diversify the industrial base and to promote investment in rurual areas. A SEZ is defined as an area with more than 50 hectare of land, and proper infrastructure (e.g. electricity, water supply and sewage system, solid waste management and environment protection). As of January 2016, 34 SEZs have been approved by the Government, including some SEZs without proper infrastructure. The major SEZs are in Phnom Penh, Bavet, the border with Vietnam, Poipet, and the border with Thailand and Sihanouk Ville, facing the Gulf of Thailand.

The Industrial Development Policy 2015-2025 prioritises the development of SEZs in order to enhance Cambodia's investment climate. The table below shows policy measures / action plans related to SEZs in the IDP. Among them, is a plan to establish industrial centers focusing on Sihanouk Ville, Koh Kong, Bavet, and Poipet by developing residential housing, infrastructure, health care, education, and vocational training. Furthermore, the IDP encourages participation of the private sector in developing the infrastructure of the SEZs, given the fact that there are some SEZs with factories operating without proper infrastructure. In addition, it promotes further regional integration by establishing economic corridors connecting the large centers in the neighboring countries. There may be possibilities for incentivizing the private sector that contributes to realising the policy measures in the IDP.

Table 5-1: Policy Measures and Action Plans related to SEZs in the IDP

Development of SEZ and Preparation of Industrial Zones	Duration/ Year	Lead/Responsible institution
Review the incentives framework for foreign and domestic firms and SMEs located in SEZs;	2015	- Council for Development of Cambodia; - Ministry of Economy and Finance; - Ministry of Industry and Handicraft
Take measures to promote more active participation from the private sector to develop physical infrastructure in government approved SEZs so as to ensure their attractiveness for investors seeking opportunities to establish their production bases;	2015 to Medium and Long Term	- Council for Development of Cambodia

Development of SEZ and Preparation of Industrial Zones	Duration/ Year	Lead/Responsible institution
Promote the establishment of large industrial parks and clusters by enacting the Law on Special Economic Zones aimed at supporting in a comprehensive way the development of these zones to meet international standards: including infrastructure management system; adequate supply of electricity and clean water; provisions of raw materials and other inputs; trade and transport facilitation; provisions of incentives and other supporting measures to promote investments in SEZs;	2015	Council for Development of Cambodia
Continue developing industrial zones in provinces, aimed at promoting hubs for SMEs while enhancing their competitiveness by way of supplying as a matter of priority electricity connection, clean water, transportation and logistics links as well as other incentives and facilitation from the government;	Medium to Long Term	- Council for Development of Cambodia; - Sub-National Administration; - Ministry of Industry and Handicraft
Promote the development of industrial corridors, especially the Sihanoukville-Koh Kong Southern Coastal Economic Corridors, and other corridors linking main national roads to domestic economic poles and to neighboring countries in ASEAN and Greater Mekong Sub-region economic corridor frameworks;	Medium to Long Term	Council for Development of Cambodia; - Ministry of Economy and Finance; Ministry of Land Management, Urbanization and Construction; - Relevant Sub-National Administration.
Encourage competition among SEZs by way of establishing key performance indicators for measuring these SEZs to be used as evaluation criteria for providing incentives and promoting best practices;	2015 to Medium Term	Council for Development of Cambodia
Prepare urban/city development plan to transform into industrial centers focusing on Sihanoukville, Koh Kong, Bavet and Poipet by way of creating an institutional coordinating mechanism to promote based on long-term development planning a comprehensive development of industrial centers, including determining land areas based on concrete land use plan, managing environmental resources to ensure sustainability of the eco system, developing residential housing and infrastructure including electricity, road, port, clean water supply system, flood prevention system, waste and drainage system as well as social services and health care, education and vocational training;	Medium to Long Term	Ministry of Land Management, Urbanization and Construction; - Council for Development of Cambodia; - Ministry of Public Works and Transportation; - Ministry of Economy and Finance; - Relevant Ministries/ Institutions.
Develop Phnom Penh surrounding areas to become an industrial hub with clear land use plan by separating industrial zones and residential zones or urban areas with the long-term plan of transforming Phnom Penh into an administrative, industrial, scientific and innovative center;	Medium to Long Term	Ministry of Land Management, Urbanization and Construction; - Ministry of Interior/Phnom Penh Municipality; - Council for Development of Cambodia; - Ministry of Public Works and Transportation; - Ministry of Economy and Finance; - Ministry of Industry and Handicraft; Relevant Ministries/ Institutions.

Development of SEZ and Preparation of Industrial Zones	Duration/ Year	Lead/Responsible institution
- Conduct a study to develop industrial parks for SMEs in order to promote linkages between foreign enterprises and domestic enterprises, through their participation in regional production and value chain in the context of regional integration;	Medium to Long Term	Council for Development of Cambodia; - Ministry of Industry and Handicraft; - Relevant Sub-National Administration.
Maintain the momentum in developing physical infrastructure for industrial development purposes such as clean water, electricity, transportation and telecommunication, especially in SEZs, developing industrial clusters and transforming urban areas into national industrial centers in line with the urbanization, land use and management plan;	Medium to Long Term	Ministry of Land Management, Urbanization and Construction; - Council for Development of Cambodia; - Ministry of Industry and Handicraft; - Ministry of Mines and Energy - Ministry of Public Works and Transportation; - Relevant Ministries/ Institutions.
Set clear standards and guiding principles on environmental protection and production safety for investment projects located in SEZs and other industrial zones;	2015 to Medium Term	Council for Development of Cambodia; - Ministry of Environment.
Continue strengthening and streamlining the administrative capacity and institutional framework for managing the operations of SEZs by way of increasing the effectiveness of the One-Window Service mechanism in order to promote the development of specialised SEZs. The focus of the latter would be on some priority sectors such as agro-processing for export (the development of specialised SEZ needs to be based on specific geographic location, the type of business ventures, adequate infrastructure and enticing incentives);	2015 to Medium Term	Council for Development of Cambodia;
Review the feasibility of promoting the development of large high standard SEZs through Public Private Partnership.	Medium term	- Ministry of Economy and Finance; - Council for Development of Cambodia.

5.1.2 Benefits of the SEZ

One of the benefits of the SEZ for a foriegn firm is reduced risk in acquiring land to establish a factory. In Cambodia, since a foreigner or a foreign company cannot own land, they have to lease it from a Cambodian firm, which increases the risk of doing business in Cambodia, given the significant investment required to establish a factory. On the other hand, in the SEZ, firms sign a contract with the managing company of the SEZ to lease the land. Therefore, they can establish operations in Cambodia with reduced risk.

Another benefit of SEZs is that the operation office of a SEZ can provide one-stop service (application for investment, customs, certificate of origin, labour management, etc) if such office is operational. Therefore, firms in the SEZ don't have to go to ministries every time they administrative services are required. Furthermore, firms operating inside the SEZs are eligible for additional investment incentives. Therefore, export/import applications can be simpler for the firms in the SEZs near the border.

Because of these benefits, SEZs have been a platform for foreign investment in the manufacturing sector. As a result, firms operating inside the SEZ are mostly foreign[29] and it is also the case for Japanese manufacturers operating in Cambodia. Furthermore, while manufacturing companies outside the SEZs are mainly garment related, those inside the SEZs are relatively diverse, for example; electricity, electronics, and furniture[30]. Actually, only 10 % of members of the Garment Manufacturers Associations Cambodia (GMAC) are based in SEZs.

Given the fact that most of the large manufacturing bases are concentrated in Phnom Penh, SEZs are important in promoting industry in the provinces. In addition, SEZs near the border and ports will play a critical role in the regional integration, accelerated by the launch of the ASEAN Economic Community (AEC). On the other hand, it is imperative to stabilise Cambodia's electricity supply and lower its cost, in order to attract diverse manufacturing firms into the SEZs and modernise the production line. The full realisation of the IDP is, therefore, strongly recommended.

5.2 Outline of the Field Survey

A field survey was conducted from 1–18 March, 2016 in order to identify the human resources required in the manufacturing industry in the mid-long term and the role of education and training institutions in nurturing such human resources. The target of the survey is managing companies in the SEZs, firms operating inside of the SEZs, HR companies, major associations, and Chamber of Commerces, as listed in the table below.

The target firms in the survey were mainly SEZ related firms because of two reasons. Based on the literature review, it is clear that Cambodia's economic growth has been led mainly by foreign direct investment (FDI) and is likely to continue to be so in the future, considering the scarce domestic investment resources. The SEZ has been a platform for such FDI in the manufacturing sector. Secondly, IDP, which is one of the most important policies in Cambodia, highlights the importance of SEZs. The SEZs surveyed were Phnom Penh, Bavet, Sihanouk Ville, and Poipet, based on the request to establish technical high schools by the Ministry of Education.

Since IDP stresses importance on the promotion of industry in the rural areas, more firms were interviewed in the provinces than in Phnom Penh. Firms in Phnom Penh were mainly selected from the non-garment sector, and which are modernising the production line. Not to be biased to only Japanese companies needs, HR companies which send labour forces to Cambodian companies, major associations, and, National Employment Agency (NEA) were also interviewed.

[29] ADB (2015) Cambodia's Special Economic Zones, ADB Economics Working Paper Series, No. 459
[30] JICA (2012) Final Report, Data Collection Survey on Industrial Policy Formulation in Cambodia

Table 5-2: Outline of the HR Needs Survey for SEZs

Objective	to identify the human resources required in the manufacturing industry in mid-long term and role of education and training institutions in nurturing such human resources
Target	✓ Managing companies and firms in the SEZs in Phnom Penh, Bavet, Sihanouk Ville and Poipet ✓ HR firms (Forval, CDL) ✓ Cambodia Chamber of Commerce ✓ Garment Manufacturers Association of Cambodia, GMAC ✓ National Employment Agency ✓ JETRO Cambodia Office ✓ JICA TVET Project
Period	1 – 18 March 2016
Method	Interview survey

The following sections outline the characteristics and human resource needs of major SEZs in Phnom Penh, Bavet, Sihanouk Ville, and Poipet.

5.3 Results of the Field Survey

5.3.1 Characteristics of the Major SEZs

(1) Phnom Penh

The Phnom Penh SEZ (PPSEZ) is the only SEZ in Phnom Penh. It was established in October 2006 jointly by a Chinese-Cambodian firm and a Japanese firm. Besides its accessibility to capital functions and relatively large land area, it became easy to establish a regional division of labour with Thai and Vietnamese factories after the inauguration of the Southern Economic Corridor. It is noted that there are more companies augmenting production capacity to mechanise the production line, or, manufacturing automotive parts in PPSEZ, taking advantage of relatively good infrastructure and stable electricity supply. More than half of the firms operating in this SEZ are Japanese firms.

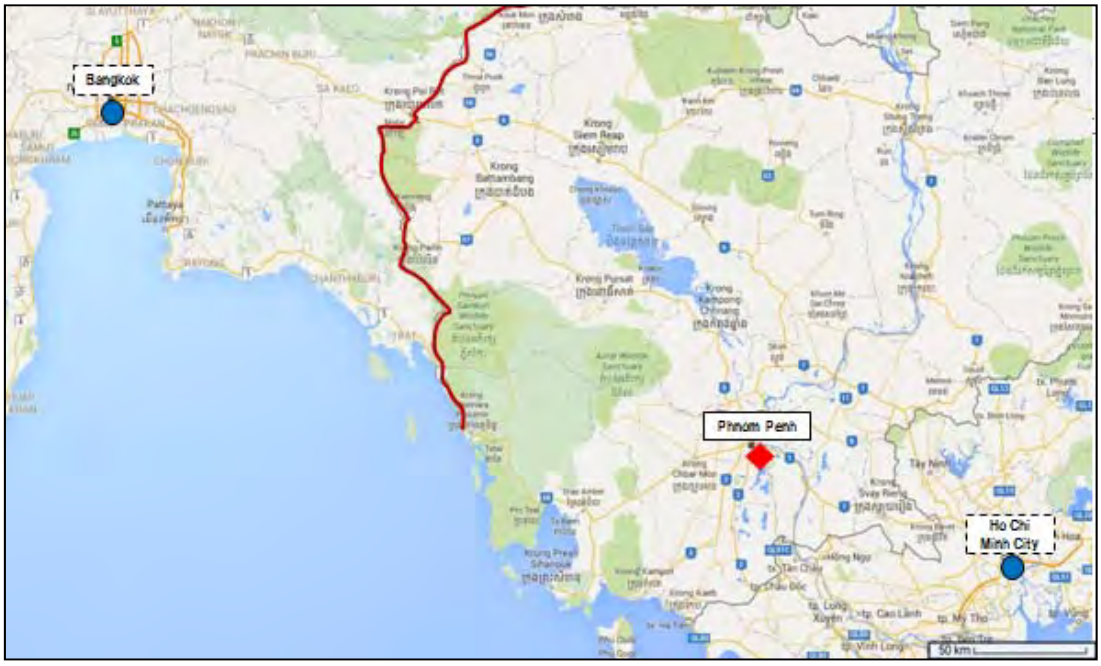


Figure 5-1: Location of Phnom Penh in Regional Map

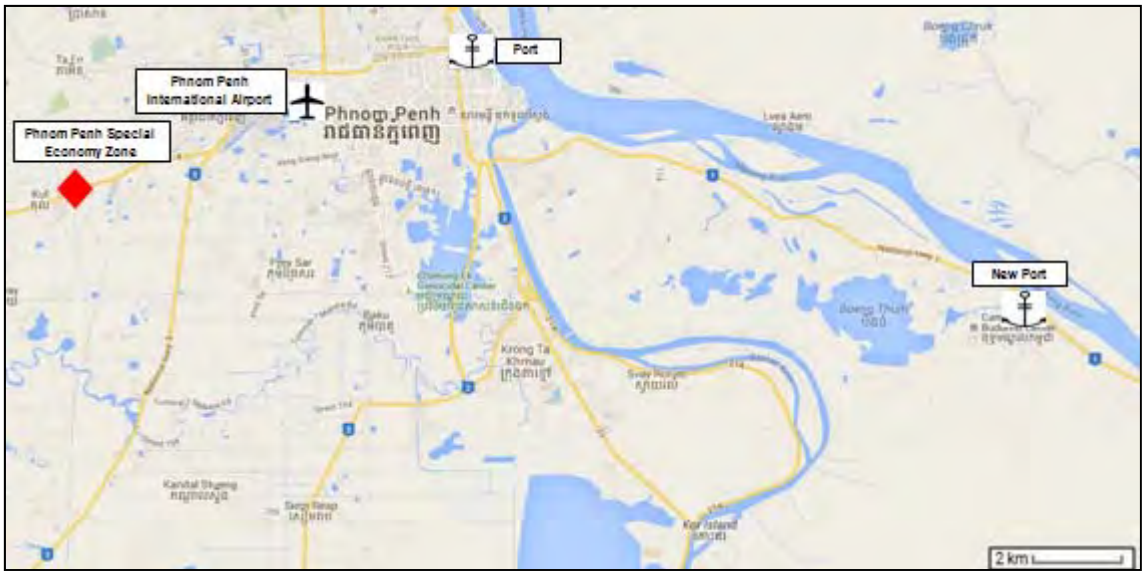


Figure 5-2: Location of PPSEZ

There are many education and training institutions in Phnom Penh, and their graduates prefer to work in Phnom Penh. Therefore, there is a higher supply of engineers and technicians in Phnom Penh as compared to other industrial centers in the country. This is one of the reasons why firms choose Phnom Penh over other locations in the country.

In PPSEZ, GMAC plans to establish a technical training center with voluntary contribution by some firms with a loan provided by the French Government. According to GMAC, it is a 326 million USD project aiming at enabling Cambodian workers to assume the mid-level management positions which are currently assumed by foreign personnel. GMAC is currently conducting a needs survey to inform the course contents and curriculum, whose results should be monitored to avoid duplication with possible assistance for technical high school in / around PPSEZ. Furthermore, there are plans to establish technical education institutions near PPSEZ. PPSEZ is located in the western side of Phnom Penh City, on the border with Kampong Speu. On the eastern side of PPSEZ, a general technical high school (GTHS) will be established in 2016. Within Kampong Speu, an Institute of Technology will be established, with the assistance of the Thai Royal Family. (See Chapter 8 for details)

Table 5-3: Phnom Penh SEZ

Name	Phnom Penh SEZ
Developer	Phnom Penh SEZ Co., Ltd
Establishment	October 2006
Access	8km from Phnom Penh International Airport, 18km from Phnom Penh city center
Size	Total: 360ha Phase 1: 141ha (developed) Phase 2: 162ha (under development since January 2011) Phase 3: 57ha
Firms	62 firms , other 14 firms under preparation
Major tenants	Minebea (small motor), DENSO (automotive parts), Yeo's (beverage), BETAGRO (food processing), Laurelton Diamond (Jewerly)

(2) Bavet

There are nine SEZs in Bavet, which borders Vietnam. Since Bavet is 86 km from Ho Chi Minh, the largest merchant city in Vietnam, most of the firms operating in Bavet use the Ho Chi Minh port to export / import goods or products to / from China. Many firms came to Bavet because of the increased labour costs in China or Vietnam, where they have a primary production base. Svay Rieng Province, where Bavet is located, is one of the most populated areas in the country, providing a working population of 1.5 million, together with neighboring Pray Veng.

Figure 5-3: Location of Bavet in the Regional Map

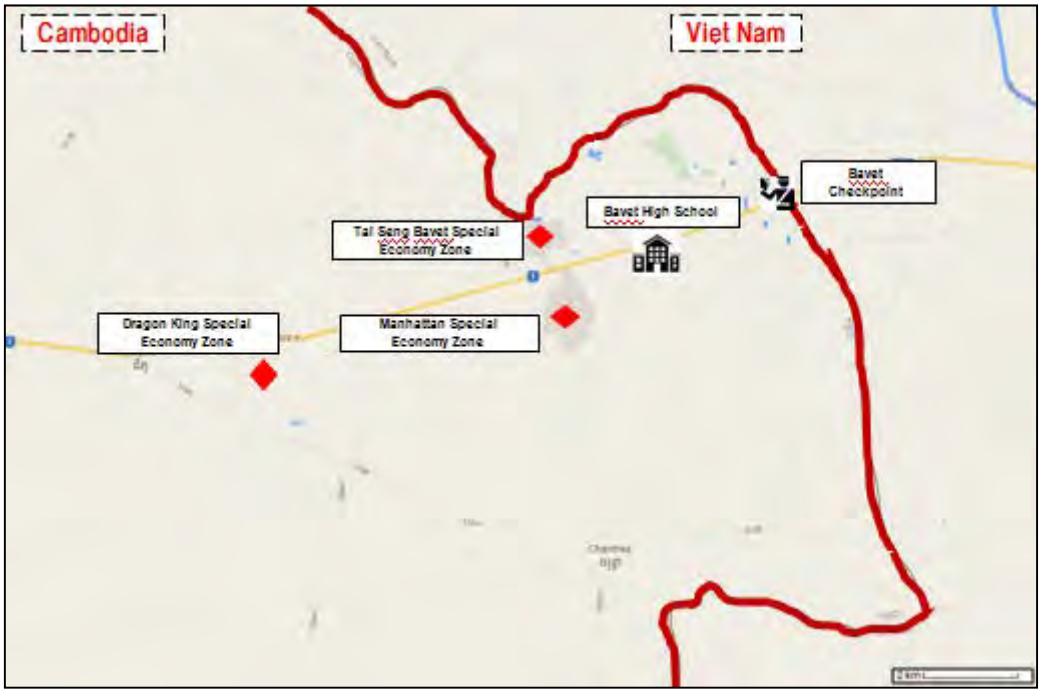


Figure 5-4: Location of Major SEZs in Bavet

The common challenge in the SEZs in Bavet is the electricity supply. SEZs in Bavet import electricity from Vietnam. There is frequent interruption of the power supply, due to the tight electricity demand in Vietnam, among other reasons. The unstable power supply is one of the reasons why the production lines in Bavet are not as mechanised as other SEZs in the country. JICA is supporting Svay Rieng province to establish power transmission lines with the aim of replacing imported electricity with domestically generated electrical power.

Another reason why the production lines have not become mechanised in Bavet is that it is difficult to hire skilled labour in this region. In Svay Rieng, there is the University of Svay Rieng which has a Faculty of Science and Technology; however, the Faculty has not yet started accepting students. In addition, there is a training center under MLVT in the Svay Rieng city center. The training center has a course in electricity; however, it fails to produce a labour force that is apt for working in the SEZs. Therefore, firms send engineers and technicians from their home, or, third countries, or, hire them from Phnom Penh. The first option means increased costs, while the second leads to a higher attrition rate.

Another challenge for the firms in this region is industrial relations. Workers' protests take place everywhere in the country, though it often starts in Bavet. Firms are forced to experience significant losses, due to the interruption in operations because of the protests.

The following section describes the major SEZs in Bavet; Tai Seng SEZ, Manhattan SEZ, and Dragon King SEZ.

Tai Seng Bavet SEZ

Tai Seng Bavet SEZ is an SEZ which was established in 2007 with 100% Cambodian capital. This SEZ has the most Japanese companies among the SEZs in Bavet. The most of the companies are garment while there is a few producing electricity parts including the one which is manufacturing coil transformer.

Table 5-4: Tai Seng SEZ

Name	Tai Seng SEZ
Developer	Tai Seng Enterprise Group, Tai Seng Bavet SEZ Co., Ltd
Establishment	2007
Access	6.7 km from Bavet, 80km from Ho Chi Minh International Port, 160 km from Phnom Penh on National Road #1.
Size	Total: 200 ha Main Phase: 77 ha Sub Phase: 48 ha (5 km nearer to Phnom Penh)
Firms	22 firms
Major tenants	DK Inc (garment), Swany (globes), Yorks (globes), Nakayama (garment), Ronchester, (garment), Towa (garment), Vangogh Artists (photo frame), A&J (bicycle), Smart Tech (bicycle), Gingko (garment), Tokyo Parts (Electronic parts), etc

Manhattan SEZ

The Manhattan SEZ was established by a Taiwanese developer in 2005. It is characterized by a relatively large lot of land. The total number of employees is approximately 30,000 and it is the biggest SEZ in terms of the number of employees in the country (as per 2014). The tenants are mostly Taiwanese and Chinese companies producing garment and footwear, while there are a few manufacturing bicycles. According to the interview with Manhattan International, the managers of the SEZ, their 2016 annual plan aims at transforming the SEZ into a city containing

a hospital, residential area, and a commercial facility, and they are eager to host a satellite campus of GTHS inside the SEZ.

Table 5-5: Manhattan SEZ

Name	Manhattan SEZ
Developer	Manhattan International Co., Ltd
Establishment	2005
Access	6 km from Bavet (border with Vietnam), 86 km from Ho Chi Minh City on Vietnamese national rod # 22, 160 km from Phnom Penh on the national road #1
Size	Total: 310 ha
Firms	33 firms
Major tenants	Morofuji (plastic bags), Kingmaker (footwear), etc

Dragon King SEZ

Dragon King SEZ was approved for establishment in December 2012, and started by a Cambodian national who lived in the United States for a long time. There are three companies operating inside the SEZ while it is still under development.

Table 5-6: Dragon King SEZ

Name	Dragon King SEZ
Developer	Dragon King SEZ Co., Ltd
Establishment	December 2012
Access	12 km from Bavet (border with Vietnam), 92 km from Ho Chi Minh City on Vietnamese national rod # 22, 154 km from Phnom Penh on the national road #1
Size	Total: 200 ha Stage 1: 100 ha
Firms	3 firms
Major tenants	Nissey Cambodia (wristwatch and bazel), Toko Kosen (garment)

(3) Sihanouk Ville

Sihanouk Ville is located 214 km South West of Phnom Penh. It has the only deep sea port in Cambodia, facing the Gulf of Thailand. There are two SEZs; Sihanouk Ville Port SEZ (SPSEZ) which adjoins to the Port, and Sihanouk Ville SEZ (SSEZ), which is located 12km from the Port on the national road #4 towards Phnom Penh. There are three companies operating in SPSEZ, 79 in SSEZ, and approximately 30 factories outside of the SEZs[31]. In total, 100 factories are in Sihanouk Ville.

[31] Cambodian firms such as Angkor Beer and foreign companies producing garment and textile.

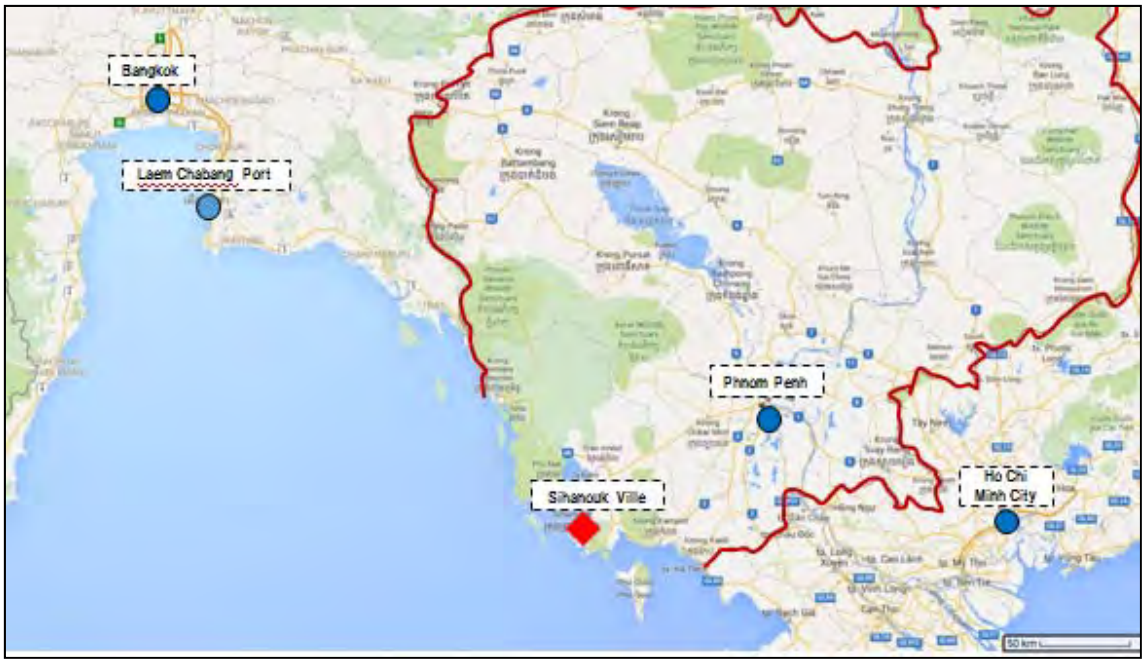


Figure 5-5: Location of Sihanouk Ville in the Regional Map

Figure 5-6: Location of SPSEZ and SSEZ

The challenge for firms in SEZs in Sihanouk Ville is similar to those of Bavet, and is the severe shortage of local engineers and technicians. They have no choice but to hire skilled labour from Phnom Penh, or, send them from home, or, third countries. In Sihanouk Ville, there are several training centers, one Provincial Training Center (PTC) under MLVT and one private established by the Don Bosco Foundation[32], both of which provide courses in electrical engineering. Among the Japanese firms interviewed for this survey, there was no firm which employed

[32] Italian Roman Catholic Foundation

graduates from the PTC, and the PTC was not known to them. The electricity course of PTC under MLVT aims to develop electricians who are able to work on home appliances (e.g. air conditioners). This might be one of the reasons why no graduates from this center are working in the SEZ. On the other hand, the Don Bosco training center is sending many interns to the SEZ. Some of them are employed by the same firm after their internship. The firms know the school, though they claim that the graduates are not good enough in terms of their skill level and their English communication skills.

Sihanouk Ville Port SEZ (SPSEZ)

SPSEZ was established with a Japanese Yen Loan and was completed in May 2012. While other SEZs in the country are operated by the developer (a private company), SPSEZ is operated by the Sihanouk Ville Autonomous Port (public). Custom clearance procedures can be completed inside the SEZ, which shortens the process time and decreases the cost related to customs clearance. SPSEZ also provides free logistic services between the port and the factories. Sihanouk Ville is a relatively thinly populated area, though most of the workers in SPSEZ commute to and from the Sihanouk Ville town. The firms hire workers from the neighboring communes.

In SPSEZ, three firms are currently operating, and all of them are Japanese. As the Government of Cambodia will start repaying the loan soon, they are considering a plan to attract more firms to SPSEZ.

Table 5-7: Sihanouk Ville Port SEZ

Name	Sihanouk Ville Port SEZ
Developer	Sihanouk Ville Autonomous Port
Establishment	2012
Access	Adjoined to Sihanouk Ville Port, 15 km from Sihanouk Ville Airport, 230 km from Phnom Penh on National Road #4. Rail freight transportation (264 km) between Phnom Penh and Sihanouk Ville started in 2014.
Size	Total: 70 ha
Firms	3 firms
Major tenants	Ojitex Harta Packaging (Sihanoukville) Ltd, Taiki (cosmetics), S.J Corporation (pest control)

Sihanouk Ville SEZ

Sihanouk Ville SEZ (SSEZ) was established in 2008 by a developer from Wuxi City of Jiangsu Province of China, one of the major industrial zones in China. Since the developer invited firms based in Wuxi to go to SSEZ, the firms operating in SSEZ are mainly from Wuxi. As per March 2015, the number of firms operating in the SSEZ is 79 and they are mainly garment. The developer aims to have 300 tenants in 10 years and SSEZ to become a city where 80,000 – 10,000 people reside. According to ADB (2015), more than half of the non-production workers in SSEZ is Chinese, which characterizes this SEZ.

Table 5-8: Sihanouk Ville SEZ

Name	Sihanouk Ville SEZ
Developer	Sihanouk Ville Autonomous Port
Establishment	2008
Access	12 km from Sihanouk Ville Port, 3 km from Sihanouk Ville Airport, 212 km from Phnom Penh
Size	Total: 1,113 ha 1st phase : 528 ha (300 ha completed) 2nd phase : 585 ha
Firms	79 firms
Major tenants	Izumi Electronics, Caffco, GGC, REBECCA etc

(4) Poi Pet

Poi Pet is located on the Southern Economic Corridor, at the border with Thailand. It is one of the potential candidate locations for "Thailand Plus One", a strategy begun in 2011, when a massive flood occurred in Thailand, aimed at spreading the risk of having a single production base in Thailand, by having another base in a neighboring country. There are more than 2,400 automotive parts manufacturers on the outskirts of Bangkok, which creates the biggest automotive cluster in Asia. The concentration of the automotive industry around Bangkok is causing a chronic shortfall in human resources, and rising labour costs. At the same time, political instability under the Yingluk administration after 2012 brought about moving production bases from Thailand to neighboring countries, such as Cambodia, Laos and Myanmar. There are two SEZs approved in Poi Pet; Sanco Poi Pet SEZ and Poi Pet O'Neang SEZ. In addition to these two, Phnom Penh SEZ has already acquired the land to start another SEZ in Poi Pet. In the light of IDP, it is expected that Poi Pet contributes to the diversification of the manufacturing industry by attracting automotive parts manufacturers from Thailand, though currently the operations in the firms in Poi Pet are mainly labour-intensive.

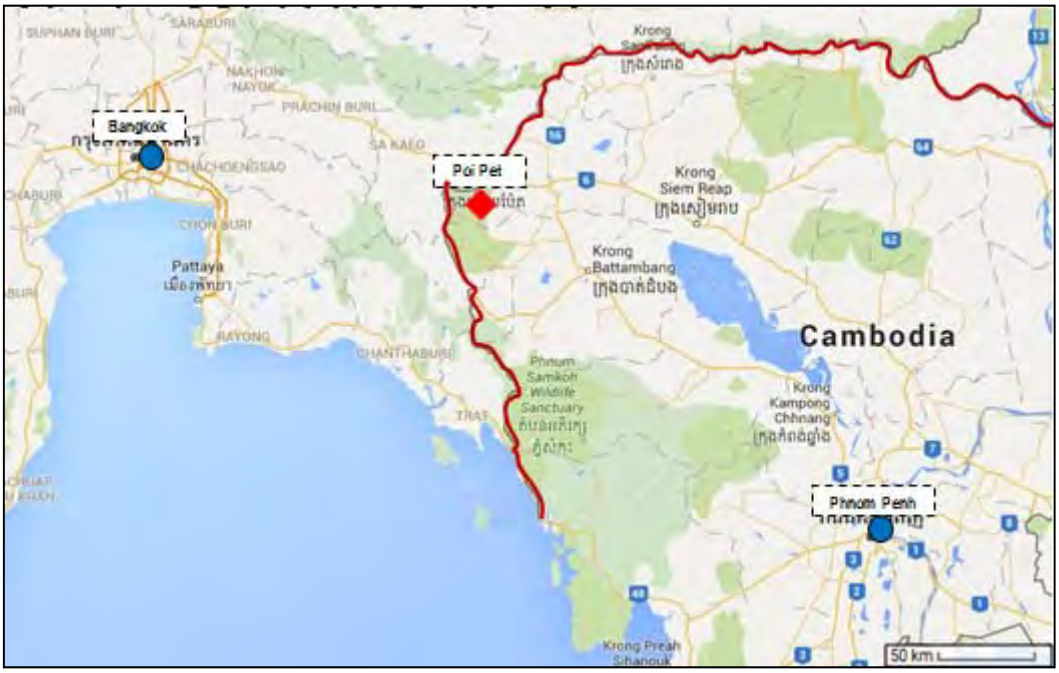


Figure 5-7: Location of Poi Pet in the Regional Map

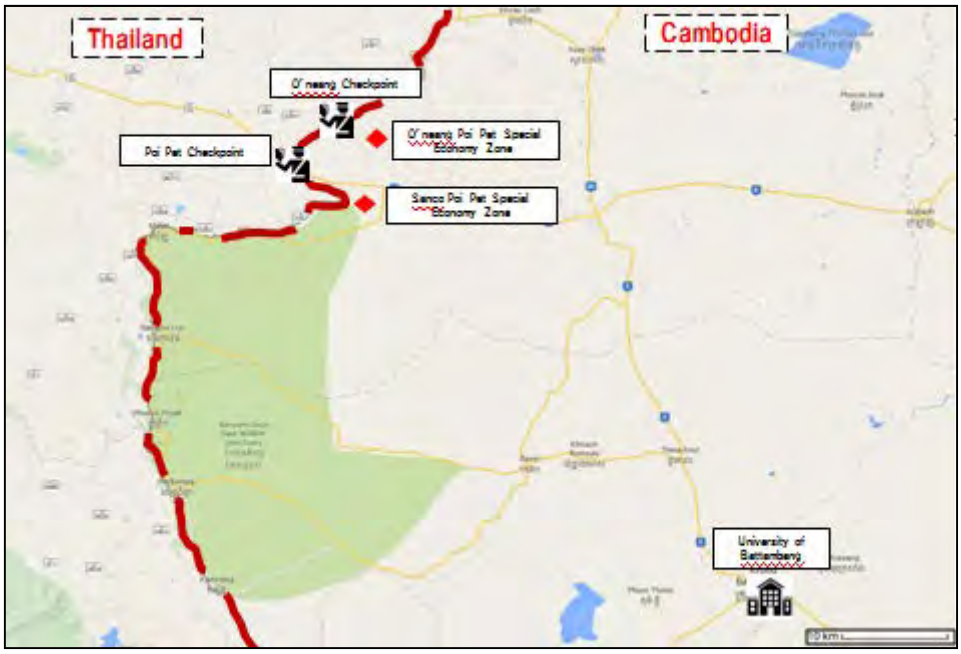


Figure 5-8: Location of SEZs in Poi Pet

In Banteay Meanchey, where Poi Pet is located, there are many people moving to Thailand to work, according to NEA (2015)[33]. Currently, firms operating in Poi Pet are not facing any difficulties in ensuring the appropriate number of workers, while an HR company hiring labour on behalf of firms in Poi Pet pointed out that they may have to go to Battambang or Pursat to hire workers in the future. The bigger challenge is hiring local skilled labour. According to the interview, it is impossible to hire engineers and technicians in Poi Pet. Therefore, firms send skilled labour from home, or third countries, or hire them from Phnom Penh, just as they do in Sihanouk Ville and Bavet. A US Charity organisation is planning to support nine high schools in Banteay Meanchey in strengthening their technical courses, which should be carefully watched, in order to avoid duplication with any possible cooperation by JICA.

Sanco Poi Pet SEZ

Sanco Poi Pet SEZ was established in 2012 by a joint venture between a Cambodian firm and a Japanese firm. Currently, there are four companies which have already signed the contract for the SEZ and one of them starts operations in March 2016.

In March 2015, Toyota Tsusho, a Japanese trading company, announced establishment of Techno Park, which supports the manufacturing of automotive parts. In its 60,000 m^2 (6 ha) land area, four factories (30,000 m^2) will be constructed. There will be services such as renting factory in 1,000 m^2 blocks, a canteen for employees, the provision of administrative services (general affairs, accounting, finance and human resources) and the hiring and training of the labour force. By minimizing the risk involved in moving operations to Cambodia, it aims at attracting automotive parts suppliers in Thailand. The first phase will be completed in August 2016. Three companies have already contracted as per march 2016.

[33] NEA (2015) Skills Shortages and Skills Gaps in the Cambodian Labour Market; Evidence from Employer Skills Needs Survey 2014

Table 5-9: Sanco Poi Pet SEZ

Name	Sanco Poi Pet SEZ
Developer	SANCO CAMBO INVESTMENT GROUP
Establishment	2012
Access	7 km from border of Thailand, 250 km from Leam Chabang Port, a major international port in Thailand
Size	Total: 83 ha 1st phase : 21 ha 2nd phase : 32 ha Will be expanded till 500 ha
Firms	4 firms already contracted
Major tenants	NHK Spring (Car Seat Cover), Steel Hub Limited (steel materials), SC WADO (HD for computer), Toyota Tsusho (Techno Park)

Poi Pet O'Neang SEZ

Poi Pet O'Neang SEZ was approved in 2006 and it was the first SEZ approved in Cambodia. It is 21 km away from Poi Pet checkpoint, relatively distant compared to Sanco. However, there will be the O'neang check point which is located 4 km from the O'neang SEZ and it will open shortly. Since the Poi Pet checkpoint is very busy and takes time to cross the border, the O'neang checkpoint is expected to shorten the time required to cross the border. Furthermore, there will be the national road # 58 along the border, funded by Chinese Government, to link Banteay Meanchey to Uddor Meanchey, and it will continue to be extended to the east.

Table 5-10: Poi Pet O'Neang SEZ

Name	Poi Pet O'Neang SEZ
Developer	Chhay Chhay Investment Ltd
Establishment	2006 (year of approval)
Access	21 km from Poi Pet Checkpoint, 4 km from O'neang checkpoint which is under construction
Size	Total: 467 ha
Firms	4 firms + 2 firms already contracted
Major tenants	Garment, jewelry box

Table 5-11: Outline of the Four Candidate Areas for GTHS

	Phnom Penh	**Bavet**			**Sihanouk Ville**		**Poipet**	
SEZ	PPSEZ	Tai Seng SEZ	Manhattan SEZ	Dragon King SEZ	Sihanouk Ville Port SEZ	Sihanouk Ville SEZ	Sanco Poipet SEZ	Poipet O'neang SEZ
Land	Total: 360ha Phase 1: 141ha (developed) Phase 2: 162ha (under development since January 2011) Phase 3: 57ha	Total: 200 ha Main Phase: 77 ha Sub Phase: 48 ha (5 km nearer to Phnom Penh)	Total : 310 ha	Total: 200 ha Stage 1: 100 ha	Total : 70ha	Total: 1,113 ha 1st phase : 528 ha (300 ha completed) 2nd phase : 585 ha	Total: 83 ha 1st phase : 21 ha 2nd phase : 32 ha Will be expanded till 500 ha	467 ha
Number of firms (Japanese firms)	62 (35)	22 (11)	33 (2)	3 (2)	3 (3)	79 (1)	4 (3)	4 (0)
Characteristics	- More than half of the firms is Japanese - Relatively diverse categories of products (not only garment) - Easier to hire skilled labour compared to other areas - Relatively good infrastructure - It is advanced than other SEZs in terms mechanization of production line	- Densely populated, providing 1.5 million labour force (Svay Rieng and Pray Veng) - Manhattan SEZ is the biggest SEZ in the country in terms of the number of workers - The annual plan of Manhattan SEZ intends to transform SEZ into a city which contains hospital, dormitory, commercial area and training / education institution.			- Annexed to the only deep sea port in the country - SPSEZ was constructed using Japanese yen loan - Approximately 30 factories outside the SEZ		- Potential candidate for "Thailand Plus One" - Establishment of Techno Park by Toyota Tsusho (2016 August) - Phnom Penh SEZ is expanding its business to Poi Pet	
Challenges / issues to be considered	- There are many education and training institutions - There will be a training center of GMAC inside the SEZ	- Lack of engineers / technicians - Industrial relations - Instable and expensive power supply - Mainly labour intensive garment industry			- Lack of engineers / technicians - Relatively thinly populated - SPSEZ is considering how it can attract more firms in the light of start repaying the loan		- Lack of engineers / technicians - There are many workers go to Thailand where the minimum wage is 2.5 to 3 times expensive - A US Charity organisation is planning to support nine high schools in Banteay Meanchey in strengthening technical course	

5.3.2 Challenges for Industrial Human Resources and the Implications for the Education Sector

In this survey, industrial human resources are divided into three occupational categories; worker, technician, and engineer. These occupations are defined based on the educational background, work description, and categories in ISCO2008, as described in the table below. In defining these occupations, we referred to JICA (2012)[34] and International Standard Classification of Occupations (ISCO) 2008 by International Labour Organization[35].

Table 5-12: Definition of Engineer, Technician, and Worker

Occupation	Educational Background (approximate)	Work description	Category in ISCO2008
Engineer	Graduated from engineering department of university	Designing and development of a product Designing production line	214 Engineering professionals (excluding electrotechnology) 215 Electrotechnology engineers
Technician	Graduated from high school	Managing and improving the operation and tackling the problems in the production line, Quality control, Work requires expertise acquired in professional training	72 Metal, machinery and related trades workers 74 Electrical and electronic trades workers 75 Food processing, wood working, garment and other craft and related trades 8 Plant and machine operators, and assemblers
Worker	N/A	Un-skilled worker in labour intensive industry Assembly which doesn't require expertise	932 Manufacturing labourers

Based on the survey results, the challenges and needs for human resource development for workers, technicians and engineers are described as below. The needs for human resource development are focused on the education, given that this is an education sector survey. As explained before, the supply of engineers and technicians are quite low in the provinces while the same challenges are common in all the SEZs. Therefore, the needs for human resource development are not described region by region, but, rather, occupation by occupation.

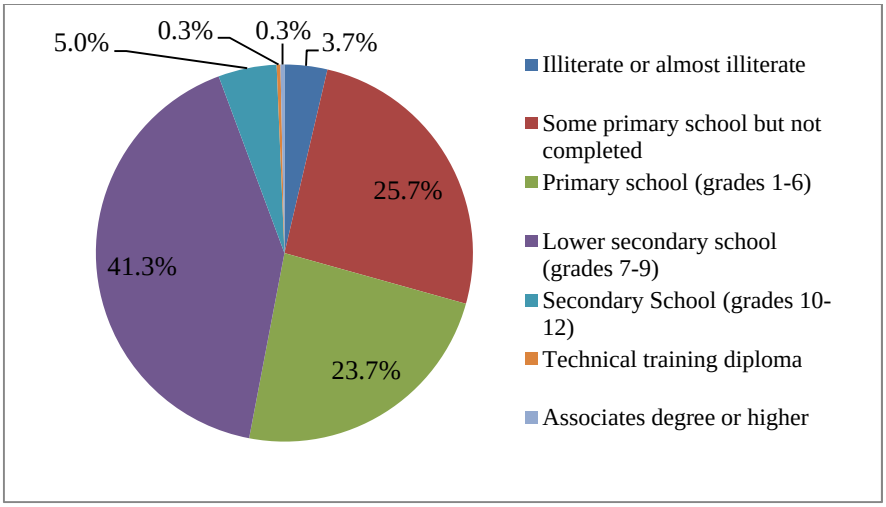
A report from a past survey[36] points out that Japanese companies are more devoted to human resource development than other foreign or Cambodian companies. Interviews with SEZ management and some firms endorsed the Japanese companies' efforts towards local human resource development. However, how much a firm spends on human resource development also depends on the size of the firm and their long-term strategy on continued operations in Cambodia. In other words, if a firm wants to localise a factory in the mid-long term, local human resource development is imperative. On the other hand, if the primary motive for a company to move operations to Cambodia, in order to make the most of the cheap abundant labour force, then human resource development is not a priority for them, especially, if they can make enough profit utilizing a skilled labour force from outside the country. In sum, firms, regardless of their nationality, develop human resources based on the mid or long term strategy

[34] The Preparatory Study on Program for Human Resource Development for Industry in the Kingdom of Cambodia
[35] http://www.ilo.org/public/english/bureau/stat/isco/isco08
[36] The Preparatory Study on Program for Human Resource Development for Industry in the Kingdom of Cambodia

for the operations in Cambodia and its prospect of profit. So there should not be a big difference depending on their nationality[37].

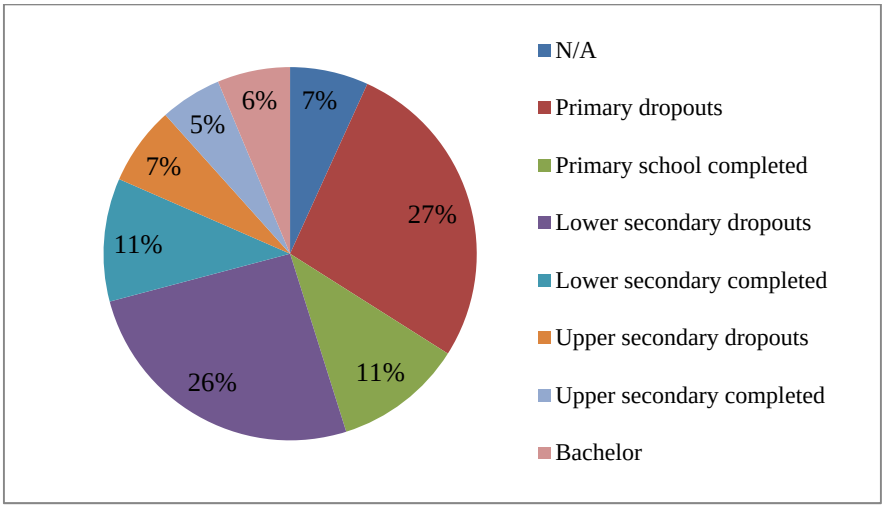
(1) Worker

All the firms interviewed in this survey responded that they didn't expect special skills from workers, because most of the companies operating in Cambodia are labour-intensive. In fact, as shown in the below chart, according to a survey conducted on 200 garment workers by Cambodia Institute of Development Studies (CIDS) in 2009, 30 % of the workers surveyed had not graduated from primary school, 24 % had graduated from primary school and only 5.6 % had graduated from high school. In this survey, the educational background of employees of a firm (garment) was obtained. The educational background is higher than the CIDS survey, because it included staff (in the office and line leaders) and mechanics (29 in total). However, it coincides with the CIDS survey with the rate of employees under primary school graduates being 50%.



Source: Cambodia Institute of Development Studies (2009)

Figure 5-9: Workers' Academic Background



Source: information obtained in the interview with company A

Figure 5-10: Educational Background of all Employees of a Firm A (Garment)

[37] interview with HR company

The reports from the past survey[38] point out that the problem around the workers is the "soft skills" which deals with the attitude towards work and communication skills. On the other hand, this survey revealed that companies were spending a significant cost for workers' training that would not be necessary if they had basic knowledge and skills. For example, most of the firms interviewed this time spent several weeks or several months for workers' induction training when they were hired. The induction training was not only to acquire a specific skill to do the job but they also spent a significant amount of time to complement the basic knowledge and skills that should have been acquired during a basic education. For example, in the garment sector, they teach the metric system (e.g. "cm" and "mm") before teaching cutting, sewing or trimming. Furthermore, some firms claimed that it was difficult to communicate the instruction accurately to some workers, which makes the standardization of work difficult. According to some firms, some workers forgot things easily due to the lack of concentration or short memory caused by lack of good study habits. They also told that the workers were not used to living or working with other people, and they were not good at group work.

In addition, there were some problems caused by a lack of discipline and social common sense. The World Bank (2015) points out that having punctual, responsible, honest and hardworking employees is the first step to enhancing productivity and improving competitiveness. In this survey, many firms also claimed a lack of discipline and social common sense. Besides, this survey revealed that workers' lack of social common sense sometimes brought about a significant loss or increased cost to the firms. For example, in Bavet, there was a big protest caused partly by the workers' ignorance on the concept of tax. They were dissatisfied with the fact that the salary tax was deducted from their salary and it was one of the reasons why they started the protest. The firms had to stop their operations for a few days, which cost them a significant loss. Firms were also spending additional costs on training workers on manners, behavior and attitude. There was a firm which made a video to show workers the manners on how to live in the dormitory. An HR company told the Study Team that they provided training to workers to teach them basic business ethics, such as punctuality and greetings, upon request from the firms.

In fact, reading and writing Khmer properly, four arithmetic operations, and metrics, are all included in the curriculum of primary education. Therefore, workers who have graduated from primary school should have been equipped with these basic skills. However, a firm which mainly employs lower secondary education graduates pointed out that their workers were not equipped with those skills. IDP also emphasises the role of education; by enhancing the quality of basic education by focusing on math, science, and literature, extending general education for at least nine years, by reducing the dropout, and, improving curriculum through integrating soft skills including communication, problem solving and working discipline.

Based on the survey, the challenges related to the workers, the implications for the school education and the relevant sections in IDP are described in the below table.

[38] World Bank (2010) Providing Skills for Equity and Growth – Preparing Cambodia's Youth for the Labour Market, ADB-ILO (2015) Addressing the Skills Gap, Employment Diagnostic Study

Table 5-13: Challenges Related to the Workers, Implication for the School Education and the Relevant Sections in the IDP

Challenges related to workers	**Implication to the school education**	**Relevant sections in the IDP**
Language	Khmer	6.4 Coordination of Supporting Policies A. Skills and Human Resource Development • Strengthen quality of basic education by focusing on − Math − Science − Literature − Technology • Promote general education for at least 9 years by reducing dropout rate to the maximum level at the primary education level and promoting enrolment at the secondary level. • Improve curriculum by integrating soft skills including − Social communication − Problem solving − Respect of working discipline
✓ Workers cannot record daily production report because they are illiterate ✓ Workers' illiteracy or lack of education makes standardization of the operation difficult. ✓ A literate worker memorized the password of bank account of an illiterate worker, which created a trouble among them. ✓ Workers have difficulties in explaining events in sequence and distinguishing between opinions from facts.	✓ Write and read Khmer and alphabet accurately ✓ Organisation of information and proper communication	
Numbers / Calculation	Math	
✓ When introducing commission system, workers had difficulties in understanding its concept and multiplication. ✓ Workers didn't know cm/mm and how to use the ruler so we put tape on the ruler so that they know where to cut material.	✓ Read, count, write, order and compare numbers ✓ four arithmetic operations ✓ unit and measurement	
Social Studies	Social studies	
✓ One of the causes of the protest was that the workers didn't know the concept of tax and objected that the tax was deducted from their salary.	✓ concept and significance of tax, obligation to tax payment	
Discipline and morale	Moral education/ team work	
✓ Some of the workers pay for medical certificate from a doctor and apply for sick leave which is paid. ✓ There were trashes everywhere in the factory when we started operation. ✓ To avoid trouble in the dormitory, they made a video to show how to use the common property.	✓ comply with rules as a member of a group ✓ team work ✓ judgment of right and wrong	
Study habit		
✓ Some workers have difficulties in memorizing and concentrating, which may be because of the lack of good study habits		

(2) Technicians

Expected tasks for technicians, implications for school education and relevant sections in IDP are described in the Table 5-14. Implications for school education were made in reference to the curriculum of technical high schools in Japan.

Expected Tasks for Technicians and Major Challenges

Many firms interviewed in this survey had expectations towards technicians to maintain and repair machines and electric facilities and to assume the position of line leader or quality control.

IDP also emphasises the maintenance of machines and electric facilities as an area to focus on in vocational and technical education. In this survey, it was found that SEZs in the provinces were facing bigger challenges in hiring local technicians. Though there are training centers and institutions under MLVT and private technical schools in the provinces, firms indicated that graduates from such centers and schools did not meet the expectation from the firms in terms of the required technical level and English communication skills. In light of this situation, the response of the firms in SEZs in the provinces is threefold; 1) to hire local technicians though their technical and English level was not good enough, and train them in on-the-job training or in the factories in home/third countries, 2) hire technicians from Phnom Penh, and/or 3) dispatch technicians from home/third countries. In the case of 1), some firms send technicians for several weeks to several months to the factories abroad, e.g. in Thailand or Japan, for training. In the case of 2), as indicated before, high attrition rates are a problem since they tend to prefer working in Phnom Penh. In the case of 3), according to a survey conducted by JICA TVET Project for 29 Japanese manufacturers in the country, approximately 40% of the firms used employees from a third country as a mid-level manager in the production line. In all of the cases, it is clear that firms are forced to spend additional costs on training due to the absence of local technicians who are competent enough to perform the required duties of the position.

Regarding the line leader and quality control officer, there were two options for the firms; first, was to train the potential leaders among the workers to be a line leader or a quality control officer, or second was to hire them as a line leader or a quality control officer. The main task for the line leader is to manage parts inventory, labour control of workers, performance and productivity. If the production line that he/she is in charge of is not able to produce the expected output, they have to identify the cause, address the problem, and communicate with their superior if they cannot solve the problem in their jurisdiction. Therefore, they were expected to have problem solving and communication skills. In some firms, they were also expected to develop an operations plan including the calculation of input and output in a production line which uses simple machines, such as conveyor belts. Though the majority of the firms in Cambodia, especially garment, are labour intensive, it was observed that there were some firms launching automated production with simple machines.

Implication to Education Sector

Though there are training centers in the provinces which have a course in electricity, their graduates are rarely working in the firms in the SEZs. One of the causes is that such courses aim to produce electricians who are able to repair home appliances such as air conditioners. Therefore, there is a big gap between the skill of the graduates of such institutions and the skill that is required in the firms in the SEZ. When considering the establishment of a new course in the technical high school, it is important to take the skills required by the firms into account. The table below shows the courses taught in the technical high schools in Japan for reference.

In technical high schools in Japan, the Study Team could not find a course solely dedicated to produce line managers or quality control officers, because production control and quality control are generally taught in the on-the-job training in Japanese factories. However, in the curriculum of technical high schools, there are subjects such as “production system technique” and “industry management technique”, where they introduce the concept of production control and optimizing the production line. For the graduates from future technical high schools in Cambodia to increase their career options and enhance their employability, it may be useful to include these subjects in the curriculum. In addition to these subjects, according to JICA TVET Project (2016), there were some firms that expect students in the technical and vocational education to practice 5S or Kaizen.

Many firms claimed that their technicians cannot perform expected tasks because they didn't have enough knowledge in math and physics (the calculation of area, dimension, mass and energy). In Japanese technical high schools, these issues are taught in "introduction to industrial math" and it is a potential subject in the technical high schools in Cambodia. There were some firms that claimed that their technicians needed drafting skills.

As a common challenge, many firms indicated that computer and English skills were essential. Even though it is expected that there will be more Cambodian engineers and technicians in the future, they still have to communicate with engineers and technicians from third/home countries, in order to localise the production. For those who maintain machines and electric facilities, "industrial English" may be useful so that they can learn technical terms.

One of the reasons why it is difficult to hire local technicians in the provinces is that the role of technicians or engineers and their importance in the development of a country are not yet well known in the society. Therefore, there are not enough students who aspire to be engineers or technitians. Generally, Cambodian youth tend to prefer to work in the offices or in the service industry. This is another reason why the graduates from the training centers under MLVT are not working in the SEZs. Based on this situation, it may be useful to remind us of the significance of he manufacturing industry and the mission of engineers/technicians in technical high schools in Cambodia. In Japanese technical high schools, they teach such issues in the "introduction to industry techniques".

To enhance employability of graduates and to respond to the needs of the industry, collabouration with industry is essential. Such collabouration could be pursued in research, practice, and internships.

Table 5-14: Tasks Expected of the Technicians, Challenges, and Example Courses and Subjects in GTHS

Tasks expected to the technicians and challenges	**Example of subjects and courses of GTHS[39]**	**Related sections in IDP**
Maintenance of machines	Mechanic Course	6.4 Coordination of Supporting Policies A. Skills and Human Resource Development • Increase (…) in multiple fold technical skills training in electrical , electronics, mechanics, chemistry, standards and metrology (inspection, verification, calibration, testing and skills in using metrological tools) at both technical secondary education and higher education. • Give priority to the establishment of many technical secondary schools (…) with focus on important thematic
✓ Prevention of faults in facilities and machines in the factory ✓ Maintenance and repair of machines [Challenges] It is difficult to hire local technicians.	✓ Mechanic operation (e.g. material workability, measurement of engineering quantity, production control, mechanical processing and automation) ✓ Mechanic and design (e.g. machine mechanics, strength of materials, elements and equipment of machines) ✓ Motor (e.g. conversion and environment of energy, fluid machinery, internal combustion engine, turbine engine)	
Maintenance of electric facility	Electronic Course	
✓ Installation of electric facility ✓ Maintenance of electric facility	✓ Basic electricity (e.g. AC/DC circuit, measurement) ✓ Electric power technology (e.g. generation, transmission and distribution of power, automated control)	

[39] Examples were taken from curriculum for technical high schools in Japan.

Tasks expected to the technicians and challenges	**Example of subjects and courses of GTHS[39]**	**Related sections in IDP**
[Challenges] − Factory manager has to call engineers in Japan every time they have electrical problems due to absence of skilled labour force at local level. − It is difficult to find a technician who can repair generator.	✓ Electronic technology (e.g. semiconductor, telecommunication)	such as electricity, electronics, ICT, computer science, machinery, motorcycle and automobile assembly and maintenance, agro-processing and handicraft.
Production Control	General subjects and others	
To manage ✓ Inventory control of parts ✓ labour control of workers ✓ To manage output and productivity of production line ✓ Streamlining of production line [Challenges] − It was difficult for the in-house technician to design new production line, including assignment of workers and calculation of output.	✓ Basic industrial technology (e.g. mission and responsibility of technician) ✓ Project studies ✓ Drawing (e.g. drawing, CAD) ✓ Basic industrial mathematics (e.g. calculation of area, volume, mass, force and energy) ✓ Basic information technology (e.g. basic computer control, basic programmeming) ✓ Manufacturing system technology (e.g. machinery and equipment, material processing technology, production control, rationalization of production and system technology) ✓ Industrial management technology (e.g. production schedule and management, process control, quality control, safety management, personnel management, maintenance, factory management) ✓ Technical writing/communication	
Quality Control		
✓ Inspection for control and assurance of quality ✓ Identification of cause and prevention of faulty products ✓ Coordination with other departments in the factory to enhance the quality		

(3) Engineers

As previously described, IDP aims to transform and modernise of the Cambodian industry base. In other words, it promotes the transformation from a labour-intensive model of industry to a skill-based industry and integration of regional production network, developing clusters, and improvement of competitiveness and productivity. In order to achieve these goals, RGC intends to ensure the viability of the Policy by amending the Law on Investment, enacting the Law on

Special Economic Zones, revising the criteria for Potential and Quality Investment Projects (QIPs), and supplying stable and cheaper electricity.

In this survey, it was observed that some large manufacturing bases in Phnom Penh started expanding their production capacity to be able to produce parts, where they are now concentrated in labour-intensive assembling. Some firms plan to mechanise their production lines to realise mass production by machines.

On the other hand, firms are spending significant time and costs to train skilled labour who are able to lead the manufacturing and processing of parts and mass production. In particular, in the provinces, many factories have not been able to start automation of their production line due to the severe shortage of local engineers and the unstable and expensive power supply. In other words, the lack of local engineers is slowing down the transformation and modernisation of the manufacturing sector in Cambodia. In the interview with the National Employment Agency (NEA), they also pointed out that there would be a shortage of engineers in terms of quantity as well as quality.

For the firms to be able to manufacture and process parts and to realise mass production through automation of the production line, engineers in charge of production technique are needed. Production technique, i.e. industrial engineering, deals with optimisation of production processes and systems by identifying challenges and reviewing production process, tasks and assignment of workers. Some firms needed mechanics who could handle production machines, quality control officers to assure the performance of the products before shipment, and those who could maintain and repair molds.

Furthermore, according to a survey of Japanese manufacturing firms by JICA (2015)[40], the firms pointed out that graduates from an engineering faculty of universities needed to foster expertise and logical thinking. Engineers were also expected to perform not only as engineers but also as mid-level managers. In JICA (2012), surveyed firms claimed that though they train engineers in the firms, their engineers didn't have sufficient basic knowledge, which was necessary for such trainings; such as four arithmetic operations, fraction and logical thinking.

5.4 Human Resource Development Needs for Mid-Long Term Industrial Development

While regional integration is being accelerated with the launch of the ASEAN Economic Community (AEC), the minimum wage for workers in Cambodia keeps increasing. For Cambodia to be relevant in the regional production network, it is imperative to strengthen competitiveness and enhance productivity. In order to achieve the goal of IDP, i.e. diversification and modernisation of industry, the productivity of workers in the manufacturing sector should be improved, the number of engineers and technicians should be increased, and their quality should be enhanced.

Regarding the workers, firms were spending additional costs due to the low level of education of the workers. The current curriculum in Cambodia includes almost all basic knowledge and skills that firms think that their workers don't have. Therefore, it is important to continue promoting schooling and preventing dropouts from the schools. It is also expected to enhance the quality of basic education by improving the curriculum and textbooks and strengthening teacher education. Working discipline and morale education, whose absence was problematic, according to some firms, are included in the new curriculum framework which was completed

[40] JICA (2015) Survey on Possible Partnership between ITC and Private Sector

in December 2015. It is expected that this new curriculum framework will be implemented soon.

Improvement of access and quality of basic education is also imperative to increase technicians and engineers who will lead the industrial development of Cambodia. As stated before, firms pointed out that their technicians did not have basic knowledge, such as physics and mathematics, which were essential for the OJT to be effective and to perform their job properly. If the quality of basic education is low, secondary and tertiary education institutions have to re-educate the students on the topics that were supposed to be covered in the basic education. This re-education decreases the time that they can spend to study technical subjects. Furthermore, if employees are required to learn basic knowledge which is supposed to be learned in the basic education, it results in lower productivity. Therefore, a quality basic education is essential to develop technicians and engineers efficiently and is also important in ensuring the effectiveness of the efforts to improve technical and engineering education. For the education sector to be able to contribute effectively to the industrial development of the country, it is necessary to tackle challenges consistently from basic education through to tertiary education.

According to JICA (2012), the demand for technicians and engineers is estimated to be 46,000 and 35,000 respectively in 2018[41]. This demand is estimated based on the assumption that the working population is increased in proportion to the increase of investment. However, as stated in section 3.4, investment to the industrial sector has slowed down since 2013, when the minimum wage started to increase. Actually, in the latest Cambodia Inter-Censal Population Survey[42], the working population of the secondary sector has not increased as much as it was estimated in JICA (2012). Furthermore, based on the same Survey, the number of Technicians and Associate Professionals[43] working in the secondary sector is estimated to be 20,000, which is far less than 81,000, which is the aggregated estimate of engineers and technicians by JICA (2012). This situation reconfirms the importance of increasing the number of good engineers and technicians and to tackle the challenges listed in section 3.3 such as the provision of stable and cheaper electricity, in order to increase the investment which was the basic assumption in this estimate. In other words, this estimate can only be validated if there are proper efforts put forth to promote investment.

In order to fulfill the demand for engineers and technicians, it is imperative to expand the education institutions as soon as possible. In particular, the shortage of skilled labour in the provinces is severe. In this sense, strengthening technical and vocational education in the provinces has an enormous significance. Ensuring enough engineers and technicians with adequate skills is essential not only to attract diverse manufacturers other than garment but also to enhance the overall productivity and competitiveness of Cambodia through automation of the production line. On the other hand, training centers which aim to only to produce graduates who are able to fix home appliances will not see their graduates make it to firms in the SEZ. For education institutions to be able to produce a productive and effectively skilled labour force that can contribute to the industrial development of the country, close collabouration with manufacturing firms should be constantly sought, starting with the development of the curriculum, through to the implementation of actual lessons.

[41] P23-24, The demand is estimated based on the estimated amount of FDI, ratio of working population for industry with reference to the development model of working population of Thailand. It should be noted that there are many hypothesis involved in this estimation and there might have a large margin of error.

[42] National Institute of Statistics, http://www.nis.gov.kh/nis/CensusInfo2.0/index.htm

[43] Technical and associate professionals in Cambodia Inter-Censal Population Survey include those who work for the tertiary sector. Therefore, the number of technical and associate professionals working in the secondary sector was estimated using the ratio of working population of secondary and tertiary sector.

6. Basic Education

6.1 Overview

The Ministry of Education, Youth, and Sport (MoEYS) has been making every effort to develop primary and secondary education, starting with early childhood education, teacher education, technical education, and non-formal education. The departments under the Directorate General of Education (DGE) take responsibility for the basic education subsector.

6.1.1 Access

(1) Schools and Students

The absence of armed conflict after 1987 gave long-term peace to the Cambodian people and brought economic development during the 2000s. The rapid increase of students and schools taking place in the 2000s was realised owing to the environment in which students could continuously go to school. For example, as seen in Table 6-1, the number of upper secondary schools increased by 240 between 2000 and 2010, although the increment between 1990 and 2000 was only 85.

On the other hand, the number of students in primary, lower secondary, and upper secondary schools was at its maximum in the school year of 2002-03, 2007-08, and 2010-11, respectively. It is likely that the same cohort of students has moved from primary to upper secondary. While the number of students has been decreasing recently, it is expected to be increased in the near future as indicated in Figure 6-1.

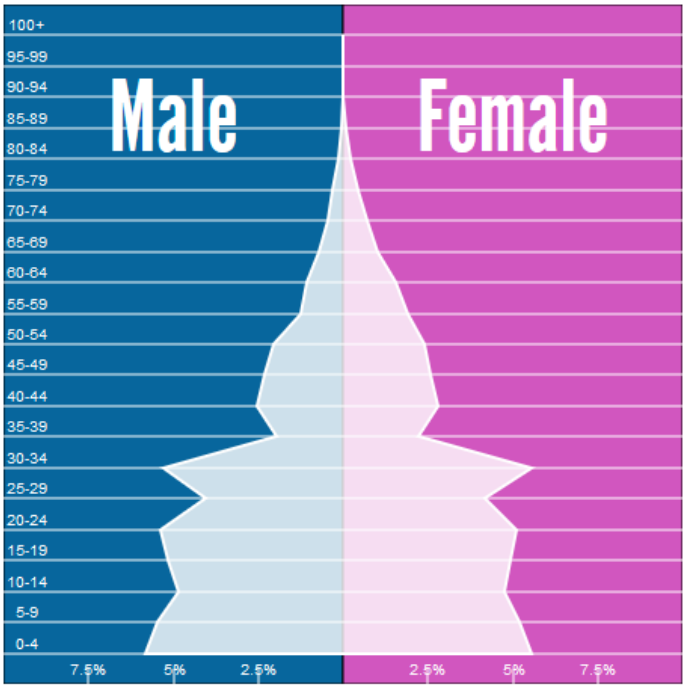
The number of pre-school students has been steadily rising: the students in 2014-15 are 1.6 times more than those in 2009-10, the increase of which is much larger than that in the previous 5 years. This is the consequence that MoEYS has approved “Early Childhood Care and Development Policy” in February 2010, and strengthened pre-school education through a school readiness programmeme with support of development partners. However, it should be noted that the pre-school programmeme helps students prepare for primary education and seems to give positive impact on the primary completion rate, but it does not contribute to improving the net enrolment rate, which has already reached 97%.

Table 6-2 analyses the number of students from 2014-15 by sex. It clearly indicates that the government’s efforts to minimize a gender gap in school education are successful. In addition, the lower part of the table shows that girls are more likely to be promoted to the next step of education than boys, although it is problematic that less than 30 % of primary enrolments are in lower secondary education, and less than 15% of those are in upper secondary.

Table 6-1: Transition in the Number of Schools, Classes, Students, and Staff from 1979 to 2015

Academic Year	Schools				Classes				Students				Staff			
	Pre	Pri	College	Lycee	Pre	Pri	Lower	Upper	Pre	Pri	Lower	Upper	Pre	Pri	Lower	Upper
1979-80	96	n.a	14	1	230	12,069	101	7	8,229	947,317	4,803	281	267	13,619	205	20
1980-81	149	n.a	62	2	446	25,526	394	14	15,077	1,328,053	17,291	555	630	30,316	671	28
1981-82	213	3,521	96	5	448	31,909	938	33	16,579	1,538,839	39,515	1,517	818	31,884	1,586	65
1982-83	371	3,114	173	7	823	33,740	1,949	73	23,797	1,597,081	87,005	3,493	956	34,859	3,300	158
1983-84	500	3,005	200	13	1,128	33,287	3,089	149	25,466	1,504,839	145,726	7,639	1,493	35,479	4,494	271
1984-85	541	3,133	222	19	1,420	33,345	4,698	211	39,920	1,367,089	234,927	10,888	1,835	35,578	6,116	468
1985-86	689	2,294	278	28	1,557	31,062	5,730	266	56,165	1,315,531	297,775	14,020	2,398	35,080	7,416	617
1986-87	551	4,282	304	33	1,864	30,946	6,262	364	55,760	1,294,227	327,049	18,799	2,625	36,754	8,967	858
1987-88	560	4,780	337	40	2,059	30,890	6,538	497	59,679	1,279,053	326,403	26,176	3,017	37,292	10,866	1,064
1988-89	679	4,730	373	49	2,195	31,384	6,265	650	61,349	1,313,689	289,064	35,125	3,209	36,930	11,702	1,403
1989-90	416	4,773	394	61	2,181	31,553	5,602	817	56,017	1,276,957	244,842	43,561	3,383	41,261	12,702	1,766
1990-91	397	4,665	397	66	1,789	32,858	5,064	919	51,421	1,322,143	201,496	47,562	2,959	40,014	14,351	2,057
1991-92	221	4,555	407	80	1,714	33,142	4,848	1,084	48,207	1,371,694	183,025	53,857	2,736	40,631	14,668	3,149
1992-93	220	4,539	358	82	1,712	35,025	4,844	1,216	50,976	1,468,958	183,793	55,570	2,920	42,405	13,107	6,439
1993-94	203	4,693	354	89	1,700	36,798	5,402	1,350	53,080	1,621,685	224,273	61,506	2,682	44,454	13,621	7,645
1994-95	184	4,744	363	90	1,586	39,159	6,001	1,244	49,591	1,703,316	246,198	51,357	2,628	44,985	12,179	8,784
1995-96	188	4,845	350	92	1,516	40,691	5,851	1,561	48,721	1,805,631	235,155	52,920	2,519	45,753	11,315	8,806
1996-97	812	4,899	351	106	1,438	43,469	6,304	1,370	44,814	1,918,985	265,895	61,671	2,071	47,147	17,459	3,246
1997-98	793	5,026	350	125	1,393	45,443	5,926	1,653	43,358	2,011,772	229,102	73,849	1,971	48,460	17,399	3,825
1998-99	806	5,156	355	132	1,414	48,370	5,903	1,860	45,068	2,094,000	226,057	82,110	1,983	49,400	17,582	4,561
1999-00	874	5,274	363	140	1,523	50,960	5,951	2,262	50,597	2,211,738	233,278	108,213	2,125	50,188	18,033	5,083
2000-01	915	5,468	367	151	1,605	55,448	6,860	2,299	55,798	2,408,109	283,578	105,086	2,181	52,168	18,952	5,000
2001-02	1,015	5,741	379	163	1,772	60,698	7,795	2,443	63,747	2,705,453	351,635	113,404	2,346	54,519	19,650	5,234
2002-03	1,145	5,915	411	183	2,041	59,897	8,799	2,721	64,727	2,747,411	415,703	128,182	2,538	57,077	19,841	6,070
2003-04	1,238	6,063	486	212	2,205	60,985	9,566	3,165	72,224	2,747,080	459,986	153,758	2,697	59,271	21,307	6,341
2004-05	1,345	6,180	578	232	2,316	61,648	10,744	3,513	72,214	2,682,129	528,940	177,129	2,833	60,841	21,985	6,829
2005-06	1,429	6,277	670	252	2,413	61,901	11,783	3,996	75,669	2,558,467	588,333	204,925	2,882	61,657	21,729	7,981
2006-07	1,524	6,365	846	283	2,548	61,249	12,633	4,303	77,899	2,461,135	626,005	222,271	2,978	59,889	24,052	7,722
2007-08	1,634	6,476	1,006	315	2,678	60,384	13,300	4,968	79,585	2,311,107	637,629	260,965	3,130	58,776	27,240	7,857
2008-09	1,798	6,565	1,122	349	2,916	60,227	13,281	5,604	90,036	2,262,834	605,707	292,423	3,247	56,978	27,784	10,681
2009-10	1,895	6,665	1,172	383	3,111	58,062	13,024	6,311	99,130	2,240,651	585,115	323,583	3,353	56,670	28,252	11,680
2010-11	2,092	6,767	1,189	407	3,343	57,697	12,504	6,786	103,315	2,191,192	560,868	334,734	3,711	56,339	30,012	11,686
2011-12	2,575	6,849	1,196	426	4,006	58,594	12,251	6,750	121,306	2,142,464	541,147	318,165	4,032	56,344	31,698	11,706
2012-13	2,813	6,910	1,214	433	4,248	58,837	12,184	6,361	128,257	2,173,384	534,710	288,789	4,309	56,108	31,815	12,880
2013-14	3,184	6,993	1,244	444	4,929	59,454	12,281	6,031	157,288	2,073,811	538,626	266,293	4,717	55,958	32,616	13,330
2014-15	3,443	7,051	1,249	455	5,261	59,654	12,390	5,933	163,468	2,012,175	546,864	262,072	5,027	55,788	32,525	14,055

Source: MoEYS (2015). Educational statistics and indicators



Source: Produced from "Population Pyramids of the World from 1950 to 2100"[44]

Figure 6-1: Cambodia's Population Pyramid in 2015

Table 6-2: The Number of Students in 2014–15

	Pre-school	Primary	Lower Sec	Upper Sec
Students	163,468	2,012,175	546,678	262,258
Girls	82,177	970,999	275,137	128,679
Boys	81,291	1,041,176	271,541	133,579
Girls/Boys	1.01	0.93	1.01	0.96
Girls %	50.3%	48.3%	50.3%	49.1%
Pre-school/Primary	8.1%	---	---	---
Girls	8.5%	---	---	---
Lower Sec/Primary	---	---	27.2%	---
Girls	---	---	28.3%	---
Upper Sec/Primary	---	---	---	13.0%
Girls	---	---	---	13.3%

Source: Produced from MoEYS (2015). Educational statistics and indicators

[44] Website: https://populationpyramid.net/cambodia/2015/ (11 March 2016)

(2) Teachers

Table 6-3 shows the number of teachers from pre-school to upper secondary school in 2014-15. According to this data, there is only 1 male teacher out of 25 teachers in preschools, while the ratio of female teachers falls down in primary education and only one-third of teachers are female in upper secondary schools.

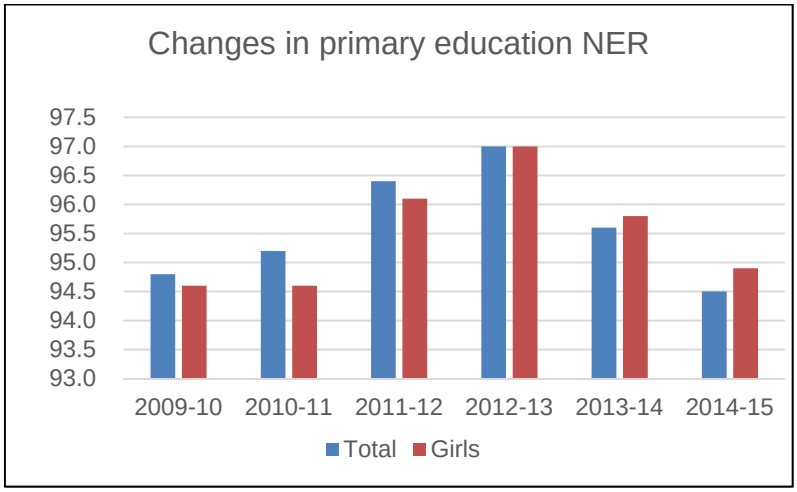
Table 6-3: The Number of Teachers in 2014–15 by the Level of Education

	Pre-school	Primary	Lower Sec	Upper Sec
Teachers	4,839	44,292	27,793	12,277
Female	4,646	23,227	11,844	4,053
Male	193	21,065	15,949	8,224
Female/Male ratio	24.07	1.10	0.74	0.49
Female %	96.0%	52.4%	42.6%	33.0%

Source: MoEYS (2015). Educational statistics and indicators

(3) NER: Net Enrolment Ratio

The net enrolment ratio of primary education is currently disclosed in EMIS. As in Figure 6-2, the primary NER has been decreasing since 2012-13, and interestingly the gap between the girls' and boys' NER has been widening since the girls' NER exceeded the boys' in 2012-13 in which the girls' NER was 97.0% and the boys' was 96.9%. The same tendency is observed in the gross enrolment ratio and the completion rate.

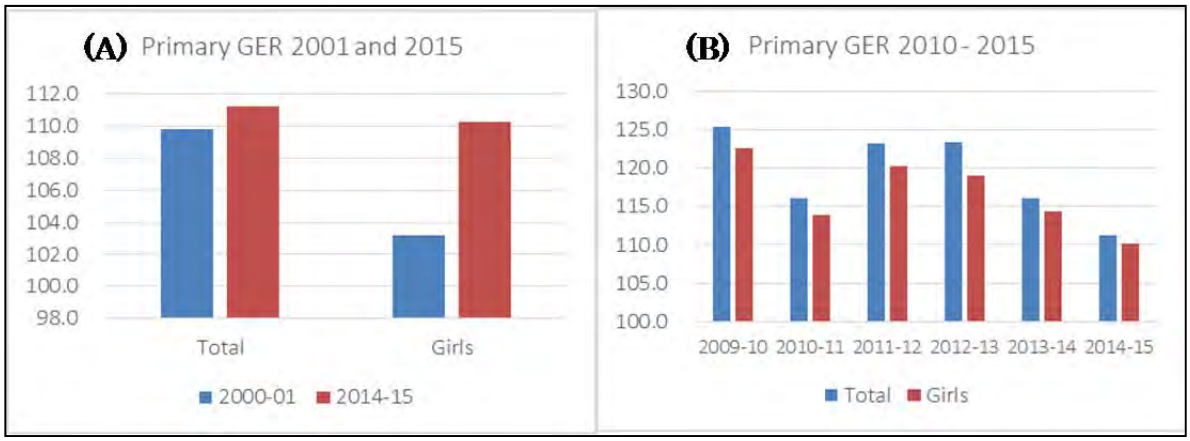


Source: MoEYS (2015). Educational statistics and indicators

Figure 6-2: Transition in the NER of Primary Schools

(4) GER: Gross Enrolment Ratio

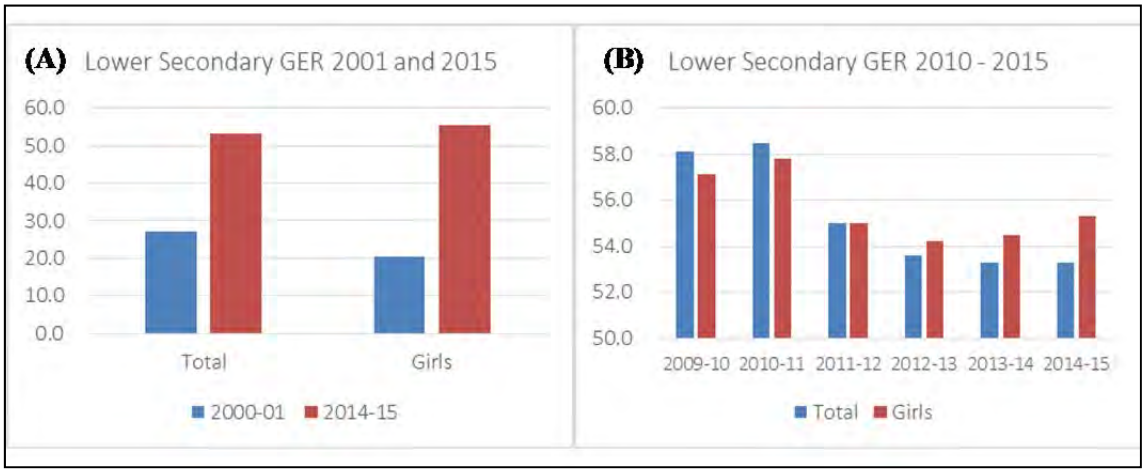
As shown in Figure 6-3 (A), the GER at the primary level, particularly that of the girls, has increased in the past 15 years. However, the primary GER has been dropping since the school year 2011-12 as in Figure 6-3 (B). The fact that the gap between GER and NER has been narrowing is not a negative phenomenon, but it is necessary to observe the changes in a longer term as the primary NER has also been dropping for the past few years.



Source: MoEYS (2001, 2010, 2011, 2012, 2013, 2014, 2015). Educational statistics and indicators

Figure 6-3: Transition of GER at the Primary Level

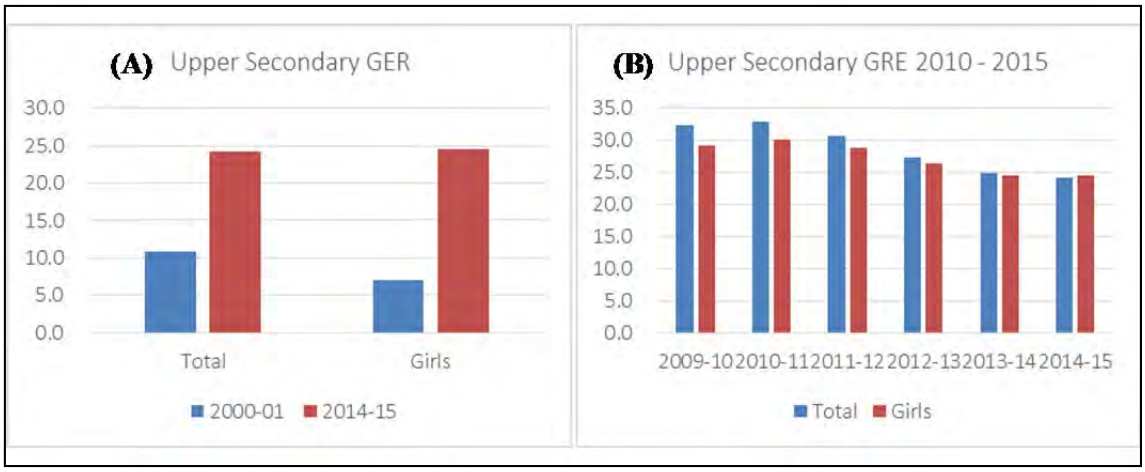
On the other hand, the lower secondary GER has increased by twice between 2000-01 and 2014-15, and furthermore the girls GER at the lower secondary level has increased by 2.7 times as in Figure 6-4 (A). In addition, Figure 6-4 (B) shows that since the GER of girls caught up with that of boys (55.0%) in 2011-12, the girls GER has always been beyond the boys' and the gap between girls and boys has been widening at the lower secondary level.



Source: MoEYS (2001, 2010, 2011, 2012, 2013, 2014, 2015). Educational statistics and indicators

Figure 6-4: Transition of GER at the Lower Secondary Level

Moreover, as in Figure 6-5 (A), the upper secondary GER has increased more than twice between 2000-01 and 2014-15, and the girls GER at the upper secondary level has increased more than 3 times in the same period. Also, as in Figure 6-5 (B), the upper secondary girls' GER has increased and finally exceeded the boys' in 2014-15. Because the 2014-15 upper secondary students' cohort is the same with the 2011-12 lower secondary students' cohort, it is likely that this trend will continue for several years.



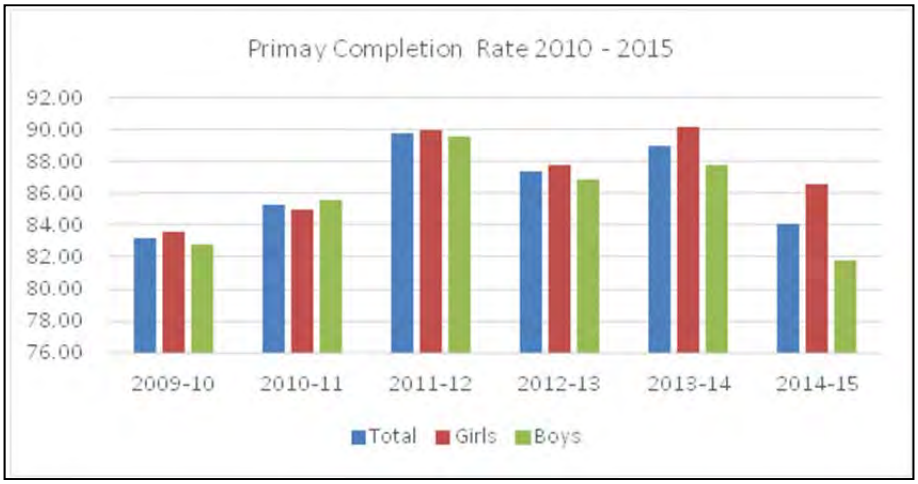
Source: MoEYS (2001, 2010, 2011, 2012, 2013, 2014, 2015). Educational statistics and indicators

Figure 6-5: Transition of GER at the Upper Secondary Level

(5) Completion Rate

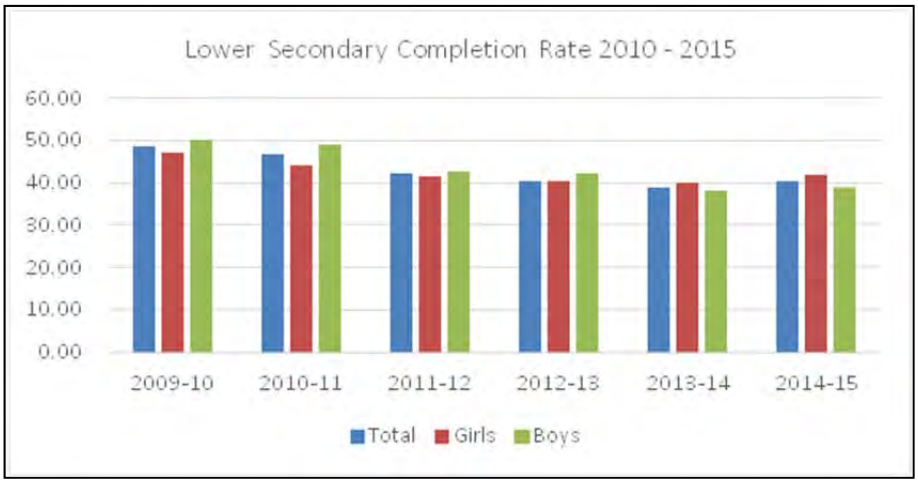
The dominance of girls can also be found in the completion rates. At the primary level, the overall completion rates between 2009-10 and 2014-15 do not show any certain tendency in the past few years, but the girls' completion rate has exceeded the boys' in 2011-12, and the gap between girls and boys has been widening (Figure 6-6). At the lower secondary level, the overall completion rates remain at approximately the same level between 2009-10 and 2014-15, but the girls completion rate has exceeded since 2013-14 (Figure 6-7). At the upper secondary level, the completion rate has been dropping and the girls' completion rate (20.1%) finally got ahead of boys' (20.0%) in 2014-15 (Figure 6-8).

It is not clear why the completion rates at the primary and lower secondary levels have changed as described above, however it is clear that the drop in the upper secondary completion rate has resulted from the sharp decline in the pass rate of the grade 12 final examination in 2013-14 and 2014-15 which have been implemented strictly to avoid any cheating and corruption.



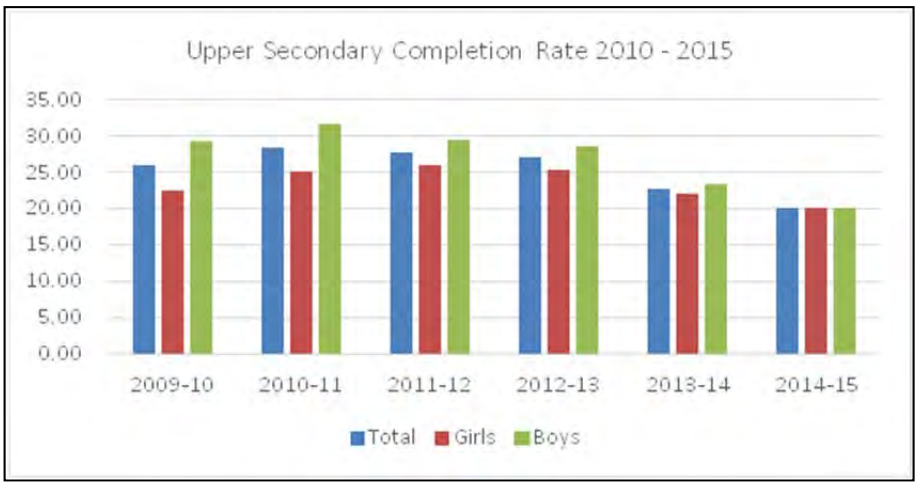
Source: MoEYS (2010 – 2015). Educational statistics and indicators

Figure 6-6: Transition of the Completion Rate at the Primary Level



Source: MoEYS (2010 – 2015). Educational statistics and indicators

Figure 6-7: Transition of the Completion Rate at the Lower Secondary Level



Source: MoEYS (2010 – 2015). Educational statistics and indicators

Figure 6-8: Transition of the Completion Rate at the Upper Secondary Level

(6) Dropout and Advancement Rates

As shown in Table 6-4, the dropout and advancement rates have not changed drastically for 5 years, except in 2014, where more than half of the grade 12 students failed in the final examination. One of the possible reasons for this trend is that the salary in the tourism and manufacturing industries does not change significantly according to educational qualifications, particularly between primary and secondary graduates, which does not strongly motivate students to go for further study to upper secondary education. For example, our study in Special Economic Zones (SEZs) shows that there is not a salary difference among “workers” (up to upper secondary graduates) although there is a clear difference between “workers” and “staff” (mostly university graduates).

On the other hand, Table 6-5 clearly shows that the dropout rate is higher and the advancement rate is lower in rural areas in 2014, and that girls perform better than boys in all the levels and in both urban and rural areas.

Table 6-4: Transition of Dropout and Advancement Rates

School year	2010	2011	2012	2013	2014
Dropout rate					
Primary (Grade 1-6)	8.7	8.3	3.7	10.5	8.3
Lower secondary (Grade 7-9)	19.6	21.7	20.0	21.2	21.0
Upper secondary (Grade 10-12)	11.8	13.7	10.1	14.0	27.5
Advancement rate					
From primary to lower secondary	80.2	79.3	78.9	76.8	78.7
From lower to upper secondary	71.6	69.8	74.0	70.2	71.1

Source: MoEYS (2011-2015) Education Statistics and Indicators

Table 6-5: Gap in dropout and Advancement Rates between Urban and Rural Areas in 2014

	Dropout rate			Advancement rate (Female)	
	Primary	L.Sec	U.Sec	Primary → L.Sec	L.Sec → U.Sec
Whole kingdom	8.3 (7.2)	21.0 (20.3)	27.5 (25.4)	78.7 (81.2)	71.1 (72.9)
Urban	5.7 (4.7)	14.3 (13.1)	22.4 (19.9)	93.9 (94.1)	91.0 (95.2)
Rural	8.8 (7.7)	22.9 (22.3)	30.4 (28.4)	75.8 (78.8)	64.6 (65.7)

Source: MoEYS (2015) Education Statistics and Indicators

(7) Gaps in Enrolment

Table 6-6 shows the result of comparing the primary and lower secondary completion rates, the primary NER and the advancement rate to lower secondary education among the Phnom Penh capital and the 24 provinces. According to the table, the gap between the best and worst is more than 30 points in the completion rates and the advancement rates, and the gap in the primary NER is also more than 28 points. These facts highlight the remaining gaps in basic education enrolment between provinces.

Table 6-6: Gaps in the Completion and Advancement Rates between Provinces

Worst	Completion Rate 2014/15		Primary NER 2014/15	Transition Rate in 2013/14 From Pri to Lower. Sec	Enrolment 2014/15 (Total)	Poverty Rate[45] (%) 2015
	Primary	L. Secondary				
1	Ratanak Kiri 62.3	Ratanak Kiri 25.2	Pailin 71.1	Ratanak Kiri 55.7	Kep 8,279	Otdar Meanchey 28.83
2	Kep 65.0	Pailin 26.7	Kep 72.6	Stung Treng 63.1	Pailin 14,828	Preah Vihear 28.67
3	Pailin 65.8	Stung Treng 28.6	Preah Sihanouk 74.5	Otdar Meanchey 71.7	Mondul Kiri 16,155	Stung Treng 27.37
4	Preah Sihanouk 66.3	Otdar Meanchey 29.3	Koh Kong 74.8	Tbaung Khmum 72.4	Kok Kong 26,054	Kratie 26.90
5	Mondul Kiri 66.4	Mondul Kiri 29.6	Mondul Kiri 79.3	Mondul Kiri 73.2	Stung Treng 27,045	Kampong Thom 24.47
6	Stung Treng 67.5	Kratie 29.9	Banteay Meanchey 85.7	Kratie 73.7	Preah Sihanouk 39,134	Ratanak Kiri 24.46
7	Koh Kong 68.4	Banteay Meanchey 31.6	Otdar Meanchey 88.3	Battambang 73.9	Ratanak Kiri 42,587	Mondul Kiri 23.58
8	Kratie 73.8	Battambang 31.8	Phnom Penh 89.5	Kampong Thom 74.3	Otdar Meanchey 48,643	Siem Reap 23.29
9	Otdar Meanchey 73.9	Preah Sihanouk 32.1	Kampot 91.0	Koh Kong 74.5	Preah Vihear 49,076	Battambang 23.16
10	Banteay Meanchey 75.6 -----	Pursat 32.5 Tbaung Khmum 32.5	Kampong Speu 93.4 -----	Siem Reap 75.5 -----	Kratie 77,694 -----	Pursat 23.16 -----
Best	Takeo 97.2	Takeo 57.3	Kampong Cham 99.3	Phnom Penh 94.3	Kandal 233,336	Phnom Penh 1.08

Source: Produced from MoEYS (2015) and MOP (2015)[46]

[45] The poverty rate is the ratio of the number of people (in a given age group) whose income falls below the poverty line; taken as half the median household income of the total population.

[46] MOP (2015). Poverty Rare by Capital, Pronvices, Municipalities, Districts, Khans and Communes, Sangkats、2015 (Khmer language)

In addition, the comparison between these indicators and the poverty rate published by the ministry of planning shows that 8 out of the worst 10 provinces in the advancement rate are in the poorest 10 provinces, which indicates that the economic status may affect the advancement of students to lower secondary education. Also, 7 out of the worst 10 provinces in the lower secondary completion rate are in the poorest 10 provinces. However, these sorts of correlations are rarely observed between the primary NER and the poverty rate, and one may daresay that sparsely populated provinces often show a low primary NER. It is interesting that the Pailin province in the worst performing provinces in the completion rates and NER is at the middle of the poverty ranking, the 13th (22.68%) in 25 provinces, and that the Phnom Penh capital, which is most affluent, comes in as the 8th worst in the primary NER. Although it requires further research to identify the reasons behind it, these facts imply that poverty does not necessarily lead to low NER, completion, and advancement rates.

6.1.2 School Curriculum

The Early Childhood Education Department (ECED) and the Department of Curriculum Development (DCD) take charge of the curriculum for preschool and that for primary and secondary education, respectively. In the previous curriculum development, DCD received assistance from UNICEF in the 1990s, and, from USAID in the 2000s.

In the 2000s' curriculum development, DCD organised subject-wise committees and prepared the syllabus for each subject with the minimum standards for grades 3, 6 and 9. In addition, the previous curriculum introduced two streams, called a science stream and a social study stream, so that students could intensively study specific subjects. Currently, there are more students choosing the science stream than the social stream. For example, the number of students taking the 2015's grade 12 examination in the science stream is 73,630, and that in the social study stream is 9,655, which indicates that the ratio of science students as to social study students is 7.6 : 1.

On the other hand, MoEYS disclosed a new curriculum framework for 2016-2025 in the consultative workshop held in December 2015. According to the progress report in the workshop, the major changes in the new curriculum are as follows:

1. Add computer subject in primary school
2. Separate art education subject and health education subject
3. Facilitate study hours by subject and level of study
4. Create guideline of curriculum development based on regional standard
5. Make the assessment for learning and teaching
6. Create guideline for teacher professional development
7. Organise the curriculum by formula of 1 + 1 + 3

6.1.3 Academic Achievement of Students

The grade 12 final exam results sent shockwaves through all of Cambodia. The pass rate of this exam, which was conducted very strictly with the help of the Anti-Corruption Unit to stop any type of corruption, was only 25.72%[47], although it finally came up to 40.67% by conducting a 2nd-chance exam to help students who failed in the 1st exam. Even including the 2nd-chance exam results, the pass rate in 2014 was halved from 2013.

[47] 23,126 students were successful among 89,939 examinees.

The grade 12 exam results in 2015 demonstrated a pass rate of 55.88%[48], in which the number of grade A students was 108, grade B was 1,085, grade C was 3,292, grade D was 6,093, and grade E was 35,982. This means that the proportion of students passing the exam in grades A to C was no more than 6% of all the successful students. In addition, the proportion of students who were successful in mathematics was only 23.29% (23.57% for girls), but they passed the exam because the evaluation was made based on the average score of all the subjects.

On the other hand, the grade 9 exam pass rate in 2015 was still high: 93.60% for the whole kingdom, and 95.77% for girls. But it should be noted that the pass rate ranges from 82.69% in Ratnakiri to 99.51% in Pailin. These good results in the grade 9 final exam, however, do not accurately show the current level of students' understanding. For example, the results of academic achievement tests consisting of fourfold multiple choice questions that a JICA project had conducted in 2015 for grade 8 and 9 students, show that in some questions less than one-fourth of students have chosen a correct option: a majority of students have chosen one wrong option in some questions, and the least number of students have chosen a correct option in other questions. One of the typical examples is as shown in Figure 6-9, which is a question for grade 8 students, but the topic is what they have already learnt in grade 7. This question only requires students to use a formula for the volume of a cylinder, or "radius × radius × height × π", but only 14.4% of students have chosen the correct answer (b), and surprisingly 59.0% of students have chosen a wrong answer (c).

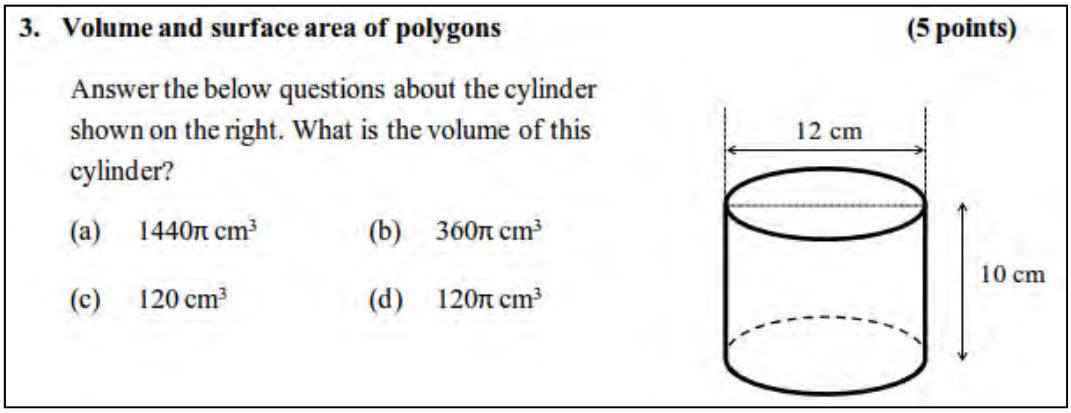


Figure 6-9: STEPSAM3 End-line Survey Question

These results may indicate that an unignorable number of teachers do not teach all the topics given in the textbooks, and also throw doubt on the validity of the above mentioned grade 9 exam results.

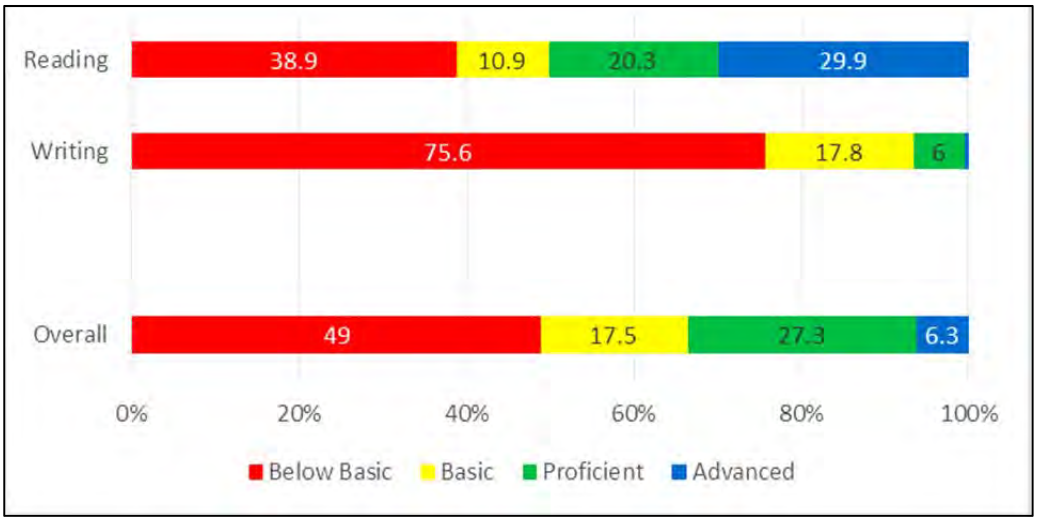
Furthermore, the results of the grade 6 national assessment conducted in 2013 also question the level of academic achievement in primary education. As shown in Table 6-7, the correct answer rate in the Khmer test was only 45.7%, and we can observe a clear learning gap between urban and rural areas. In addition, the correct answer rate in "reading" was 62.2%, "dictation" was 38.3%, and "writing activities" (on "Good person description", "Apology letter", "Poem Analysis" and so on) was only 19.5%. In the detailed analysis depicted in Figure 6-10, almost a half of the grade 6 students were evaluated "below basic" in Khmer language, particularly 3 out of 4 students were evaluated as "below basic" in writing, while around 30% of students were categorized as "advanced" in reading.

[48] 46,560 students were successful among 83,325 examinees. The pass rate of social study stream students was 71.18% (6,872 out of 9,655), and that of science stream students was 53.87% (39,688 out of 73,670). The pass rate of girls was 59.43, which was clearly higher than boys.

Table 6-7: National Assessment 2013 Results: Khmer Language

OUTCOME:	WHOLE SAMPLE	BY LOCATION:	
		RURAL	URBAN
Percent Correct by Curriculum Area:			
Reading	62.2	60.4	71.0*
Writing	28.9	26.9	39.2
Dictation	38.3	36.1	49.5*
Writing Activities	19.5	17.7	28.8*
Overall Khmer Average:			
Percent Correct	45.7	43.8	55.3*
Number of students (n)	5,984	4,985	999

(* = there is a statistically significant difference between rural and urban)
Source: MoEYS (2015). Results of Grade Six Student Achievement from the National Assessment in 2013, EQAD.



Source: MoEYS (2015). Results of Grade Six Student Achievement from the National Assessment in 2013, EQAD.

Figure 6-10: Distribution of Students in Khmer Test in National Assessment 2013

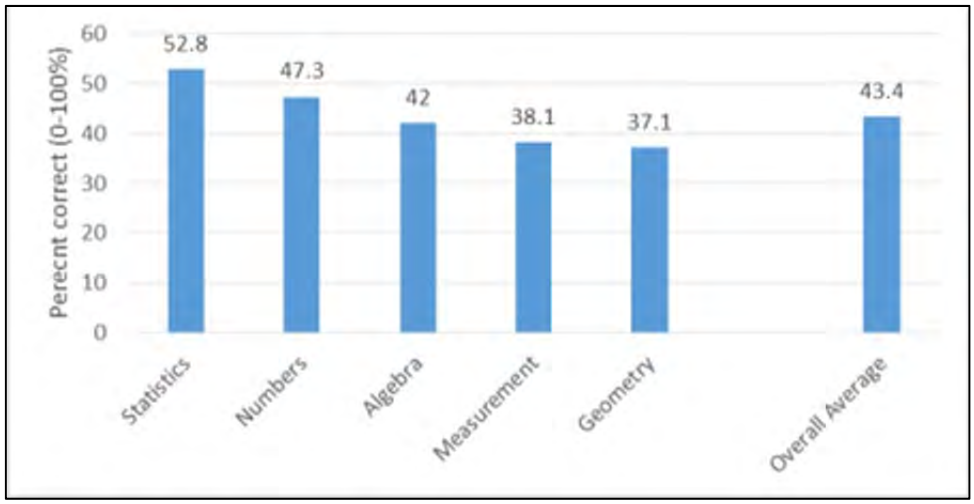
Mathematics in National Assessment 2013 shows the same trend. As in Table 6-8, the correct answer rate is only 43.4%, and the rural students lag behind their urban counterparts. Also Figure 6-11 shows that students are weak in measurement and geometry, which results from the low scores in "distance and speed" (22.5%) in measurement, and in "volume" (30.8%), "geometric figures" (29.1%) and "(parts of) circles" (21.1%) in geometry.

National Assessment 2013 clearly shows that more than a half of the students seem to be unsuccessful in learning both Khmer and mathematics, and such students are unlikely to understand the content of lessons in the succeeding grades, which will result in rote learning without understanding.

Table 6-8: National Assessment 2013 Results: Mathematics

OUTCOME:	WHOLE SAMPLE	BY LOCATION:	
		RURAL	URBAN
Overall Percent Correct	43.4	41.7	52.7*
Number of students (n)	5,984	4,985	999

(* = there is a statistically significant difference between rural and urban)
Source: MoEYS (2015). Results of Grade Six Student Achievement from the National Assessment in 2013, EQAD.



Source: MoEYS (2015). Results of Grade Six Student Achievement from the National Assessment in 2013, EQAD.

Figure 6-11: Area-wise Achievement in Mathematics in National Assessment 2013

6.1.4 School Management

(1) School Budget

Government schools throughout the country receive a "Programmeme Budget" (PB) through the education office of each district. The amount of money they receive is, as of March 2016, as follows:

- School support budget: 1,500,000 riels/year
- Implementation budget: 18,000 riels/student/year

MoEYS suggests that the POEs disburse PB to schools in 3-month cycles so that each school receives money 4 times a year, and each school is required to submit receipts at the end of each cycle. According to the interviews with school directors, each school is prepared for the case where the disbursement of PB is delayed: for example, borrowing money from its school support committee (SSC), using its own savings, diverting money from a different item of expenses.

In addition, SIDA supports the provision of School Improvement Grants (SIG) from September 2013 to August 2016 to improve the access to pre-school, primary and secondary education, improve the completion rate of primary and secondary education, and strengthen the capacity of school management.

(2) School Organisation and In-school Training

Each school has one school director and one or more vice directors under which technical groups are organised. All of the decisions, in terms of school management, are supposed to be made by the school director.

According to the government rules and regulations, each school has to establish an SSC, and the SSC is responsible for a wide range of activities: preparing and implementing a school's annual plan; improving enrolment ratios in cooperation with people in the society; monitoring the quality of teaching and learning in the school; encouraging the local community to provide financial support to the school, and so on.

Each school director assigns a leader of each technical group, and each technical group leader (TGL) conducts technical group meetings every month. A technical group meeting, which is a half-day programmeme, normally consists of an all-staff meeting to share administrative information and a subject-wise meeting including lesson observation and discussion. There are also a variety of ways to organise technical groups. Although the preferred method is to group the teachers of the same subject, teachers of neighbouring subjects (e.g., math and science) are often grouped together in the smaller schools, and teachers of the same subject from grade 7 to 12 are grouped together in some of the secondary schools.

One of the issues observed in the technical group meetings is the degree of teacher's participation. In the school monitoring that the STEPSAM3 project conducted in June 2015, some teachers came late to the technical group meetings, and some did not come at all. This is a likely result of the low wages paid to teachers[49], as many teachers prioritise their side-job over the technical group meetings. In the interview, some teachers said that those who join in the technical group meetings are thought of as unfortunate persons who do not have a side-job.

(3) Double Shift

As shown in Table 6-9, a number of schools adopt a "double-shift" system in order to accept more students into school education, and 3 out of 4 primary schools are 2-shift schools. In comparison between urban and rural schools, the proportion of 2-shift schools in urban areas is more than twice as large as that in rural areas, which is presumably related to the high advancement rate in urban areas. The salary for the teachers giving lessons in both shifts becomes double as well.

Table 6-9: Proportion of Double-shift Schools

Level	Preschool	Primary	Lower Sec	Upper Sec
Whole kingdom (%)	0.4	75.7	14.4	37.1

Level	Primary	Secondary
Whole kingdom (%)	75.7	24.1
Urban (%)	72.6	46.7
Rural (%)	76.0	20.6

Source: MoEYS (2015). Education Statistics and Indicators

[49] According to the World Bank (2015), the earnings of a married teacher with two dependents is below the poverty line.

(4) Teacher Deployment and Recruitment

Cambodia has so far adopted a "closed" system that only allows the graduates of teacher training institutes to become government school teachers, and all the new graduates are guaranteed a teaching job after graduating from their institutes.

For teacher deployment, each POE aggregates the information about new teacher needs in each school from kindergarten to grade12, and submits it to the department of personnel, which is followed by a discussion with the Ministry of Civil Service (MCS) and the Ministry of Economy and Finance (MEF). The decision on the number of teachers is finally made by the Council of Ministers, and sent to MoEYS. Each POE finally makes a decision about how many teachers will be deployed in which schools, and this information is also shared with each TTC. On the supply side, the trainees of each TTC can select the school where they want to work after graduation, although the selection process is made based on the order of their academic achievement in the TTC. According to the World Bank (2014)[50], 80% of TTC students think it is important whether they know someone in POE or DOE or the school in their province, rather than paying bribes to teach at a particular school.

(5) Teacher Salary and Promotion

Teacher salaries have been increased every year. According to the sub-decree 41 enforced in March 2016, the starting teacher salary has reached around 200 USD for primary, 220 USD for lower secondary, and 240 USD for upper secondary as in Table 6-10, and allowances for dependents will be added to the basic salary. While teachers may still feel this amount is unsatisfactory, the starting salary of primary teachers in 2016 is more than 2.5 times as much as that in 2013 which is around 78 USD. In addition, the teacher salary is now paid by means of a bank transfer. This change was made in 2014 so as to avoid corruption resulting from distributing cash by hand.

[50] World Bank (2014). Educating the next generation: Improving Teacher Quality in Cambodia. World Bank Cambodia, Phnom Penh

Table 6-10: Salary Scale from April 2016

No.	Function	Basic Salary			Education Functional Allowance	Supplementary Allowance	Total Salary	Other
Higher Education Teacher (Category A)								
1	Higher Education Trainers (Teach at National Institute of Education)	A 3 4	586,500		500,000		1,086,500	Minimum
		A 1 1	935,000		500,000	40,000	1,475,000	Maximum
2	Higher Education Teachers (Teach and Administration)	A 3 4	586,500		470,000		1,056,500	Minimum
		A 1 1	935,000		470,000	40,000	1,445,000	Maximum
3	Secondary Education Trainers (Teach at Teacher Training School)	A 3 4	586,500		390,000		976,500	Minimum
		A 1 1	935,000		390,000	40,000	1,365,000	Maximum
4	Secondary Teachers (Teach and Administration)	A 3 4	586,500		380,000		966,500	Minimum
		A 1 1	935,000		380,000	40,000	1,355,000	Maximum
Basic Education Teacher (Category B)								
1	Basic Education Trainers (Teach at Teacher Training School)	B 3 4	510,000		380,000		890,000	Minimum
		B 1 1	799,000		380,000		1,179,000	Maximum
2	Basic Education Teachers (Teach and Administration)	B 3 4	510,000		370,000		880,000	Minimum
		B 1 1	799,000		370,000		1,169,000	Maximum
Primary Education Teacher (Category C)								
1	Primary Education Trainers (Teach at Teacher Training School)	C 10	450,500		370,000		820,500	Minimum
		C 1	663,000		370,000		1,033,000	Maximum
2	Primary Education Teachers (Teach and Administration)	C 10	450,500		350,000		800,500	Minimum
		C 1	663,000		350,000		1,013,000	Maximum

Source: Sub-decree 41 (enforced in March 2016)

In regards to teacher evaluations, a decision by MoEYS in 2007 states that each POE is supposed to organise a committee to evaluate teachers and decide who is to be promoted, however teachers have been automatically promoted every 2 years since 2014-15 unless they have caused critical problems during the same period. In addition, the best teachers and best school directors are awarded in the Education Congress every year.

6.2 Preservice Teacher Training

6.2.1 PRESET System

Cambodia introduced a PRESET system in the early 1980s as a short programmeme to tackle the severe shortage of teachers in the post-conflict, reconstruction period, and established PTTCs and RTTCs in the middle of the 1980s to provide 1-year teacher training. The teacher qualification was "7 + 1" (lower secondary + 1 year) at the beginning, and continuously revised and upgraded to "8 + 2" (lower secondary + 2 years), "11 + 2" (upper secondary + 2 years) and finally "12 + 2", which is the current system. As of May 2016, PRESET from preschool to upper secondary education is conducted as in Table 6-11. Note that preschool education covers from 0 to 70 month-old babies and infants in Cambodia.

Table 6-11: PRESET System in Cambodia

Institute	PSTTC	PTTC	RTTC	NIE
Number	1	18	6	1
Qualification for applicants	Grade 12 (*PTTCs accept Grade 9 graduates for remote areas.)			Bachelor
Entrance exam	Yes			
Duration	2 years			1 year
Qualification after graduation	Preschool teacher	Primary teacher	Lower secondary teacher	Upper secondary teacher

Source: Prepared by JICA Study Team

Because the system for teacher preparation has been changed on a regular basis for more than 20 years, the educational qualifications of existing teachers varies widely. As in Table 6-12, more than 36% of teachers are equal to or below the lower secondary education, and the proportion of low-education teachers is higher in rural areas. This is likely to be because there still exists a "9 + 2" (lower secondary + 2 years) system in place, which targets the primary schools in remote and disadvantaged areas. In secondary education, as shown in Table 6-13, while there are less than 1% of primary-school-graduate teachers, there still are 15% of lower-secondary-graduate teachers. The ASEAN standard for school teachers is equivalent to a bachelor's degree, and Cambodia is also trying to upgrade teacher qualification to a BA or above. However, there are more than 67,000 primary and secondary teachers whose qualification is equivalent to upper secondary or below, and it will take much time and effort to upgrade their qualifications to the BA level.

Table 6-12: Educational Qualification of Primary Teachers

	Primary	Lower Sec	Upper Sec	Bachelor	Master	Doctor	Total
Total	1,162	14,914	25,777	2,385	54	0	44,292
%	2.6%	33.7%	58.2%	5.4%	0.1%	0.0%	100%
Urban	145	3,069	5,839	843	29	0	9,925
%	1.5%	30.9%	58.8%	8.5%	0.3%	0.0%	100%
Rural	1,017	11,845	19,938	1,542	25	0	34,367
%	3.0%	34.5%	58.0%	4.5%	0.1%	0.0%	100%

Source: MoEYS (2015). Educational statistics and indicators

Table 6-13: Educational Qualification of Secondary Teachers

	Primary	Lower Sec	Upper Sec	Bachelor	Master	Doctor	Total
Total	196	6,007	21,375	11,736	701	5	40,020
%	0.5 %	15.0 %	53.4%	29.3 %	1.8 %	0.0 %	100 %
Urban	39	1,577	5,551	4,987	444	1	12,599
%	0.3 %	12.5 %	44.1 %	39.6 %	3.5 %	0.0 %	100 %
Rural	157	4,430	15,824	6,749	257	4	27,421
%	0.6 %	16.2 %	57.7 %	24.6 %	0.9 %	0.0 %	100 %

Source: MoEYS (2015). Educational statistics and indicators

6.2.2 State of the Students in Teacher Training Centres

Table 6-14 below shows the number of graduates in the teacher training institutes from NIE to PSTTC. As seen in the table, more than 4,500 new teachers were trained in the past 5 years and the majority of these new teachers are female, except at the upper secondary level. Given that the number of new teachers was reduced in 2015 at the level of the Council of Ministers, MoEYS decided not to accept any new students for RTTCs in 2015, because there were a sufficient number of lower secondary teachers, based on the calculation of teacher-student ratio throughout the country.

Table 6-14: Graduates of Teacher Training Institutes from 2011 to 2015

No	Training	2011		2012		2013		2014		2015	
		Total	Female	Total	Female	Total	Female	Total	Female	Total	Female
1	**National Institute of Education**	**969**	**337**	**995**	**280**	**980**	**302**	**1,200**	**419**	**1,183**	**414**
2	**Pre-School Teacher Training Center**	**201**	**193**	**204**	**199**	**205**	**201**	**208**	**203**	**202**	**191**
3	**Provincial Teacher Training Colleges**	**2,163**	**1,256**	**1,951**	**1,144**	**1,947**	**1,276**	**2,222**	**1,552**	**2,309**	**1,615**
4	**Regional Teaher Training Centers**	**1,492**	**803**	**1,454**	**755**	**1,423**	**790**	**1,311**	**773**	**957**	**579**
	+ Mathematics-Physics	216	95	208	84	185	77	170	65	119	50
	+ Physics-Chemistry	188	87	170	85	170	90	158	98	118	69
	+ Biology-Earth Science	182	115	172	114	170	117	156	112	119	97
	+ History-Geogrphy	177	91	174	73	176	73	157	77	112	53
	+ Khmer-Moral-Civics	222	120	188	107	180	119	159	92	105	68
	+ Khmer-Home Economic	168	139	168	144	163	138	150	119	108	90
	+ Drama-History	16	8	10	6	11	9	10	7	9	4
	+ Music-History	8	3	9	4	8	3	5	1	7	2
	+ Art-History	6	3	9	2	10	2	8	1	8	4
	+ French-Khmer	63	40	58	29	58	37	60	40	38	27
	+ English-Khmer	246	102	288	107	292	125	278	161	214	115

Source: Information given by TTD

There is also a problem associated with the quality of the applicants to PTTCs and RTTCs. While they are grade 12 graduates, the World Bank (2015) has revealed that around 70% of PTTC students and 80% of RTTC students are actually low achievers who have passed the grade 12 examination at grade D or E. It appears to be the case that this teacher preparation system has been working as a safety net for grade 12 graduates, however, this has also contributes to degrading the quality of teachers and so leading to the overall inefficiency of teacher education.

To tackle this problem, MoEYS decided that those who passed the grade 12 exam at grade C or above can enter TTCs without taking the entrance examination, which resulted in the increase of quality students in the TTCs: the number of students who passed the grade 12 exam at C or above in 2015 was 1,105 (out of 1,813) in PTTCs and 6 (out of 200) in PSTTC, according to TTD[51].

6.2.3 State of TTC Trainers

According to the Teacher Training Institution Standards, developed by MoEYS in 2010, teacher trainers are required to have the following characteristics:

- Have at least 3-year teaching experience at general education schools,
- Deep knowledge in the field,
- Good morale and work experience,
- Be disciplined and punctual,
- Be able to use information system,
- Be able to speak either French or English, and
- Hold at least bachelor of education.

In addition, almost all the young trainers have studied in NIE after graduating a university. According to the World Bank (2015), more than 80% of TTC trainers have teaching experience in schools. However, a recent study conducted by the TPAP team has revealed that only around one half of P/RTTC trainers in Phnom Penh and Battambang have given lessons in school.

There is not an official, comprehensive report on the knowledge and skills of the TTC trainers. However, the baseline survey conducted by STEPSAM2 of JICA in 2009, in which the subject knowledge of P/RTTC science trainers was measured using TIMSS 2003 science tests for grades 4 and 8 students, disclosed their actual level of understanding as shown in Table 6-15. In this survey, the problems identified were that in the questions for primary and lower secondary students of the world:

- TTC trainers could correctly answer only 60% of questions,
- There is not a big difference between TTC trainers and students,
- PTTC trainers performed worse than RTTC trainers, and
- The correct answer % related to analysis and reasoning was below 50%.

The weakness in the questions on reasoning indicates the prevalence of science education relying on rote memoraization.

[51] They were Grade B or C students, and there were no “Grade A” students in the applicants.

Table 6-15: Test Results of TTC Science Trainers and Students in STEPSAM2 Baseline Survey

	Total (N=325)	Trainer		Trainee	
		PTTC (N=6)	RTTC (N=22)	PTTC (N=169)	RTTC (N=128)
Average Score in % Figures	58.0	61.1	66.1	53.4	62.5
% of Correct Answers					
by Content Domain					
Physical Science	60.5	68.5	74.2	56.3	63.3
Physics	68.7	79.2	71.6	67.6	69.1
Chemistry	53.9	60.0	76.4	47.2	58.6
Life Science	50.8	61.1	47.7	48.3	54.0
Earth Science	64.5	63.9	75.8	57.8	71.4
Environmental Science	52.2	33.3	59.1	46.4	59.6
by Cognitive Domain					
Factual Knowledge	69.4	68.8	75.6	64.4	75.0
Conceptual Understanding	61.7	70.8	69.9	56.1	67.3
Analysis & Reasoning	44.6	41.7	51.7	41.3	47.8

Source: STEPSAM2 (2009). Baseline Survey Report

Although TTC mathematics and science trainers have training opportunities through the projects of development partners, the trainers of other subjects have virtually no training opportunities to develop their subject knowledge and skills. In addition, a lack of books and internet web-sites for self-study written in Khmer, a lack of time for self-study due to side-jobs, and a lack of good habits of self-improvement, contribute to the deterioration of subject knowledge and skills of TTC trainers over time, with the exception of some well-motivated individuals.

On the other hand, with the help of CDPF, MoEYS selected 56 teacher trainers having a bachelor's degree and at least 5 year teaching experience, and sent them to a masters course on math and science at Khemarak University, as indicated in Table 6-16. They are studying in the university every weekend so as not to skip their teaching in each institute.

Table 6-16: Number of Teacher Trainers Doing a Masters Course in Khemarak University

	Math	Physics	Chemistry	Biology	Total
NIE	0	1	1	1	**3**
RTTC	4	11	10	7	**32**
Breakdown	PNH 1 BTB 1 PVG 2	PNH 3 BTB 2 PVG 2 KCM 1 KDL 2 TKO 1	PNH 2 BTB 2 PVG 2 KCM 1 KDL 2 TKO 1	PNH 1 BTB 2 KCM 1 KDL 2 TKO 1	
PTTC	11	1	1	7	**20**
Breakdown	PVG 1 KPT 2 KCM 2 BTB 3 SVG 2 KTM 1	SRP 1	TKO 1	KCN 1 KPT 2 BTB 1 KSP 1 SVG 1 TKO 1	
PSTTC	0	1	0	0	**1**
Total	**15**	**14**	**12**	**15**	**56**

PNH = Phnom Penh, BTB = Battambang, KCM = Kampong Cham, PVG = Prey Veng, TKO = Takeo, KDL = Kandal, KPT = Kampot, SVG = Svay Rieng, KTM = Kampong Thom, SRP = Siem Reap, KCN = Kampong Chhnang, KSP = Kampong Speu

Source: Prepared by JICA Study Team based on the information obtained in TTD

6.2.4 Laws and Regulations about Teacher Education Institutions

Table 6-17 below shows the difference in laws and regulations between Cambodia and Japan. As seen in the table, the Japanese teacher education system is based on the following acts:

(1) Basic Act on Education (1947, major revision in 2006)
(2) School Education Act (1947)
(3) Educational Personnel Certification Act (1949)
(4) National University Corporation Act (2003)[52]

These acts are complemented by the following ordinances of Japanese Ministry of Education, Culture, Science and Technology (MEXT):

(5) Ordinance for Enforcement of the Educational Personnel Certification Act (1954)
(6) University Establishment Standards (1956),

and the following decision of the Central Council of Education[53]:

(7) Accreditation Criteria for Teacher Training Programmemes (2001)

Among these, (1) and (2) are very fundamental; (3) gives the basis for (5) and (5) gives the basis for (7); and (4) gives the basis for (6).

On the other hand, Cambodia has acts and standards for the establishment of higher education institutions, but does not have acts and standards that correspond to "Education Personnel Certification Act" in Japan, a backbone of Japan's "Accreditation Criteria for Teacher Training Programmemes". The Cambodian "Teacher Education Provider Standards" (TEPS), which is under development, is expected to stipulate the standards for teacher education programmemes, teacher educators, and new teachers. However, there are not any acts or ordinances that stipulate what teacher candidates are required to study and how many credits they are required to obtain. It would be necessary for TEPS to give a detailed description of the content of education in each PRESET programmeme so that all the teacher education institutes can provide PRESET programmemes at the same level of quality.

In addition, a TEPS draft (as of 25 May 2016) proposes establishing a "Teacher Council" to accredit, supervise, and assess the teacher education programmemes. This "Teacher Council", which is almost equivalent to the teacher training subcommittee of the Central Council of Education of Japanese MEXT, is expected to be responsible for both INSET and PRESET to be conducted in higher education institutions, although TTD, ACC and HED do not currently have such functions.

[52] This Act is a replacement of "National School Establishment Act" (1949).
[53] According to the MEXT HP (http://www.mext.go.jp/english/organisation/1303054.htm), "The Central Council for Education is an organisation that carries out research and deliberations on important matters related to the promotion of education, lifelong learning, sports and other matters in response to requests from the Minister of Education, Culture, Sports, Science and Technology and provides its opinions to the Minister." (01 June 2016)

Table 6-17: Comparison of Laws and Regulations on Teacher Education between Cambodia and Japan

Category	Japan (*Acts are bolded.)	Cambodia (*Sub-decree or above are bolded.)
Basic laws	• **Basic Act on Education** (1947, major revision in 2006) • **School Education Act** (1947)	• **Education Law** (2007)
Courses and credits to receive a teacher licence	• **Educational Personnel Certification Act** (1949) • Ordinance for Enforcement of the Educational Personnel Certification Act (1954)	None (Each teacher training curriculum stipulates the courses.)
Establishment of teacher education courses in HEIs	• **National University Corporation Act** (2003) (*Replacement of National School Establishment Act (1949)) • University Establishment Standards (1956) • Accreditation Criteria for Teacher Training Programmemes (2001) (*Decision of the Central Council OF Education)	• **Government Decision on the Establishment of Teacher Training Collages** (1980) • **Government Decision on the Establishment of Regional Teacher Training Centres** (1984) • **Royal Decree on Accreditation of Higher Education** (2003) • Teacher Training Institution Standards (2010) • Minimum standards for institutional accreditation (2009, ACC) • Standards for University Establishment (2002) • Conditions and Detailed Criteria on the Establishment of Higher Educational Institutes (2007) (TEPS is being developed to set out the standards for HEIs involved in teacher education.)
Others	• Special Act for Education Personnel (1949) • Act on Special Measures for Educational Personnel in Compulsory Education (1974)	None (Sub-decree provides a salary scale for education personnel.)

Source: Prepared by JICA Study Team

6.3 Analysis of Teacher Training Curriculum

6.3.1 Overview of PRESET Curriculum

In the current system, TTD is responsible for developing the PRESET curricula from preschool to lower secondary. The PSTTC, PTTC, and RTTC curriculum was finally revised in December 2010, April 2011, and August 2011, respectively. Each curriculum has 44 weeks per year, among which 36 weeks are allocated to teaching and learning in TTCs (1st year: 30 weeks in classroom and 6 weeks for practicum, 2nd year: 28 weeks in classroom and 8 weeks in practicum), while the remaining 8 weeks are for new school year preparation, long vacation, examination, and so on. The contents of teaching consists of the following areas: professional skill training; strengthening basic knowledge; strengthening knowledge on each level of education and teaching methodology; pedagogical research; and practicum. The course hours

allocated to each area is as shown in Table 6-18.

Table 6-18: Teaching Hours Allocated to Each Area in PSTTC, PTTC and RTTC

Contents	Course Hours	Proportion
PSTTC curriculum	2,691	
Professional skill training	562	20.9 %
Strengthening basic knowledge	756	28.1 %
Strengthening the knowledge on preschool education and teaching methodology	805	29.9 %
Pedagogical research	16	0.6 %
Practicum	552	20.5 %
PTTC curriculum	2726	
Professional skill training	524	19.2 %
Strengthening basic knowledge	425	15.6 %
Strengthening the knowledge on primary education and teaching methodology	1209	44.4 %
Pedagogical research	16	0.6 %
Practicum	552	20.2 %
RTTC curriculum	2830	
Common subjects	1044	36.9 %
Study on speciality area and teaching methodology (1^{st} and 2^{nd} specialities)	1218	43.0 %
Pedagogical research	16	0.6 %
Practicum	552	19.5 %

Source: Prepared by the JICA Study Team

(1) Subjects on the Teaching Profession

In Japan, the Educational Personnel Certification Act includes a wide variety of subjects on the teaching profession as described in Table 6-19, in which those subjects called “Pedagogy” in a wider sense are mostly included. The Japanese teaching profession course requires students to gain more than 35 credits for preschool, 41 credits for primary, and 31 credits for lower secondary, in a 4-year period, where 2 credits are equal to 15 classes (= 1 semester). Although the Cambodian preservice teacher training is conducted over a 2 year period, which one half of the time required in Japan, it seems that the TTC curricula lacks some important topics, and only summarises other important topics, whereas, in Japan, these important topics are covered for a period of 6 months. For example, the TTC curricula does not thoroughly cover the history of education, philosophy of education, curriculum theory, etc., and provides only a few hours on the principle of education, and the rules and regulations on education.

In addition, both curricula contain a course on school administration. However, the Cambodian curriculum provides only a very practical knowledge on conducting daily routines in the school, while the Japanese teaching profession course provides more comprehensive knowledge on educational administration from the central to the provincial levels and analyses and dicusses the legal and financial issues.

In the psychology courses offered in PTTC and PSTTC, 60 out of the 90 course hours are disproportionately allocated to developmental psychology, and so the time for general educational psychology seems to be insufficient. Moreover, educational assessment, which is a part of educational psychology, has not yet been dealt with as an independent subject in TTCs. Also, according to the curriculum, TTC trainees are supposed to be assessed by both formative and summative measures. However, the TTC curriculum scarcely includes the lessons that trainees comprehensively learn the theory and practice of such assessment methodologies.

Table 6-19: Courses on "TEACHING profession" Offered in Japanese Universities

Educational Personnel Certification Act		Courses on "teaching profession" offered in Japanese universities (example) (mostly 2 credits = 15 classes)	Corresponding contents in TTC curriculum
Importance of teaching profession		• Introduction of Teaching Profession	→ Partly included in "Professional ethics"
Basic theory in education		• History of Education	→ None
		• Philosophy of Education	→ None
		• Principle of Education	→ 1-2 hours
		• Educational Psychology	→ Partly included in "psychology"
		• Developmental Psychology	→ Most part of "psychology"
		• Educational Assessment	→ None
		• Laws of Education	→ Partly included in "moral-civil"
		• Educational Administration	→ Partly involved in "school administration"
		• Classroom Management	→ Partly included in "CFS"
Theory and methodology necessary for teaching	Curriculum and teaching methodology	• Curriculum Theory	→ None
		• Studies of Moral Education	→ There are similar subjects.
		• Studies in Extra-curricular Activities	→ None
		• Methods of Early Childhood Education	→ Partly included in "CFS"
		• Teaching Methodology in Subject Education	→ There are similar subjects.
	School counselling	• School Guidance and Personnel Services: Career Education, School Counselling and Behaviour Problem	→ None

Source: Prepared by the JICA Study Team

Classroom management is included in the lessons on Child Friendly School (CFS). The course on CFS deals with a variety of topics, seemingly fragmentally, and gives insufficient time for classroom management and school counselling. It would be necessary to re-design the curriculum so that trainees can learn the topics and methodologies on classroom management in a more structured manner, based on the analysis of the issues seen in real classrooms.

Moreover, the study of the school curriculum, in which the learners acquire knowledge on the structure of the subject matter, is completely missing in the course on teaching methodology. As a result, it is likely that TTC trainees become teachers without knowing in what order the subject matter should be arranged, how logically one topic is related to another, how the learning of one topic in a subject helps learners acquire new knowledge in other subjects, and so on. Also, this would result in the teachers' indifference towards the order of instruction and the relationship between concepts in their teaching without noticing the theoretical gaps between the content in the textbooks, and finally in strengthening the memorization of the content.

Furthermore, particularly in the P/RTTC curriculum, the lessons on the teaching methodology focus only on teaching techniques from the teacher's point of view, with little regard to the

learners and their learning process, such as what they think difficult or how they make errors and mistakes. This may indicate that the curriculum does not define teachers as reflective practitioners who always learn from their practice to improve it. For Cambodian teachers, the necessity of acquiring Pedagogical Content Knowledge is also pointed out[54], so as to develop teachers' knowledge on the teaching of a certain topic to the students in front of them based on the sufficient contextual understanding.

(2) Pedagogical Research

As shown in the table above, only 16 hours are allocated to "Pedagogical Research" in 2 years, which is around 0.6% of total course hours. In this pedagogical research, TTC trainees are required to study a certain issue on education under the instruction of a trainer, and prepare a report using a given format. However, it is unlikely that trainees learn research methods, prepare and make presentations on their research, examine the research results, and share and discuss their outcomes, given 8 hours of study per year. It should be noted that in Japanese teacher education courses, students spend more than 67.5 hours in 1.5 years for this kind of research, which exclude the time for literature review, preparation for presentations, analysis of research results, and so on.

(3) Study of Each Discipline

One of the noteworthy characteristics in the P/RTTC curricula is the allocation of many course hours to "re-studying" of the content of secondary education. While the hours allocated to such restudying vary among courses, the lower secondary math course allocates 454 hours in 2 years, which accounts for approximately 16 % of the total course hours in RTTC, the PTTC Khmer, math, science, history, and geography subjects allocate 511 hours to re-studying, which is equivalent to 18.7% of the course hours. It seems inefficient to re-study the material which they have already learned, however it is also important for the TTC trainees, most of whom are graded as D or E in the grade 12 final examinations, to understand the content of secondary education, in order to gain self-confidence before entering the teaching profession.

On the other hand, each TTC curriculum contains ITC-related subjects so as to equip trainees with the knowledge and skills required to utilise computers to conduct educational activities. However, in reality, it is limited to the introduction of a computer and the internet, and does not reach the level at which the trainees collect information to prepare and improve their lessons and make presentations on their study. If MoEYS intends to make full use of ITC in the classroom, it should provide an environment for TTC trainees to easily access the computer facilities to conduct their research and utilise the equipment in their presentations.

(4) Practicum

It seems that sufficient course hours are allocated to practicum from PSTTC to RTTC: 6 weeks (216 hours) in the 1st year, and 8 weeks (336 hours) in the 2nd year. In the practicum, trainees observe lessons and support the teachers in the cooperative school in the 1st year, and prepare lesson plans and conduct lessons in the 2nd year. What needs to be improved in practicum is to specify the roles and responsibilities of TTC trainers and school teachers: in what ways and aspects they give instruction to the trainees, how often they discuss with the trainees, from what viewpoints they assess the trainees' work. It would be necessary to clarify these regulations and make sure that all the teachers and trainers implement them accordingly.

[54] Benveniste, L., Marshall, J. and Caridad Araujo, M. (2008). Teaching in Cambodia. Washington, DC, World Bank

(5) Courses in Liberal Arts

The TTC curricula include some general subjects, such as civilization, environment, human rights for children and women, knowledge on gender, prevention of sexual trafficking, exploitation and violation, and so on. However, these mainly deal with these issues within the Cambodian context, with little regard to the international trends and global context. It will be necessary for the teachers in the future to examine the existing issues of Cambodia from a much wider perspective, which will be highly conducive to making the quality of education and teachers come up to the international standards.

6.3.2 TTC Curriculum and the Development of Industrial Human Resources

As described the previous chapter, the manufacturing industry requires the graduates of basic education to have the following knowledge and skills.

(i) Basic linguistic skills, including communication and thinking skills
(ii) Basic mathematical and scientific skills and their application to daily lives
(iii) Basic knowledge on civil society, ethics, and moral

It is the role of teachers to produce such human resources to the society, and the existing TTCs, and TECs in the future, are the stronghold for this purpose. However, on the other side, these viewpoints do not seem to be taken into consideration in the current TTC curricula. While it should be linked with the ongoing school curriculum development, TTCs and TECs are required to produce teachers who not only have these knowledge and skills, but also have teaching skills that help students acquire such knowledge and skills. For example, the Japanese course of study (curriculum) for national language at the primary level is designed to gradually develop students' communication and thinking skills through the following process:

- Lower primary (grade 1 to 2):
  ➔ Students will be able to record, explain, and introduce what they see and what they want to inform, and report what they have experienced.

- Middle primary (grade 3 to 4):
  ➔ Students will be able to record and arrange the information about what they have explored, observed, and experimented, summarise into a report, and make a presentation using the data and information.

- Upper primary (grade 5 to 6):
  ➔ Students will be able to write their own explanation, opinion, and report according to the purpose, explain it with reasons and evidence, and reflect their linguistic activities.

This sort of elabouration is also necessary in the new school curriculum in Cambodia, and simultaneously in teacher education so as to produce teachers who can foster such students' knowledge and skills.

The same holds true for mathematics and science education. The school curriculum should be designed to help students gradually acquire process skills, such as observation, measurement, and prediction, from early grades, develop an ability to find and solve problems in their surroundings, and the skills to explain their ideas and solutions using tables and figures. In this regard, the teacher education curriculum should be revised accordingly.

With regards to social studies, while the TTC curriculum includes civil, ethic, and moral education, these deal with the basic required knowledge, and as a teacher, and are not designed to develop primary and lower secondary students as future change agents who can contribute to solving the social issues around them. Therefore, for the industrial development of Cambodia, the new school curriculum and teacher education curriculum for social studies should be designed to help students acquire a law-abiding spirit, the habit of punctuality, and the knowledge on the rules for communal life, from the early grades in primary education, and facilitate them to learn how society works (e.g., the concept and necessity of taxes, etc.) and how they and the society are related with each other in which "society" is gradually enlarged from their village, commune, district and province, to the nation , ASEAN, and, finally, the world.

6.4 Facilities and Equipment of PTTC/RTTC

6.4.1 Current Situation of Teacher Training

In Cambodia, there are 6 Regional Teacher Training Centres (RTTC) where pre-service lower secondary teachers are trained. The regional capitals of Phnom Penh Capital, Kandal, Takeo, Kampong Cham, Prey Veng, and Battambang have the RTTCs. All RTTCs are located in the town of the respective regional capitals.

On the other hand, there are 18 Provincial Teacher Training Colleges (PTTC) where pre-service primary teachers are trained, all of which are located in the town of respective provincial capitals. All 6 regional capitals with the RTTCs also have the PTTCs. And, MoYES has proposed to integrate the RTTCs and the PTTCs into TECs in the 6 regional capitals. Accordingly, the Consultant team surveyed all 6 RTTCs to inspect the existing buildings and available equipment. This section discusses the PTTCs and RTTCs in Phnom Penh and Battambang, for which the Cambodian side requests JICA's assistance.

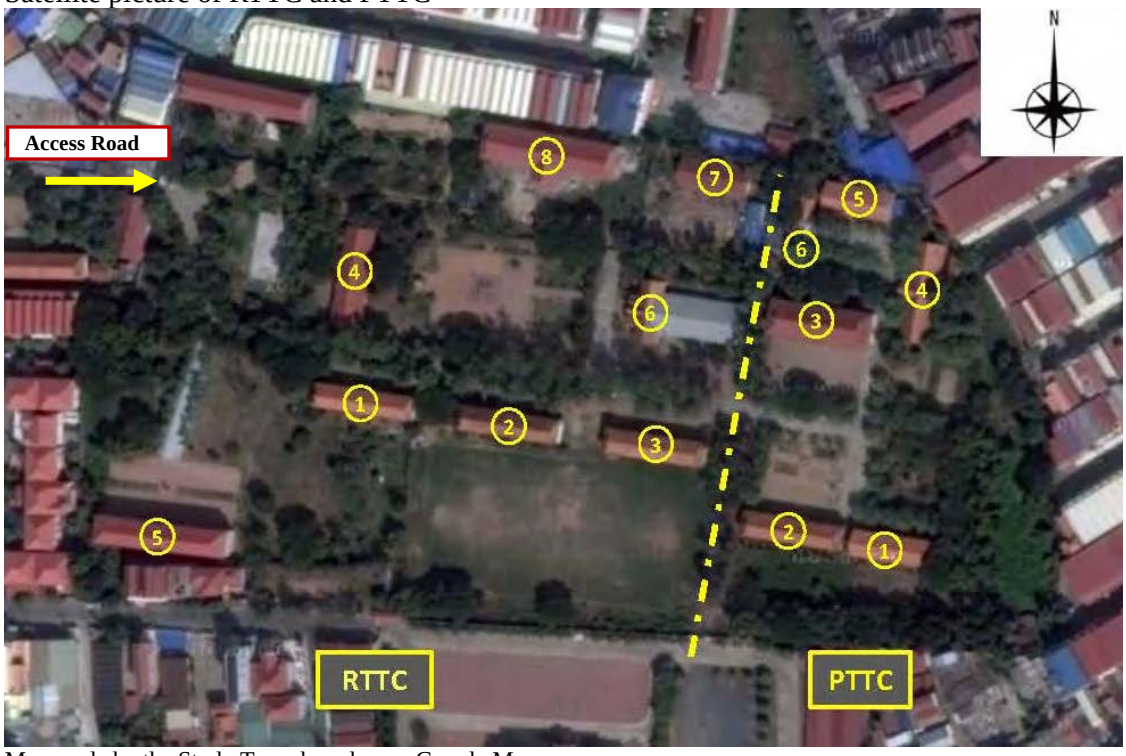
(1) Phnom Penh PTTC/RTTC

Location in the aerial map

Map made by the Study Team based upon Google Map

Figure 6-12: Location of RTTC&PTTC Phnom Penh in a Satellite Map

Satellite picture of RTTC and PTTC



Map made by the Study Team based upon Google Map

Figure 6-13: Location of RTTC&PTTC Phnom Penh Campus in a Satellite Map

Detailed Information of the Site:

The site area is small compared to those of the provincial RTTCs/PTTCs. Many buildings are 2-storey Reinforced Concrete (RC), while most of buildings in other RTTCs/PTTCs in the provinces are single-story RC.

8 buildings and 6 buildings were constructed between late 1980s and 2010s in the RTTC and the PTTC respectively. Additionally, in the RTTC, a student dormitory of 3-storey RC building with a budget from the Office of Prime Minister is now being constructed and will be completed soon. Furthermore, in the RTTC, a labouratory building of single-story RC was constructed with a budget of Grant Assistant for Grass-roots Human Security Projects (GGP), provided by the Embassy of Japan (EoJ) in 2009.

On the other hand, a meeting hall building of 2-storey RC was built by a Japanese NGO called Japan Team of Young Human Power (JHP) in the PTTC.

Information on the remaining buildings is summarised in the tables below. According to PTTC, the financial sources vary from development partners such as EU and ADB, to the Government of Cambodia, including the office of the Prime Minister. In general, the buildings are not well maintained and consequently, the meeting hall in the RTTC and the library building in the PTTC are no longer used due to deterioration.

Table 6-20: General Information of the Site: RTTC & PTTC Phnom Penh

Total Site Area	Access	Soil Condition	Construction Plot
RTTC +PTTC 73,534 sqm	Through a 500m access road from a main road	Weak soil and piling is necessary. The length of the existing piles is unknown.	Available. Refer to the survey sheet.
History of Natural Disasters (flooding etc)	**Electrical Service (Incoming)**	**Public Water and Sewage**	**Communication System**
Buildings get submerged about 50cm above the ground level at time of a torrent in the rainy season.	Connected.	Both are connected.	No land line telephone. Internet connection (wifi) and mobile phone connection are available.

Table 6-21: Existing Buildings and Available Equipment: RTTC Phnom Penh

RTCC Phnom Penh								
1. Administration Building		Structure: RC	No. of Stories:2	Year of Construction :1986-89		Budget Source: DP	Degree of Dilapidation
Director's room	1	Professor and staff room	1	Office room	1	RGC	About 30 years old. May be good for use 10 more years. Renovation is necessary.
Computer room	2	Equipment room	2	Library room	1		
Store	1	Male toilet	1	Female toilet	1		
Room with equipment		Available equipment				Budget Source:DP	Continuous use
Computer room1		Network computing system (for 25 students)				ADB(2013)	Possible. But equipment may become out of date soon.
Computer room2		Desktop computer					Ditto
2. Lecture building		Structure: RC	No. of Stories:2	Year of Construction :1986-89		Budget Source: DP	Degree of Dilapidation
Lecture room	6	Home economics room	1	Kitchen for home economics	1	MoEYS	About 30 years old. May be good for use 10 more years. Renovation is necessary.
Male toilet	2	Female toilet	2				
3. Lecture building		Structure: RC	No. of Stories:2	Year of Construction :1986-89		Budget Source: DP	Degree of Dilapidation
Lecture room	7	Equipment room	1	Male toilet	2	MoEYS	About 30 years old. May be good for use 10 more years. Renovation is necessary.
Female toilet	2						
4. Labouratory building		Structure: RC	No. of Stories:1	Year of Construction :2008		Budget Source: DP	Degree of Dilapidation
Biology/Earth science room	1	Equipment room for Biology/earth science room	1	Male toilet	1	EOJ (GGP)	About 8 years old. May be good for use 30 more years.
Chemistry Labouratory room	1	Preparation room for Chemistry labouratory room	1	Female toilet	1		
Physics Labouratory room	1	Preparation room for Physics labouratory room	1				

Room with equipment	Available equipment				Budget Source:DP	Continuous use
Physics Labouratory room	Table-bench for experiment (for two)				ADB(2008)	Possible but not suitable for group work.
	Equipment for experiment				Rotary club, CIESF, ADB	Possible but the quantity of each item is not enough
Chemistry Labouratory room	Table-bench for experiment				ADB(2008)	Possible, but the use is limited due to the poor infrastructure
	Equipment for experiment				CIESF,ADB	Possible but the quantity of each item is not enough.
Biology/geoscience Labouratory room	Table-bench for experiment				ADB(2008)	Possible, but the use is limited due to the poor infrastructure
	equipment for experiment				CIESF, ADB	Possible but the quantity of each item is not enough.
	Poster / panel				VVOB	Possible
	Human body anatomical model					Possible
5. Lecture building	Structure: RC	No. of Stories:3	Year of Construction :2013		Budget Source: DP	Degree of Dilapidation
Lecture room 12	Meeting room	1	Store	2	Prime Minister	About 5 years old. May be good for use for 35 more years.
Male toilet 4	Female toilet	4				
6. Student hall	Structure: RC	No. of Stories:1	Year of Construction :1989		Budget Source: DP	Degree of Dilapidation
Piloti 1	Hall (Large)	1	Rehearsal room	2	Khmer immigrants in the U.S.	About 27 years old. No longer used due to dilapidation. A new building is requested.
Waiting room 2	Male toilet	1	Female toilet	1		
7. Student dormitory	Structure: RC	No. of Stories: 2	Year of Construction: 2001		Budget Source: DP	Degree of Dilapidation
Bedroom 8	Toilet/Shower room	2			Unknown	About 15 years old. May be good for use 15 more years. Renovation is necessary.
8. New Student dormitory	Structure: RC	No. of Stories: 3	Year of Construction: 2016		Budget Source: DP	Degree of Dilapidation
Bedroom 48	Hall	1	Kitchen	1	ADB	To be completed soon. Finishing work is ongoing as of March 2016.
Cafeteria building 1	Landry	1	Toilet	5		
Shower room 4	Motorbike parking	1				

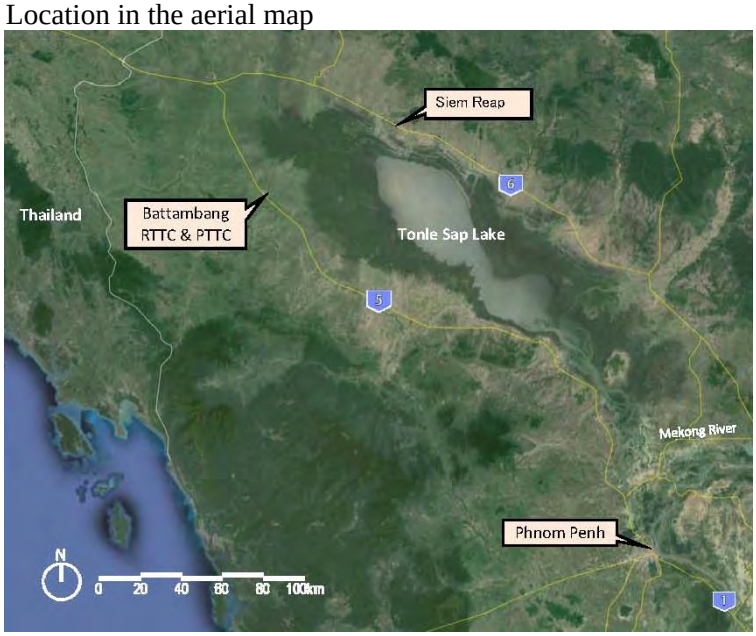
Table 6-22: Existing Buildings and Available Equipment: PTTC Phnom Penh

PTTC Phnom Penh						
1. Lecture/Administration building		Structure: RC	No. of Stories:2	Year of Construction: 1998		Budget Source: DP	Degree of Dilapidation
Lecture room	4	Director's room	1	Professor and staff room	1	EU	About 18 years old. May be good for use 22 more years. Renovation is necessary.
2. Lecture building		Structure: RC	No. of Stories:2	Year of Construction: 1994		Budget Source: DP	Degree of Dilapidation
Lecture room	8	Male toilet	2	Female toilet	2	Belgium	About 22 years old. May be good for use 20 more years. Renovation is necessary.
3. Student hall		Structure: RC	No. of Stories:2	Year of Construction: 2004		Budget Source: DP	Degree of Dilapidation
Music room	1	Dance studio	1	Home economics room (sewing)	1	JHP (Japanese NGO)	About 12 years old. May be good for use 30 more years. Maintenance /repair is necessary.
Workshop room	1	Meeting room	1				
Room with equipment		Available equipment				Budget Source: DP	Continuous use
Music room		Electric piano (8 sets)				KOICA	Possible
		Organ				JHP	Impossible
		Key harmonica				JHP	Unknown
4. Library building		Structure: RC	No. of Stories:1	Year of Construction: 1986		Budget Source: DP	Degree of Dilapidation
Library room	1	Reading room	1			RGC	About 30 years old. No longer used due to poor maintenance. Needs to be demolished.
Room with equipment		Available equipment				Budget Source: DP	Continuous use
Computer room		Network computing system (For 32 students)				ADB(2013)	Possible. But equipment may become out of date soon.
5. Student dormitory		Structure: RC	No. of Stories:2	Year of Construction 1998		Budget Source: DP	Degree of Dilapidation
Bedroom	8	Toilet/Shower room	2			EU	About 18 years old. May be good for use 25 more years. Maintenance/ repair is necessary.
6. Cafeteria building		Structure: RC	No. of Stories:1	Year of Construction 1998		Budget Source: DP	Degree of Dilapidation
Kitchen	1	Cafeteria	1			EU	About 18 years old. May be good for use 25 more years. Maintenance/ repair is necessary.

Source: Field Survey by the Study Team

(2) Battambang PTTC/RTTC

Location in the aerial map



Map made by the Study Team based upon Google Map

Figure 6-14: Location of RTTC&PTTC Battambang in a Satellite Map

Map made by the Study Team based upon Google Map

Figure 6-15: Location of RTTC Battambang Campus in a Satellite Map

Map made by the Study Team based upon Google Map

Figure 6-16: Location of RTTC Campus and PTTC Campus in a Satellite Map[55]

Map made by the Study Team based upon Google Map

Figure 6-17: Location of PTTC Battambang Campus in a Satellite Map

Table 6-23: General Information of the Site: RTTC & PTTC Battambang

Total Site Area	Access	Soil Condition	Construction Plot
RTTC : 21,162 sqm. PTTC : 12,100 sqm.	By a main road.	Weak soil and piling is necessary. The length of existing piles is 4 m.	Available. Refer to the survey sheet.
History of Natural Disasters (flooding etc)	**Electrical Service (Incoming)**	**Public Water and Sewage**	**Communication System**
Buildings get submerged about 80cm above the ground level at a time of torrent in the rainy season.	Connected.	Both are connected.	Land line telephone is connected. Internet connection (wifi) and mobile phone connection are available.

[55] RTTC and PTTC are located in separate plots.

The RTTC and the PTTC are located on different plots, the distance of which is about 1.5km. Similar to the RTTC/PTTC Phnom Penh, the site areas are small compared to other RTTCs and thus many of the buildings are multi-storied including a 4-storied building.

11 buildings and 9 buildings were constructed between the mid-1980s and 2010 in the RTTC and the PTTC, respectively. Apart from the main campus, the RTTC owns an additional plot which is separated by a road (north-east to building 10 and 11). But, a large part of the building is unlawfully occupied by the neighborhood community and the RTTC has encountered trouble in dealing with them.

Against this backdrop, the Cambodian side proposed a plot surrounded by the buildings 1,2, 3 and 4,5,6 on the main campus for an additional building. Additionally, they requested to demolish and reconstruct buildings 1 and 2, which are older than 50 years, and building 6, a part of which is currently used as a lower secondary school.

Similar to the PTTC Phnom Penh, there is a labouratory building of 2-storey RC (building 4 in the above satellite picture), construction of which was assisted by GGP of EoJ in 2010. Likewise, in the PTTC, the lecture building (building 5) of 2-storey RC was funded by JHP. As for the budget sources of the remaining buildings in the RTTC and the PTTC, the details are summarised in the tables below. According to them, financial sources vary from development partners such as ADB and EU, to the Cambodian government, including the office of the Prime Minister. In general, the buildings are not well maintained both in the RTTC and the PTTC.

Table 6-24: Existing Buildings and Available Equipment: RTTC Battambang

RTTC Battambang							
1. Administration/ Technical/lecture building		Structure: RC	No. of Stories: 4	Year of Construction :1965		Budget Source: DP	Degree of Dilapidation
Director's room	1	Vice director's room	1	Library room	1	Donated by an individual (Cambodian) RGC, DP	Over 50 years old. No longer good for use. Demolishing and reconstruction are necessary.
VVOB	1	Computer room	1	Multi-purpose room	1		
Earth science room	1	Music room	1	Lecture room	2		
Art room	1	Home economics room (sewing)	2	English Library room	1		
Male toilet	1	Female toilet	1				
Room with equipment		Available equipment				Budget Source:DP	Continuous use
Computer room1		Desktop computer					Possible. But the equipment may be out of date soon.
Computer room2		Desktop computer					Ditto
Music room		Electric piano (10 sets)				KOICA	Possible.
2. Administration Building		Structure: RC	No. of Stories: 2	Year of Construction: 1958		Budget Source: DP	Degree of Dilapidation
Human Resource Administration room	1	English Lecture	1	Computer room	2	Donated by an individual (Cambodian) RGC, DP	Over 60 years old. No longer good for use. Demolishing and reconstruction are necessary.
Professor's room	2	Lecture room	1	Office room	1		
Store	1						
Room with equipment		Available equipment				Budget Source:DP	Continuous use
Computer room3		Network computing system				ADB (2013)	Possible. But the equipment may be out of date soon.
Computer room4		Network computing system				Ditto	Ditto
Store (Roof floor)		Wood work tool					Possible
3. Lecture building		Structure: RC	No. of Stories:2	Year of Construction: 2002		Budget Source: DP	Degree of Dilapidation
Lecture room	10	Female toilet	1	Male toilet	1	Prime Minister	About 14 years old. May be good for use 25 more years.
4. Labouratory building		Structure: RC	No. of Stories: 2	Year of Construction :2010		Budget Source: DP	Degree of Dilapidation
Biology/Earth science room	1	Equipment room for biology/earth science room	1	Male toilet	1	GGP (EoJ)	About 6 years old. May be good for use 35 more years.
Physics / Chemistry Labouratory room	1	Preparation room for Physics/ Chemistry room	1	Female toilet	1		
Room with equipment		Available equipment				Budget Source:DP	Continuous use
Physics /Chemistry Labouratory room		Equipment for experiment				JICA (STEPSAM)	Possible but the quantity of each item is not enough.

Biology/geoscience Labouratory room		Equipment for experiment					JICA (STEPSAM) Microscope was donated by the Government of Vietnam (1985)	Possible but the quantity of each item is not enough.
		Poster / Panel					VVOB(2011)	Possible
		Human body anatomical model						Possible
5. Lecture building		Structure: RC	No. of Stories: 2	Year of Construction :2002			Budget Source: DP	Degree of Dilapidation
Lecture room	10	Male toilet	1	Female toilet	1		Prime Minister	About 14 years old. May be good for use 25 more years.
6. Lecture building (Lower secondary school)		Structure: RC	No. of Stories:3	Year of Construction :1966			Budget Source: DP	Degree of Dilapidation
Lecture room	24	Store	1				Neighborhood community	About 50 years old. Currently in use but dilapidated. A new building is requested
7. Student hall		Structure: RC	No. of Stories:1	Year of Construction: 2004			Budget Source: DP	Degree of Dilapidation
Student hall	1						RGC	About 12 years old. May be good for use 30 more years.
8. Female dormitory -1		Structure: RC+ Wood (2-storied)	No. of Stories: 2	Year of Construction :1985			Budget Source: DP	Degree of Dilapidation
Bedroom	8	Professor's Bedroom	2				RGC	About 30 years old.
9. Female dormitory -2		Structure: RC	No. of Stories :2	Year of Construction :1999			Budget Source: DP	Degree of Dilapidation
Bedroom	8	Toilet	2				EU	About 17 years old. May be good for use 25 more years.
10.Male dormitory -1				Year of Construction :1987			Budget Source: DP	Degree of Dilapidation
Bedroom	8						RGC	
11. Male dormitory -2		Structure: RC+ wood (2-story)	No. of Stories: 2	Year of Construction :1999			Budget Source: DP	Degree of Dilapidation
Bedroom	8	Professor's Bedroom	2				EU	

Table 6-25: Existing Buildings and Available Equipment: PTTC Battambang

PTTC Battambang									
1. Administration Building		Structure: RC	No. of Stories:2	Year of Construction :2013		Budget Source: DP	Degree of Dilapidation
Director's room	1	Office room	1	Professor room	1	ADB	About 3 years old. May be good for use 40 more years.
Computer room	1	Library room	1	Meeting room	1		
Store	1	Male toilet	2	Female toilet	2		
Room with equipment		Available equipment				Budget Source: DP	Continuous use
Library room		Computer (3 sets)				Cell Card	Possible.
Computer room		Network computing system (for 52 students)				ADB(2013)	Possible. But the equipment may become out of date soon.
2. Lecture building		Structure: RC	No. of Stories :1	Year of Construction: 1997		Budget Source: DP	Degree of Dilapidation
Lecture room	6	Professor and staff room	1	Meeting room	1	EU	About 20 years old. May be good for use 20 more years.
Music room	1	Library room	1	Workshop room	1		
Room with equipment		Available equipment				Budget Source:DP	Continuous use
Wood work room (Workshop room)		Tool for wood work					Possible
Music room		Electric piano (10 sets)				KOICA	Possible
		Key harmonica				JICA	Unknown
3. Labouratory building		Structure: RC	No. of Stories:1	Year of Construction :2011		Budget Source: DP	Degree of Dilapidation
Labouratory room	2	Teachers and preparation room	1	Male toilet	1	GGP (EoJ)	About 5 years old. May be good for use 35 more years.
Female toilet	1						
Room with equipment		Available equipment				Budget Source: DP	Continuous use
Science room		Equipment for experiment					Possible. But the quantity and items are not enough.
		Poster/ panel				VVOB (2011)	Possible.
4. Male dormitory		Structure: RC	No. of Stories :2	Year of Construction 2000		Budget Source: DP	Degree of Dilapidation
Bedroom	3	Meeting room	1			RGC	About 16 years old. Maybe good for use 25 more years.
5. Lecture building		Structure: RC	No. of Storey:2	Year of Construction 2009		Budget Source: DP	Degree of Dilapidation
Lecture room	10	Male toilet	1	Female toilet	1	JHP (Japanese NGO)	About 7 years old. Maybe good for use 35 more years.
6. Female dormitory -1		Structure: RC	No. of Stories:2	Year of Construction :1997		Budget Source: DP	Degree of Dilapidation
Bedroom	8	Toilet	1	Shower room	1	EU	About 18 years old. Maybe good for use 25 more years.

7. Female dormitory -2		Structure: RC	No. of Stories :2	Year of Construction :1997		Budget Source: DP	Degree of Dilapidation
Bedroom	8	Toilet	1	Shower room	1	EU	About 18 years old. Maybe good for use 25 more years.
8. Cafeteria building		Structure: RC	No. of Storey:1	Year of Construction :1997		Budget Source: DP	Degree of Dilapidation
Kitchen	1	Cafeteria	1			EU	About 18 years old. Maybe good for use 25 more years.
9. Lecture building (Primary school)		Structure: RC	No. of Storey:2	Year of Construction :1997		Budget Source: DP	Degree of Dilapidation
Lecture room	8	Male toilet	1	Female toilet	1	EU	About 18 years old. Maybe good for use 25 more years.

Source: Field Survey by the Study Team

7. Higher Education Sub-Sector

7.1 Current Situation of Higher Education Sub-Sector

Higher Education Institutions (HEIs) in Cambodia are administered by 15 Ministries. When Cambodia moved to a market economy in 1994, those HEIs had to abandon the automatic intake of students from the HEIs of their own as government officers. The country has introduced a tuition fee paying system to the HEIs in 1997, which opened the door to private institutions.

Table 7-1: HEIs According to Administering Ministries

Ministries	National	Private	Total
Ministry of Education, Youth and Sport	12	59	71
Ministry of Labour and Vocational Training	12	13	25
Ministry of National Defense	5	0	5
Ministry of Agriculture, Forestry and Fisheries	3	0	3
Ministry of Cults and Religions	3	0	3
Ministry of Health	2	0	2
Ministry of Culture and Fine Arts	1	0	1
Ministry of Interior	1	0	1
Ministry of Economy and Finance	1	0	1
Ministry of Public Work and Transport	1	0	1
National Bank of Cambodia	1	0	1
Office of the Council of Ministries	1	0	1
Ministry of Social Affairs, Veterans, and Youth Rehabilitation	1	0	1
Ministry of Industry, Mines and Energy	1	0	1
Ministry of Post and Telecommunication	1	0	1
Total	46	72	118

Source: MoEYS EC Report (March 2016)

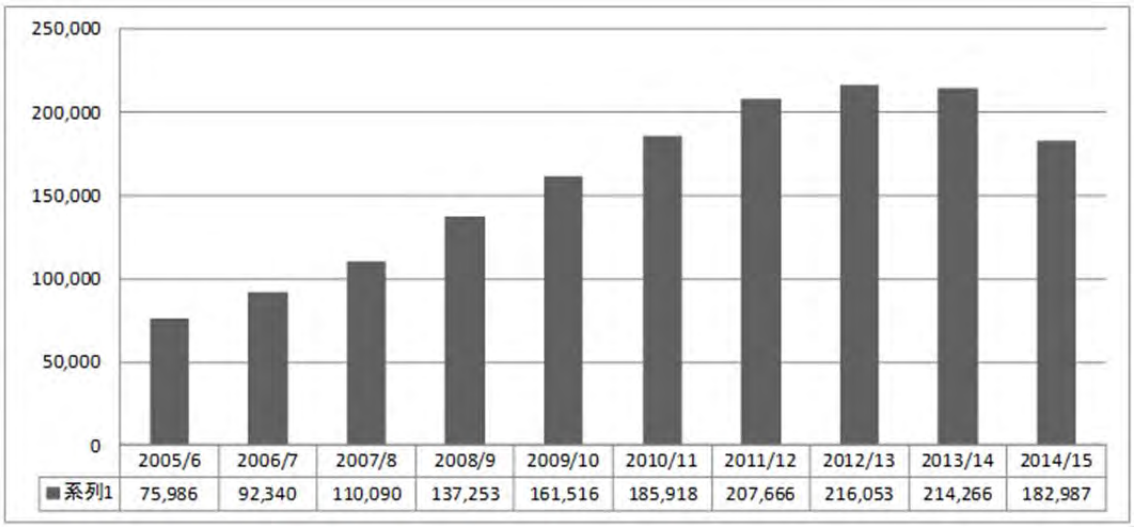
The number of HEIs has increased in the past 20 years, in which private institutions has risen since 2002 when the Sub-degree No. 54 ORNKR.BK (03 June 2002) on Criteria for establishment of University was issued. Top level politicians have since been promoting a one university one province policy, and the number of HEIs in the provinces is gradually increasing.

Table 7-2: Number of HEIs in Cambodia

Year	National	Private	Total
1997	8	1	9
2001	8	7	15
2002	9	16	25
2004	10	27	37
2011	32	57	93
2012	44	62	106
2013	39	66	105
2015	43	67	110
2016	46	72	118

Source: Date for the year between 1997 and 2012 are from Nishino (2009), and the ones for the year 2013 to 2016 are from MoEYS

The total number of students studying in undergraduate programmemes has increased consistently for the past 10 years, recently reaching a total number of 200,000 students.



Source: MoEYS

Figure 7-1: Location of PTTC Battambang Campus in a Satellite Map

Approximately 96,000 (44%) undergraduate students were enrolled in national institutions in the academic year 2013-14, while approx. 120,000 (56%) were accommodated in private universities. Prior to the year 2001-02, immediately before the Sub-degree No. 54 ORNKR.BK, mentioned above, the share of private universities was at 26%. There has been a constant increase of students in private universities after the law was enacted.

Approximately 180,000 students are in undergraduate level studies in the academic year 2014-15, of which about 46% are female. The number has increased 2.4% in the past 8 years. Post-graduate students are approx. 19,000 in the year 2013-14, growing 6.7 times from the figure in 2005-06. However, the percentage of female students in the post-graduate level studies remains more or less at 20%, which, is the second lowest level after Afghanistan in Asian countries.

Table 7-3: Number of Students in 2-14-15 Acadmic Year

	Associate Degree	Bachelor	Master	Doctor	Total
Number of students	24,970	182,987	18,253	1,175	227,385
# of female students	12,247	84,164	3,954	61	100,426
% of female students	49%	46%	22%	5%	44%

Source: data from MoEYS EC Report March 2016

According to the Human Capital Report 2015 from the World Economic Forum, the share of students in STEM academic fields are about 18%, in which 9% are in Science, 3% are in Engineering, 3% are in Medical and Health, and 2% are in Agriculture majors out of graduates from HEIs in Cambodia.

The MoEYS and the Embassy of the UK in Cambodia created a booklet to list all HEIs offering STEM-related majors in Cambodia. According to the material, there are 52 institutions currently providing the majors, of which 16 are national institutions and 36 are private. Out of the 16 national institutions, 11 are located in the capital city of Phnom Penh and 5 are in provinces. 24 private universities are in Phnom Penh, while 12 are in provinces. In conclusion, this survey

indicates the importance of national universities, which are supposed to take the role of easing the imbalance between the Capital and provinces[56].

Table 7-4: Number of HEIs Offering STEM Related Majors

	Capital	Province	Total
National	11	5	16
Private	24	12	36
Total	35	17	52

Source: STEM booklet issued by MoYES and UK Embassy

There are 110 faculties and departments listed in the above booklet, and, its distribution, according to various majors, is shown in the following table. Agriculture-related faculties and departments are the majority (26), followed by medical and health-related (20), and science and technology (18).

Table 7-5: Distribution of STEM Related Faculties and Departments According to the Area of Studies

Medical	Science	Engineering	Sci. & Tech.	Info. Tech.	Agric.	Others	Total
20	15	14	17	7	26	11	110

Source: STEM booklet issued by MoYES and UK Embassy
Notes: 1) A faculty in an university or a department in an institution is counted as one
2) Single institution without multiple departments is counted as one
3) Faculty or department of Architecture is counted in engineering
4) In case of more than one academic field is associated in its name, first word is taken. For example,"Faculty of Sciences, Engineering, and Information Sciences" is counted in "Science".

There is only one private institution which has engineering-related faculty out of all the universities in the provinces. The rest of the engineering-related faculties and departments are located in Phnom Penh.

Table 7-6: Number of Engineering Related Faculty and Department

	Capital	Province	Total
National	9	0	9
Private	4	1	5
Total	13	1	14

Source: STEM booklet issued by MoYES and UK Embassy

In contrast, the Faculty for Science and Technology are relatively available in the provinces. There are three national universities, including UBB and SRU, which have faculty. Out of the total 17 faculties, 9 are in the Capital and 8 are in provinces, while 3 are in national and 14 are in private institutions.

[56] As a reference, there are 14 national institutions in capital Tokyo and 75 in provincial areas in Japan (except junior colleges which offer programmes with associate degrees). http://www.mext.go.jp/b_menu/link/daigaku.htm (accessed on 26th May 2016)

Table 7-7: Number of Science and Technology Faculties

	Capital	Province	Total
National	0	3	3
Private	9	5	14
Total	9	8	17

Source: STEM booklet issued by MoYES and UK Embassy

7.2 Policies related to the Higher Education Sub-Sector

(1) Types of Higher Education Institutes

Education Law 2007 defines the type of HEIs by two categories, one of which is University and the other is Institute. A University must have at least five academic disciplines which include at least humanity, science, and social science, while an Institute can have only one academic discipline. Entry into the bachelor degree programmeme requires a general certificate for the completion of upper secondary education, while entry into an associate degree programmeme does not require the completion of upper secondary education.

(2) Policy for Free Tuition Fee and Scholarship

The Cambodian Government introduced a fee-paying system into national universities in the mid 1990s, which brought about an increase of students into the universities. The first private HEIs in Cambodia, Norton University, started in 1997, followed by a rapid expansion of private institutions. There are full and partial tuition waivers available, according to students' academic grades. The host institutions do not receive financial subsidies equivalent to those tuitions waived when they accept the students. MoEYS and WB have initiated a pilot project where the scholarship covers not only the cost for tuition but also living expenses. In Cambodia, university students quit studying when they find jobs, so the number of tuition waived students and scholarship recipients gradually decrease as their grades advance. There is currently no penalty, such as refunding the costs, if a tuition-waived or scholarship awarded student quits school. There is also no duty or national service for the students, such as working in government agencies or schools for a certain period of time after graduation.

The above-mentioned MoEYS and WB pilot scholarship is a part of the Higher Education Quality and Capacity Improvement Project (HEQCIP). This scheme provides the tuition fees for students, which becomes income for the hosting institutions. In addition, the scholarship covers the students' living expense, where US$70 and US$50 is provided monthly for students studying in the Phnom Penh area, and provinces, respectively, for a total of 10 months in a year. The programme started with 1,000 students. There are currently 862 scholarship students continuing their studies. The Cambodian government does not have a scholarship scheme for overseas study, and does not provide student loans.

(3) Policy related to the Higher Education Sub-Sector

Policies are for the higher education sub-sector are discussed in the Policy on Higher Education Vision 2030 (hereinafter referred to as "Vision 2030"), the Cambodia Industrial Development Policy 2015–2025 (hereinafter referred to as "IDP 2015"), and the Education Strategic Plan 2014-2018 (hereinafter referred to as ESP 2014)

Vision 2030 looks at three key issues, namely access, quality of learning through curriculum development through education and research, and institutional management, which, indicates the needs for reform throughout the sub-sector.

Table 7-8: Summary of Vision 2030

Access	Create a comprehensive equity and access programme that ensures all qualified students have the opportunity to study at HEIs and complete a quality programme.
Quality of learning: Curriculum	Develop relevant curricula that provides students with excellent knowledge and skills that help them contribute fully to national development and labour market needs.
Quality of learning: education and research	Improve quality of learning, teaching and research systems to provide students with knowledge and skills needed in the labour market and contribute to national development.
Institutional management	Develop a governance system, mechanisms and policies for higher education which enhance the quality of management and performance of higher education institutions and other relevant institutions.

Source: Vision 2030 (http://planipolis.iiep.unesco.org/upload/Cambodia/Cambodia_Policy_Higher_Education_2030.pdf)

The major policies described in IDP 2015 concerning HEIs are (1) increase as much as possible in multiple fold technical skills training in electrical, electronics, mechanics, chemistry, standards and metrology (inspection, verification, calibration, testing, and skills in the use of metrological tools); and (2) Strengthen education at the universities with a curriculum related to agriculture sciences and other important sciences, and, engineering, by upgrading the labouratory equipment in order to enhance education quality for research and development. In the appendix of "Matrix of Policy Measures and Action Plans" it is proposed to create a contest for technology-related individuals and groups, collabourating in scientific and technological innovation, providing specialised skills training to address the skills shortage in priority sectors, increasing training scholarships for engineers and technicians, strengthening capacity of HEIs, based on the demand for research and development of industrial technology, and, upgrading labouratory equipment, etc.

ESP 2014 mentions that the higher education development programme is one of the prioritised programmemes, which undertakes a systematic reform of the higher education system to bring higher education into line with regional and international standards, and enforce the quality implementation of the system; teaching and research in science, technology, engineering, arts and mathematics (STEAM) subjects.

In addition, the current Prime Minister recently stated that his government's goal is to build at least one public university in each of the country's 24 provinces.

(4) University Teachers

According to the "The Education, Youth and Sport Performance in the Academic Year 2014-2015 and Goals for the Academic Year 2015-2016" (herein after referred to as "EC Report 2016"), there are 12,256 academic staff working in HEIs in Cambodia, of which 1918 (15.66%) are female. The staff can be classified into two categories, namely (1) government public servant and (2) contracted staff. The former ones are under the management of the MoEYS human resource department, the latter ones are directly administered by the institutions for which they work. There is only one classification of academic staff in public HEIs in Cambodia which is "lecturer". It is reported that they have ongoing discussions to introduce additional classification such as "professor". When an academic staff with public servant status goes overseas to study, their status as a government worker is guaranteed until his/her return.

(5) Establishing Higher Education Institutes

Sub-decree No: 54 ANK.BK on the Criteria for the Establishment of University defines the necessary criteria and conditions for establishing universities. The law states that a university shall consist of at least 5 faculties, 3 of which must be (1) arts, humanities and languages, (2) mathematics and sciences, and (3) social sciences, and 2 faculties of their choice. In addition, PRAKAS No. 1435 MoEYS.PK on the Conditions and Details for Licensing Higher Education Institutions specifies the list of documents necessary to submit to MoEYS in order to establish HEIs. Such documents include; university mission, management structure, biography of rectors, deans, other head of departments, list of lecturers, curriculum, medium and long time strategic plan, and so forth

(6) Evaluation and Accreditation of Higher Education Institutes

Chapter 5 of the PRAKAS No. 1435 MoEYS.PK specifies that HEIs shall have an office or section for internal quality education assuring to self evaluation. In addition, external evaluation and accreditation is conducted by the Accreditation Committee of Cambodia, which is defined in Royal Decree No. NS/RKT/0303/129 on Accreditation of Higher Education.

7.3 Current Situation and Issues of Technical Education Faculties of Main Universities in Cambodia

According to a guidebook on STEM higher education institutes, compiled by the Department of Higher Education with assistance from the British Embassy, there are 52 institutes, including the Institute of Technology of Cambodia, University of Battambang, Svay Rieng University and Royal University of Phnom Penh.

7.3.1 Institutes of Technology of Cambodia (ITC)

(1) General Views of ITC

Institute of Technology of Cambodia (hereinafter referred to as “ITC”) is a national institute established in 1964 by the support of the Soviet Union. The following paragraphs explain an overview of ITC.

Management Structure

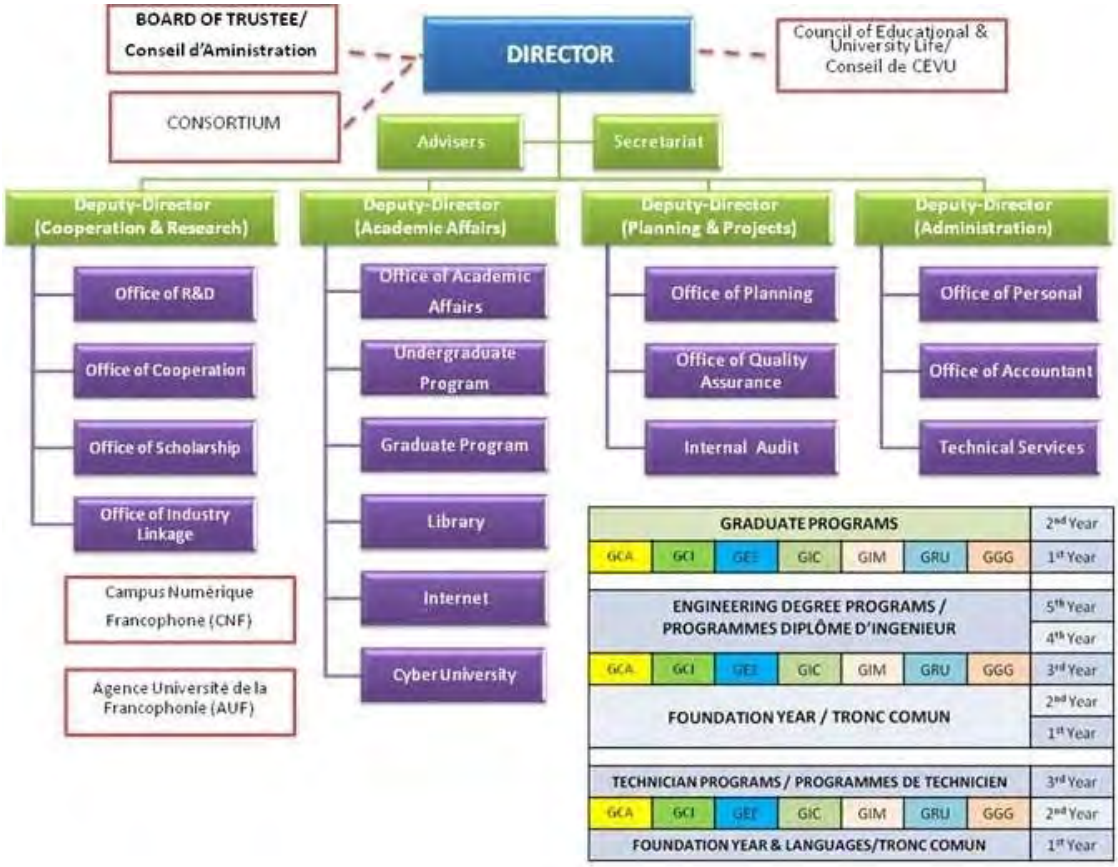
The Board of Trustees, which is chaired by the Minister of Culture and Fine Arts, is the supreme decision-making body of the institution. In the next level, there is an International Consortium which is held annually to discuss about various education and research issues. 20 members from Europe and Asia are participating in this consortium.

Table 7-9: ITC International Consortium Members

France	Cambodia	Belgium	Japan	Thailand	Vietnam	Total
11	3	2	2	1	1	20

Source: Prepared by the Study Team using data from ITC

The Director is the head of the institution and is supported by four Deputy Directors in charge of (1) Cooperation and Research, (2) Academic Affairs, (3) Planning and Projects, and (4) Administration.



Source: ITC Website, http://www.itc.edu.kh/en/index.php/about/organigram.html (accessed on 1st June 2016)

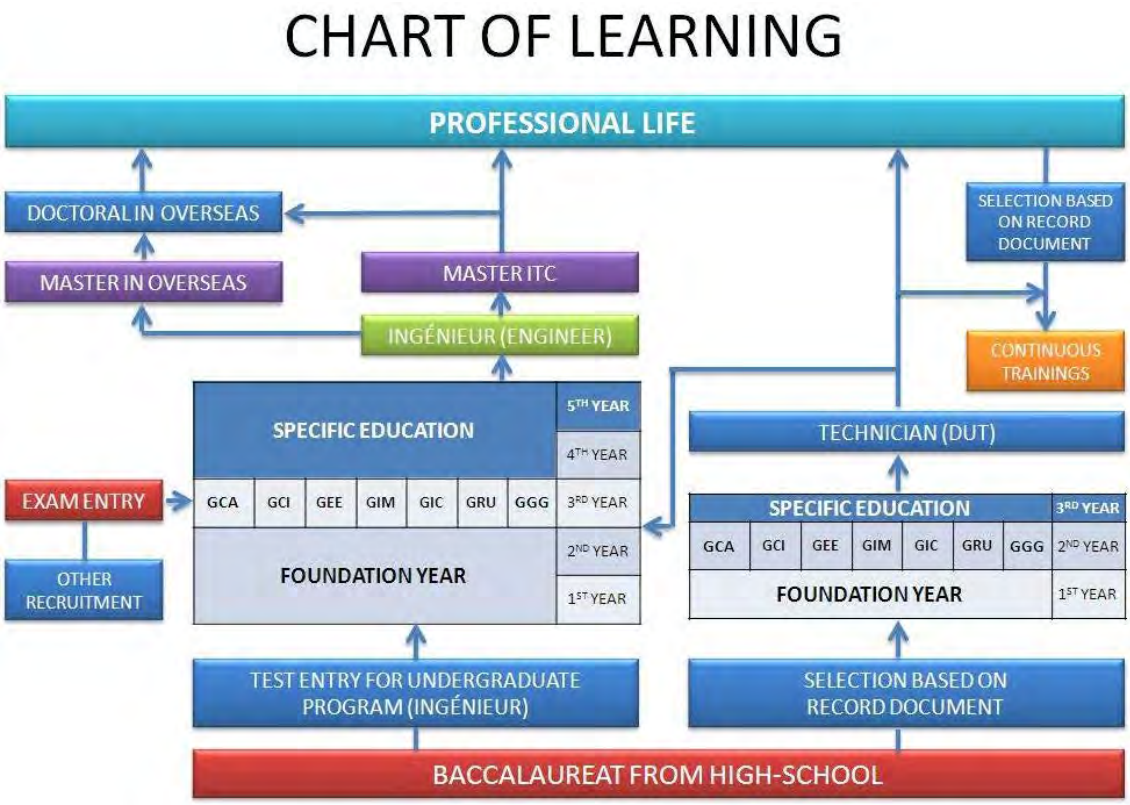
Figure 7-2: ITC Organisation Chart

Finance

More than 60% of the institution's expenditure is spent on human resource costs in the academic year 2013-14. The institution's own budget figures, out of the consolidated budget, increased by 14% in the past 4 years.

Academic Programmemes

ITC offers a 3 year technician programmeme and a 5 year Engineer programmeme. Master level study started in 2010. The institution is now preparing for a Doctor level studies programme on its campus.



Source: ITC Website http://www.itc.edu.kh/en/index.php/home/academic/chart-of-learning-skill.html (accessed on 1st June 2016)

Figure 7-3: Chart of Learning (ITC)

Both Technician and Engineer Programmemes offer the following 7 majors, namely Chemical Engineering and Food Technology (GCA), Civil Engineering (GCI), Electrical and Energy Engineering (GEE), Geo-resource and Geotechnical Engineering (GGG), Information and Communication Engineering (GIC), Industrial and Mechanical Engineering (GIM), and Rural Engineering (GRU). Students in the 3 year technician programmeme receive a certificate of Diplôme Universitaire de Technologie (DUT), and undergraduate students receive a degree of Ingénieur (Ing.) after successful completion of the programmeme.

ITC opened its master prorammes in academic year 2010-11 by offering a Civil Engineering major, followed by Electrical Engineering in 2011-12, Water Resource Engineering, Agro-Industrial Engineering, and Mobile Technology in 2012-13, and Industrial & Mechanical Engineering in 2013-14.

Table 7-10: ITC Master Students

	2010-11	2011-12	2012-13	2013-14	2014-15
Master of Civil Engineering	6	9	7	7	12
Master of Electrical Engineering		28	27	22	0
Master of Water Resource Engineering			14	17	15
Master of Agro-Industrial Engineering			9	14	10
Master of Industrial & Mechanical Engineering				15	8
Master of Mobile Technology			12	24	7

Source: Prepared by Study Team using date from ITC Consortium Meeting Report 2016

The institution has the intention to commence doctoral programmemes in the near future. A proposed framework of doctoral courses was submitted in the International Consortium in March 2015. ITC wishes to have collabourations with Japanese supporting universities in its operations.

Student

There are 3,777 students registered at the time of November 2015, which includes both Technician and undergraduate Engineer programmemes.

Table 7-11: ITC Student Distribution

	Technician (DUT)			Undergraduate (Ingénieur)						
	1st	2nd	Total	1st	2nd	3rd	4th	5th	Total	G.Total
Foundation (DTC)				871	721				1,592	1,592
Chemical Engineering and Food Technology (GCA),	78	46	124			100	68	50	218	342
Civil Engineering (GCI)	78	33	111			151	114	103	368	479
Electrical and Energy Engineering (GEE),						104	81	85	270	358
Geo-resource and Geotechnical Engineering (GGG)						37	27	45	109	109
Information and Communication Engineering (GIC)						80	54	38	172	172
Industrial and Mechanical Engineering (GIM)	44	30	74			126	89	84	299	373
Rural Engineering (GRU)	22	15	37			106	92	117	315	352
Total	268	166	434	871	721	704	525	522	3,343	3,777

Source: Prepared by the Study Team using date from ITC Consortium Meeting Report 2016

Enrollment capacity was approved in the Board of Trustees meeting in July 2015, and is 300 students per one grade for the Technician course and 800 students per one grade for the Undergraduate Engineering course. Candidates for the former course are selected by the academic record from their upper secondary schools, and the ones for the latter programmeme have to take an entrance examination consisting of mathematics, physics or chemistry, and logic. Students that perform well in the Technician programmeme may be allowed to transfer to the third year of the Undergraduate Engineer programmeme by taking a special examination.

Academic Staff

There are 245 members of the academic staff in ITC, of which 32% are doctor holders, 52% are masters, and 14% bachelors. 40.4% of them obtained the degrees in Cambodian institutions, while 22.4% obtained their degrees in France and 9.4% in Japan. Not all academic staff has obtained the post-graduate degrees which are necessary to bean university lecturer, so there will be a continuous need for providing opportunities for post-graduate level studies for the academic staff.

(2) Education and Research of ITC

Education

Students start from the Foundation Department during the 1st and 2nd year of their undergraduate programmeme. They select their own majors at the 3rd year. Study hours and respective credit hours distributions of the example from the GIM Department are shown in the following table.

Table 7-12: ITC Subject Distribution between Common and Major (GIM Dept.)

	3rd year		4th year		5th year		Study	Credit
Semester	5th	6th	7th	8th	9th	10th	hours	hours
Common	142	128	64	64	64		464	15
Major	416	352	368	400	384	384	2304	96

Source: Consortium Meeting March 2015

ITC's courses are comprised of three types of activities; lecture (C), tutorials (TD), and practical work (TP). An example of GEE Department is show below.

Table 7-13: ITC Percentage of Lecture, Tutorial, and Practical (GEE Dept.)

Grade	Major	Lecture (C) (Upper: hours, lower: %)	Tutorial (TD) (Upper: hours, lower: %)	Practical (TP) (Upper: hours, lower: %)
3rd Year		192 (25.1%)	400 (52.1%)	176 (22.9%)
4th Year	EE	224 (30%)	336 (43.89%)	208 (27.1%)
	EA	256 (33.3%)	288 (37.5%)	224 (29.2%)
	ET	320 (41.7%)	208 (27.1%)	240 (31.3%)
5th Year	EE	128 (33.3%)	160 (41.7%)	96 (25.0%)
	EA	96 (25%)	112 (29.2%)	176 (45.8%)
	ET	128 (33.3%)	112 (29.2%)	144 (37.5%)

Source: Consortium Meeting March 2015

The overall grade for each course is calculated with attendance being 10% of the grade, mid-term examination and report 30%, and final examination 60%. The final grade is expressed in a Grade Point Average (GPA) system.

Internship

Internship is one of the graduation requirements in ITC. Students are expected to conduct it on two occasions; during the 1st year and 2nd year in the Technician course, during the 2nd year and 5th year of the Engineer course. The first internship is for getting to know the company or factory where they will spend their time and the second is to conduct their graduation projects. Students are expected to do their graduation projects in the final semester. The majority of students choose the companies and factories in Phnom Penh, while some go abroad. 3 students went to Belgium, 6 students to France, and 7 to Thailand in the academic year 2014-15. Students must submit a report after the internship. Three types of evaluations are applied by, (1) by the host company, factory, or organisation, (2) the supervisor from ITC, and (3) a final presentation, in order to calculate the final grade of the internship. Some students opt for doing an internship in the research projects in ITC. It is recently reported that approximately 15 out of 50 students choose to do so in Department of Chemical Engineering and Food Technology (GCA). There is also an international internship programmeme with the National Institute of Applied Science in France. Students in this programmeme are eligible for a French degree if he/she successfully passes the examination in France.

Research

ITC has created a new academic post of "Lecturer-researcher" for promoting more research projects. There are now 47 lecture-researchers in 35 research projects. Several research collabourations have taken place, and are shown in the following table.

Table 7-14: ITC Research Collabouration with Japanese HEIs

Impact of Human Activities and Climate Change on Hydrological Events and Sediment Transport in the Mekong River Basin	Tokyo Tech
Monitoring of Air quality in Phnom Penh City, Cambodia	Kanazawa Univ.
Investigation of Microbial changes in Novel fermented pickles by incorporation of Japanese and Cambodian Fermentation techniques	Tokyo Tech
Methane gas emission from Landfill sites in urban areas of Cambodia	Tokyo Univ. / Kasetsart Univ.
Elucidation and modelling of sediment and nutrient dynamics in rivers flowing to Tonle Sap Lake	Tokyo Tech
Sustainable Solid Waste Management in Low-income Country, Case Study in Cambodia	Tokyo Tech / Philippine Univ.
Application of community based arsenic removal unit (Sarsac) for provision of safe water in affected province of Cambodia and Laos	Hokkaido Univ.
Removal of arsenic from aqueous solution and groundwater by adsorption onto Cambodian Clay	Tokyo Tech
Development of suitable technologies using municipal solid waste as solid fuel in Cambodia	Tokyo Tech

Source: Consortium Meeting Report March 2015

ITC has recently become one of the partner institutions in the project "Science and Technology Research Partnership for Sustainable Development (SATREPS)" which is a joint funding scheme of Japan Science and Technology Agency (JST) and JICA. ITC jointly organised a pilot project "Student Research Competition" in 2015 together with National University of Management, Royal University of Law and Economics, Royal University of Phnom Penh, and MoEYS. The theme for the year was "How can we make our city clean and green?"

Labouratory-based Education (LBE)

ITC recently came up with a new policy to introduce a Labouratory-based Education (LBE) method in the final year graduation project in the undergraduate programmeme and post-graduate research project. The following schedule plan was suggested by the institution.

February 2016: establish LBE Committee
March 2016: propose in Consortium Meeting
March 2016: develop incentive mechanisms for promoting
April 2016: establish LBE groups in 4 departments

- Electrical and Energy Engineering (GEE),
- Industrial and Mechanical Engineering (GIM)
- Geo-resource and Geotechnical Engineering (GGG)
- Information and Communication Engineering (GIC)

The following research themes are expected for the above 4 departments at the time of survey. Power and energy (GEE), electric and telecommunication (GEE), control and automation (GEE), renewable energy (GIM), industrial mechanics (GIM), geo-technics (GGG), geo-resources (GG), natural languages processing (GIC), and mobile tourism (GIC)

- To be determined: start in the remaining 3 departments
- Chemical Engineering and Food Technology (GCA),
- Civil Engineering (GCI)
- Rural Engineering (GRU)

ITC thinks that full-time master students will be the key to a smooth implementation of LBE style research groups. The institution expects that scholarships have to be provided to those full-time master students, so it proposes starting with 5 masters. However, the maximum capacity of students under the current physical conditions is said to be 10 students per department. This number is expected to increase when the proposed new building is ready by 2019. ITC expects 200 master students and 80 doctor students can then be accommodated.

(3) Others

Student Career

A survey conducted on 158 graduates of ITC in 2015 indicates 84% of the Engineer course graduates and 61% of Technician course graduates have managed to get jobs after graduation. In addition, 13% of graduated Engineers and 34% of graduated Technicians went to further studies at the time of the survey. Their salary ranges are US$200 to 500 for Engineers and US$100 to 300 for Technicians.

University-Industry Collabouration

There is an Industry Linkage and Cooperation Office that is responsible for university-industry collabouration matters. The Office organised several events in order to establish the ITC-Industry Consortium. In its first Consortium Meeting held on February 2014, twenty four (24) companies took part, and included 2 Japanese firms which have local branches in Cambodia. It is expected that the member companies in the Consortium will provide student internship opportunities, suggestions to ITC's curriculum, ideas for professional training that ITC offers for factory technical staff, and research collabourations.

ASEAN Network

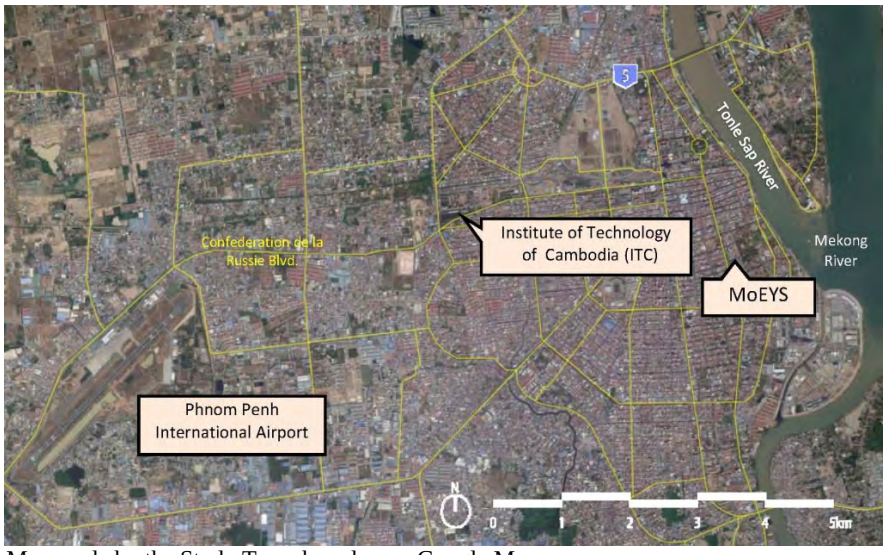
The ASEAN Cyber University Project through KOICA went into its second phase. There were 25 universities which took part in one workshop, out of which 3 indicated that they would join the project's e-learning network. The project plans to extend the cooperation with other universities in ASEAN together with an expected credit transfer mechanism.

The Director of ITC has set a goal of ITC being a host institution in AUN/SEED-Net mobility programmemes. The MoEYS Minister has a strong intention to have the institution being the leader in capacity development for other HEIs in Cambodia. The above-mentioned LBE model that ITC is going to develop can potentially be the one which contributes in human resource development for the upcoming industrialisation.

(4) Facilities and Equipments of ITC

The Institute of Technology of Cambodia is situated 1.5km west of Phnom Penh Royal Railway Station and along the Confederation de la russie Boulevard. It has seven buildings in its east-west elongated rectangle-shaped campus, which is about 7.5 ha large. In the center of the campus, there is a main building consisting of administration offices and lecture rooms. On the east side, there is a big conference hall. On the northern side of the main building, five buildings consisting of lecture rooms, labouratories and practical rooms spread out from east to west. In addition, a new 4-storied building was built by the governmental budget (building F: mainly for Foundation Engineering <for 1st year students> and Information and Communication

Engineering departments) in 2008 and a research innovation center of a total floor area of 1,314 sqm was opened with Japan's Grant Aid assistance in July 2015.



ITC is located 5 km from Airport towards the center of Phnom Penh Capital via Confédération de la russie Boulevard. On its west, there is RUPP.

Map made by the Study Team based upon Google Map.

Figure 7-4: Location of ITC Campus in a Satellite Map

Map made by the Study Team based upon Google Map

Figure 7-5: Satellite Picture of ITC Campus

The campus, though its size is small, owns enough facilities. Moreover, construction of a 6-storied new research building (113.5 m x 11.8 m) of RC (marked in yellow on the map) is planned with a governmental budget. The Government of Cambodia constructed most of the existing buildings in ITC; however, development partners have made various kinds of

contributions for ITC as well, particularly in providing equipment. The Grant Aid Assistance by the Government of Japan for the above-mentioned research innovation center project also provided equipment. Furthermore, a labouratory building for biofuel research (Building I: Labouratory building) and its equipment were provided by the Government of Japan.

Present Situation of Existing Equipment at ITC

ITC has received assistance of equipment provision from various development partners including Japan. The Government of Japan, thus far, has provided highly specialised research equipment as well as basic research equipment using the Grant Aid, Cultural Grant Aid, and Technical Assistance. Foreign private companies also provided ITC with equipment through the workshops that they assisted to organise. Furthermore, ITC introduced E-learning system with assistance from KOICA in 2012 and now records and distributes more than 10 contents in a studio provided by KOICA.

To summarise, ITC has the equipment necessary for the present research and education programmes. However, and henceforth, as a leading Cambodian university in engineering education, it may be necessary to equip ITC with basic measurement and analytical tools which could be used by different programmes, to disseminate its expertise to reginal universities/colleges.

7.3.2 University of Battambang (UBB)

(1) General Views of UBB

The current University of Battambang (hereinafter referred to as UBB) was established in 2007 as a national university. However, it follows the history of the Royal University of Battambang (1968) and National University of Management Battambang Branch (1998). The Board of Trustees, which consists of 18 members, is the supreme decision-making body of the university. The President is the head of the university, supported by a Vice President and 10 administrative departments.

UBB has the following four faculties and one institute:

- Faculty of Business Administration & Tourism
- Faculty of Agriculture & Food Processing
- Faculty of Science & Technology
- Faculty of Sociology & Community Development
- Faculty of Arts, Humanities & Education
- Institute of Foreign Languages

UBB offers three levels of academic degrees; associate degree, bachelor degree and master degree.

The Faculty of Science & Technology has four departments; the Department of Information Technology, Department of Civil Engineering, Department of Nuclear Engineering, and the Department of Mathematics. The Department of Information technology is the only department which has students in the 3rd and 4th year. UBB has a rule not to open the course if there are less than 10 students in the particular year. This is why the Department of Civil Engineering does not have students in the 3rd and 4th year. The university says that one of its reasons is low marks on the examination for the certificate of the completion of upper secondary education. The other factor is that there are many students who transfer to PTTC or RTTC from the Department of Mathematics if they succeed in its entrance examination. There are 4 shifts at UBB; the morning,

afternoon, evening, and weekend shift. The Science and Technology Faculty currently only offer a morning and weekend shift.

Table 7-15: UBB Number of Students in Faculty of Science and Technology

	Foundation		2nd year		3rd year		4th year		Total		
Department	MF	F	MF	F	MF	F	MF	F	MF	F	F%
Information Technology	50	7	26	4	16	3	15	1	107	15	14%
Civil Engineering	33	2	16	3					49	5	10%
Mathematics	26	13							26	13	50%
Nuclear Engineering									0	0	N/A

Source: data from UBB Student Affairs

There are 7 members of the academic staff in the Faculty of Science and Technology. They have the status of government employee, and are all master degree holders. In addition there are 3 contracted members out of which 1 is a doctor and 2 are bachelors. There is no regular programmemes available for the academic staff of the Faculty of Science and Technology to go for upgrading their academic level, while there are a few available for the Faculty of Agriculture and Food Processing. The Dean of the Science and Technology Faculty says that human resource development is the most challenging issue currently in his faculty.

Annual tuition for the foundation programmeme is currently US$250. Tuition for the undergraduate programmeme (2nd to 4th or 5th year) is US$350, and the master programmeme is US$750.

(2) Education and Research of UBB

The first year in the undergraduate programmeme is called foundation, where students study 10 common subjects such as Khmer Language, English, Mathematics, etc., and two to four selective subjects according to their majors. Students in the Faculty of Science and technology conduct graduation projects and write a thesis in the last semester, which is usually in the 4th year. The Civil Engineering major requires more subjects to study. Therefore the programmeme is 5 years, and its graduation project is in the 5th year. All students study set subjects and there are currently no optional or selective courses. One lecture period is 90 minutes, and there are 30 lectures in one semester. Therefore 1 course consists of a total of 45 teaching hours.

Table 7-16: UBB Course and Credit Hours (e.g. Civil Engineering Major)

	Semester	# of courses	# of credit hours
1st year (Foundation)	First	6	17
	Second	6	18
2nd year	First	6	18
	Second	6	18
3rd year	First	6	18
	Second	6	18
4th year	First	6	18
	Second	6	18
5th year	First	6	18
	Second	3	12

Source: UBB Student Affairs

The required number of credit hours for graduation is 80 for the Associate degree and 130 for bachelor degree (exception of Department of Civil Engineering), 54 for Master degree, and 72 for Doctor Degree.

Students in the Faculty of Science and technology must submit a graduation thesis. According to the list of the graduation thesis in 2014-15 academic years in the Department of Information Technology, the most popular theme was to develop a management system of customer, employee, etc using computer software for the host organisation of internship. The Department head of Civil Engineering nominated the theme of "Strength calculation about concrete installation by Matlab" from their list of thesis themes.

The President stressed that the university is aiming to be research oriented by 2020. She would like the other faculty to follow the Science and Technology and Agriculture and Food Processing Faculty so that all students would conduct graduation projects and write a thesis. She is trying to promote this by creating a Research and Development Office, and publishing a university Research Magazine. The UBB Faculty of Agriculture and Food Processing recently became a partner institution in a SATREPS project, which is lead by a professor from the Faculty of Agriculture in Kyushu University.

(3) Others

Although the university promotes STEM related majors, the students tend to be attracted by business-related studies. Many say that there are a limited number of jobs in the STEM area in Battambang, and students go into the area of business which currently offers more opportunities. In addition, STEM subject studies require high cost of study, since students have to bear the cost for experiments. As for the university, it is required to pay a huge cost for installing equipment and maintaining it, when it has a STEM related faculty or department. And, the availability of part-time lecturing jobs in the provinces is far less than in Phnom Penh, which prevents the high quality academic staff from staying in the universities in the provinces. There is no doctoral degree holders in the Faculty of Science and technology, which should be urgently remedied, in case if this faculty needs to take a responsible role in the promotion of STEM. On the other hand, the President indicated that there was a need in university management, and she is aiming to jointly develop a doctoral programmeme for management, with Saint Mary's University from the Philippines.

(4) Facilities and Equipment of UBB

Map made by the Study Team based upon Google Map

Figure 7-6: UBB Location in a Satellite Map

UBB is situated about 300 km north-west of Phnom Penh and is 6.5-hour drive from the capital. It is by Route 5 and 2.5 hour-drive from Thai-border. It stands in front of Battambang Airport, the operation of which is suspended.

Map made by the Study Team based upon Google Map

Figure 7-7: Satellite Picture of UBB Campus

Main buildings are: an administration building of 4-storied RC; a research building of 3-storied RC; lecture building A; lecture building B; a library building of 2-storied RC; and a professor and staff resident building. There are 48 lecture rooms available in the two lecture buildings. There are vacant rooms in the research building and thus no extension seems necessary. As for the library, the construction is suspended because of lack of a budget.

Map made by the Study Team based upon Google Map

Figure 7-8: Location of Female Students' Dormitory in a Satellite Map

Besides, a female student dormitory of single-storied RC is available, though it is 1.5km away from the campus. (The resident building of professors and staff stands in the campus.) A capacity of each room is 6-7 persons and a total of 8 rooms are available in 2 buildings. Thus, 48-56 students can be accommodated in total. According to an interview, no male student dormitory is available, assuming that male students rent rooms in the town. Furthermore, UBB owns an agricultural practice field of 221 ha large, which is 17 km away from the campus in the direction of Phnom Penh.

The school has laid optical fibers and provides an internet connection of 22Mbps on the campus. The Ministry of Economy and Finance (MEF) pays the provider for the connection fee. A TV conference room is also available on the campus.

The Study Team could not collect sufficient information on the existing facilities and equipment, because UBB had not been prepared well for the visit by the Study Team. For example, a list of inventories, which the Study Team had requested, was not submitted and the Study Team could not research all over the campus. Nevertheless, it turned out that there are separate labouratories for the faculty of agriculture and food processing and the faculty of science and technology.

As for the faculty of agriculture and food processing, MoEYS has equipped it with many measurement and analytical tools such as an atomic absorption spectrometer and gas chromatography mass spectrometer, both made in Japan. On the other hand, the faculty lacks basic tools such as glass tools and basic lab equipment. In principle, maintenance of those tools is outsourced to domestic agents. Expensive and large equipment is usually maintained by engineers from neighboring countries such as Thailand, Vietnam, Malaysia and Singapore or from the country of production. The faculty of agriculture and food processing sets its aim to become a leading regional agricultural center and to this end, it will be necessary that other departments are furnished with more equipment.

7.3.3 Svay Rieng University (SRU)

(1) General Views of SRU

Svay Rieng University (hereinafter referred to as SRU) was established in 2006 as a national university. The Board of Trustees is the supreme decision-making body of the university which consists of 5 members. The university is headed by a President, whom is supported by two Vice Presidents, one is for academic and research and the other for finance and administrative affairs. Academic staff concurrently serves as administrative staff in SRU. There are only two members of a full-time administrative staff. In addition, student interns are frequently used in many

administrative offices. For example, 11 student interns are currently working in 3 different shifts in the Academic Affairs Office.

SRU has following five faculties.

- Faculty of Agriculture
- Faculty of Arts, Humanities, and Foreign Language
- Faculty of Business Administration
- Faculty of Science and Technology
- Faculty of Social Science

SRU offers three levels of academic degrees; associate degree, bachelor degree, and master degree.

The university operates four shifts, morning, afternoon, evening, and weekend shift. This is for accommodating students who already have jobs in the factories nearby. The Study Team was told that factories start hiring students when they reach the 2nd year, when the university's foundation programmeme is complete. There is a trend that many students transfer to a weekend shift when they become Year 3 students.

There are 2,601 undergraduate students in total, of which female students consist of 45%. The Department of Finance and Banking in Faculty of Business Administration has the largest share of students (636) among all departments, followed by the Department of Public Administration in Faculty of Social Sciences (520), and the Department of Management in Faculty of Business Administration (468). Overall, the student share in STEM related Faculties, namely Science & Technology and Agriculture, is only 14%.

The Faculty of Science & Technology has two departments in operation; the Department of Computer Science, and the Department of Mathematics. The Department of Business Information Technology was planned, but was not approved by the MoEYS Minister. Year 2 in Mathematics Department do not have students, which is due to the similar reasons as mentioned in UBB.

Table 7-17: SRU Number of Students in the Faculty of Science & Technology

	Foundation		**2nd year**		**3rd year**		**4th year**		**Total**		
Department	MF	F	MF	F	MF	F	MF	F	MF	F	F%
Computer Science	51	5	31	2	32	2	29	2	143	11	8%
Mathematics	20	4	0	0	10	2	17	7	47	13	28%
Business Information Technology									0	0	N/A

Source: SRU Student Affairs
Trend: MF: Male and Female students, F: Female students, F%: % of female students

SRU has two types of staff; one is staff with a government employee status and the other is contract staff. When recruiting contract staff, the university usually recruits from the resource that they already know. In other words, the posts are not open to the public through the internet. Out of 101 members on the academic staff, 4 are doctoral degree holders, 85 are master, and 10 are bachelors. The number of female academic staff is 13 (14.7%).

US$180 is an annual tuition fee for the associate degree programmeme, US$280 and US$750 for undergraduate and master programmeme, respectively. There are several scholarship prorammes available in the university. The funding sources of the scholarship include prime minister's office, New Zealand, a Buddhist temple, and MoEYS / World Bank.

(2) Education and Research of SRU

The first year in the undergraduate programmeme is called foundation. All students study set subjects and currently there are no optional or selective courses. If a student fails in the final exam of the course, they have to sit in a makeup examination. The following table shows the number of courses and credit hours allocations for all semesters.

Table 7-18: SRU Course and Credit Hours (e.g. Computer Science Major)

	Semester	# of courses	# of credit hours
1st year (Foundation)	First	6	17
	Second	6	15
2nd year	First	6	18
	Second	6	18
3rd year	First	6	18
	Second	6	18
4th year	First	6	18
	Second	6	18

Source: SRU

Students in the Faculty of Science and Technology have to write a graduation thesis in the last semester of the 4th year. The Study Team obtained 25 graduation thesis titles in the last academic year from the Faculty, one of which is from the Mathematics Department. The thesis themes from the Computer Science Department include a POS system development for local guest houses and restaurants, networking in such places, and developing a data management system for such business places. Many students start working in such business places when they reach around Year 3. Such students frequently use their work places for the field of their thesis projects. Some students have such opportunities in public organisations. Some work in NGOs. They form groups of four students to conduct such projects. There is a choice of taking a final examination instead of writing a graduation thesis. However, all students in the Computer Science Department last year opted for a graduation thesis. One academic supervisor and one co-supervisor instruct each student group in a graduation thesis, of which one can be an external person. In the case of students in the programmeme for Teaching English as a Foreign Language, they take part in teaching practices (practicum) in schools.

(3) Others

SRU conducted a survey among graduates in 2011 and 2014. The percentage of students who found jobs increased to 95.58% from 80.27%. The industry which absorbed the largest number of graduates from the university is the garment industry. The university presumes that most of the graduates are working as office workers, and not in technical roles. It is said that approximately 70% of graduates from the Department of Computer Science went into the private sector and 20% went into teaching, while 60% from the Mathematics Department did go into the banking sector and 20% chose teaching. The remaining % of students may be in the public sector. In comparison, 35% of students from the Faculty of Agriculture went for jobs in the SEZs, 30% in the agriculture-related industries outside the SEZs, 20% in the micro-finance sector, and 15% in the public sector.

(4) Facilities and Equipment of SRU

Map made by the Study Team based upon Google Map

Figure 7-9: Location of SRU in a Satellite Map

The campus is located about 5km from the center of Svay Rieng and by Route 1. It is about 1.5 hour-drive from Vietnamese border. The center of Svay Rieng is about 120km south-east of Phnom Penh.

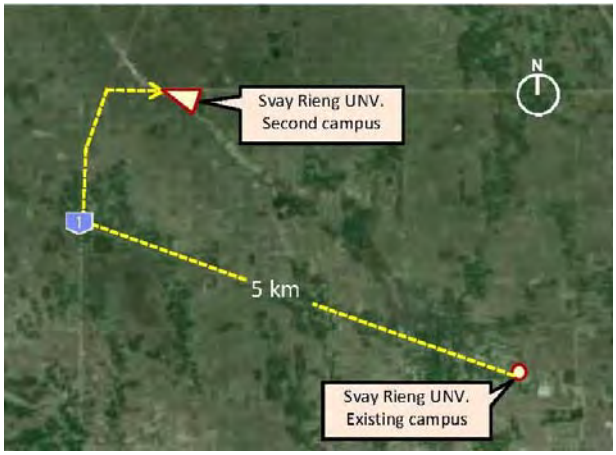
Map made by the Study Team based upon Google Map

Figure 7-10: Satellite Picture of SRU Campus SRU

Most of main facilities were constructed in 2005. Lecture building C and Hall & Library were constructed in 2009 and 2010 respectively.

Currently, Lecture building D and Meeting Hall are being built and will be available for use soon.

Lecture building D is 3-storied RC and 6 lecture rooms are planned on each floor, and a total of 18 lecture rooms will be available. There will be 57 lecture rooms in total in the entire campus, which sufficiently fulfills the demand.



Map made by the Study Team based upon Google Map

Figure 7-11: Location of the Second Campus of SRU

The Study Team was guided to the second campus of SRU by the chief of administration and the chief professor of the faculty of agriculture.

The second campus is 5.5 km away from the present campus in the direction toward Phnom Penh. The new campus was donated by the city of Svay Rieng and about 5.5 ha large. According to an interview, the campus will be used for practicums for subjects such as agriculture and animal husbandry taught under the faculty of agriculture. It is necessary to negotiate with the university if one intends to use the second campus for activities other than practicums of the faculty of agriculture.

An access road from Route 1 is not in a good condition, and thus it is necessary to improve the road.

The sport grounds on the south side of the administration building are just as large as a futsal court. Optical fibers are laid and 5Mbps and 17 Mbps internet connections are available, though the latter connection is not stable, as the connection speeds up for weekends and at night. An E-learning system and TV conference system by Polycom have not yet been introduced.

The faculty of agriculture is furnished with two labouratories: one is for the department of animal science and veterinary and the other is for the department of agronomy. The labouratories have equipment provided by the Higher Education Quality and Capacity Improvement Project (HEQCIP), assisted by the World Bank. However, lab tools made of glass are kept unorganised. Furthermore, the labouratories are used as temporary storage for computers, leaving little space for experiments. On the other hand, farm equipment for a field, cow house, aquaculture pond is sufficiently equipped.

Students of the department of agriculture study green power and use hand-made equipment which generates bio-gas for their practicum. Assuming that the LBE curriculum, using the labouratories and implementing practicums, will develop further, it is deemed that more equipment shall be needed.

Moreover, as the university has secured the second campus for the faculty of agriculture, additional equipment shall be needed, when the necessary facilities are constructed.

The department of computer science, under the faculty of science and technology, uses computers for lectures and practicums. Computer labouratories are well equipped and recently 20 sets of computers were renewed with a budget of MoEYS. The cost of maintenance of the computers is in principle covered by PB, but the actual disbursement of the fund usually takes time. Thus, the university established a strategic plan (action plan covering for a subsequent few years) this year, based on which the university determines the equipment procurement need and its priorities. By doing so, MoEYS regularly provides funds to the university. This initiative to secure a budget from MoEYS has been taken by the president of the university.

As for use of computer hardware, the university uses out-of-date computers, and lacks measurement equipment. Thus, practicums are not sufficiently implemented.

A hub to connect the university LAN is installed in a small box located in a corner of the room of the chairman of the department of computer science. The size of the hub is too small for a university having over 3,000 students and staff. The university has not used a TV conference system such as Polycom. The teaching staff of the university wishes to strengthen their expertise in the network system of Sysco Systems so that they could teach it to the students.


Pictures: Taken by the Study Team

Figure 7-12: Renewed Computers (Left), Optical Line Terminating Equipment (Right)

Previously, there was an Audio Visual room in the university, however, due to a shortage of lecture rooms, the University converted the AV room into a lecture room in 2013 and alternatively made a space in the library for putting 8 PCs and turned the space into a study room for the students. As there is a new building under construction, which is nearly completed, a new AV room may be created in the new building. When this takes place, it will necessary to supplement the existing equipment to ensure proper functionality.

There are 15 rooms (capacity of each room: 6 persons) for male students and 9 rooms for female students in the dormitory, and a total of 144 students can reside, however, the facility is now being renovated due to deterioration. There is an additional building of the same specifications with 12 rooms for staffs. Each room is shared by 2 or 3 persons there. Furthermore, 721 students, a quarter of the total enrollment, rent apartments nearby the campus. Some students working for factories in SEZ reside in an apartment provided by their workplace. The rest of the students commute from their homes.

7.3.4 Royal University of Phnom Penh (RUPP)

(1) General Views of RUPP

The Royal University of Phnom Penh (hereinafter referred to as RUPP) is the oldest university in Cambodia. RUPP is also one of the largest public universities, which hosts more than 12,000 students, across a diverse range of undergraduate and postgraduate programmes. RUPP has full membership of the ASEAN University Network (AUN).

RUPP has over 450 full-time staff. All of its 335 academic staff members hold tertiary qualifications, including 15 PhDs and 280 Masters Degrees. They are supported by over 120 administrative and maintenance staff.

There are five academic Faculties and several Foreign Language Institutes in the university

- Faculty of Science
- Faculty of Social Sciences and Humanities
- Faculty of Engineering
- Faculty of Development Studies
- Faculty of Education
- Institute of Foreign Languages

RUPP's Faculty of Engineering has just started in 2014 with the following three Departments.

- Department of Information Technology Engineering
- Department of Telecommunication and Electronic Engineering
- Department of Bioengineering

There are approximately 200 students in the Year 2 of the Faculty of Engineering, while there are approximately 320 Year 1 students. Apart from the bachelor programmeme, RUPP has a Master of Science in Information Technology Engineering (MITE) programmeme which started in 2009. The course had 58 students at the time of the survey, who are studying either in the evening or weekend.

The Faculty has 25 academic staff, most of who are from RUPP's Science Faculty who went to further study in engineering. Five of them have already obtained doctoral degrees from abroad, which include France, South Korea, Japan Germany, and Russia. They have currently three staff in overseas study, namely Finland, Germany, and Portugal. All have completed the Erasmus mobility programmeme.

The undergraduate studies are offered in full-time day shift only. The tuition fee is US$600 for undergraduate students. The MITE programmeme is US$2,000 for two years for Cambodian students and US$4,500 for foreign students.

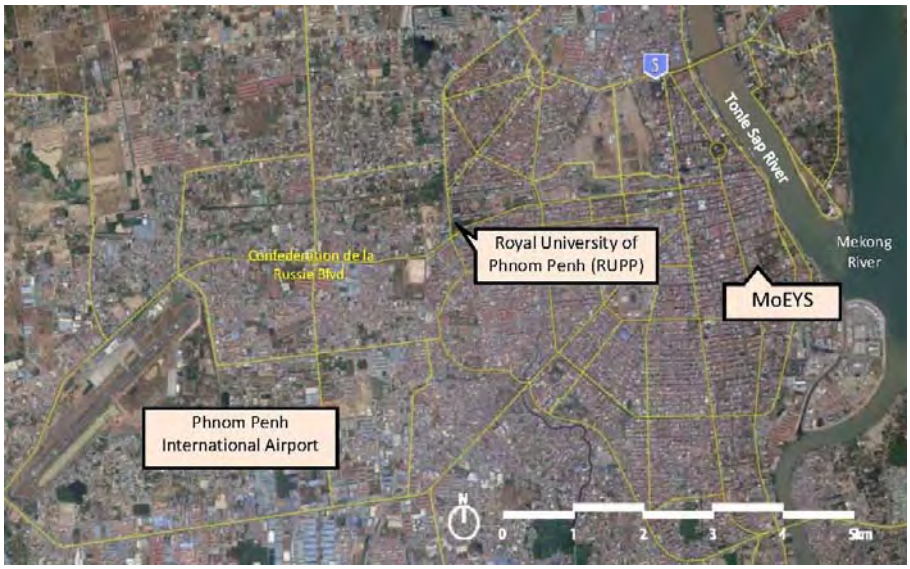
(2) Education and Research of RUPP

Engineering programmemes in RUPP are 4 years and similar to the programmemes in ASEAN countries, while the one offered by ITC is 5 years. The first year is called the Foundation Studies programme, which is a general education programmeme for all students at RUPP. The Department of Foundation Studies is in charge of this programmeme. One of the significant features of the Faculty of Engineering is that students conduct Practical Project every year after Year 2. It is an activity using method of Project-based Learning (PBL), where students form groups which try to find problems and its solutions on their own. Currently there is only Year 1 students who are in Foundation Studies and Year 2 students from the Faculty of Engineering. The faculty members wish to have internship programmeme, graduation thesis, or final examination for the Year 4 students

The Faculty of Engineering has a collabourative research project with the Faculty of Information Sciences and Arts in Toyo University in Tokyo. It is in the field of virtual technology, such as detailed architectural survey, 3D modeling, and virtual 3D animation. The project is developing, virtually, a 4 dimensional Cambodian history museum.

The Faculty has an IT solution service unit "OptimiS", which is for the capacity development of faculty members and the income generation of the Faculty.

(3) Facilities and Equipments of RUPP



Map made by the Study Team based upon Google Map

Figure 7-13: Location of RUPP in a Satellite Map

RUPP is located 5 km from Airport in the direction of the center of Phnom Penh Capital. It is by Confédération de la russie Boulevard. On its east, there is ITC.

Map made by the Study Team based upon Google Map

Figure 7-14: Satellite Picture of RUPP Campus

Although the campus is located in the town, it is larger than that of ITC. Inside, there are facilities necessary for the faculty of social science and humanities, the faculty of engineering, etc. Inside the campus, one can see the main facilities such as an administration building and lecture building which are medium-rise and 3 to 6-storied RC. The Cambodian-Japan Cooperation Center (CJCC) is located near the institute of foreign languages on the east side of

the campus. On the west side, likewise, there is the Cambodian-Korea Cooperation Center (CKCC), construction of which is assisted by the Government of the Republic of Korea. Ponds are scattered across the campus, making a new construction project difficult.

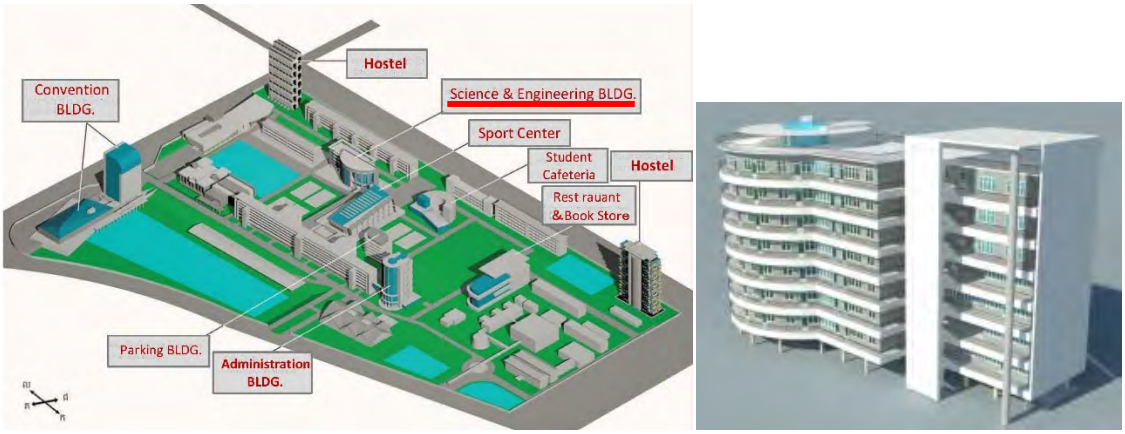
Present Situation of Existing Facilities and Equipment of the Faculty of Engineering

The faculty of engineering uses the No. 219A room of the administration/lecture building as a professor and staffs' room, which is the biggest building on the campus and was constructed in the 1960s. In addition, the faculty uses No.110 room, No.104 room, No.311B room, and No.313 room exclusively for its programmes. No.104 room is used as a computer labouratory and No.110 room is planned to be renovated as a bio-engineering labouratory and a computer labouratory. Some of rooms, such as No. 520 room, are used together with the faculty of science as a labouratory of chemistry.

Among the 3 departments of the faculty of engineering, the department of bio-engineering does not own any full-fledged labouratories, and thus, it has renovated several regular lecture rooms into temporary labouratories and rents labouratories from other departments. The remaining 2 departments have their own lecture rooms and computer rooms. 60 desktop computers in the computer rooms were procured with a budget from the university. A part of equipment owned by the department of telecommunication and electronics engineering was provided by KOICA. In addition, HEQCIP by the World Bank has provided equipment for the 3 departments; however, the variety of items and the quantity are low.

The faculty of engineering assumes an increase in student enrollment and accordingly plans to build a new building for the faculty with a governmental budget, considering that the capacity of the existing facilities is not sufficient. The new STEM building may be opened up in 2018 at the earliest.

As the new construction project allows the faculty to have a sufficient space to implement lectures and practicums according to the curriculum, the issue of a lack of equipment has been raised. The faculty submitted a list of necessary equipment to be procured with a price quotation to the board of the university (see Appendix), but, it has not been approved due to a lack of the budget.



Made by the Study Team based upon documents received from the faculty of engineering, RUPP

Figure 7-15: Extension Project of the Faculty of Engineering, RUPP

7.4 Issues of Higher Education

According to the document "Education: Where can Cambodia be in 5 years?" obtained from MoEYS, the challenges of the higher education sub-sector are low enrollment, inequitable access, low provision, and a lack of skilled orientation towards national development. It is also pointed out that government tuition waiving scheme, which should strategically increase the necessary human resources for national development priorities, is not delivering output as it was planned to do. Some had proposed that a few HEIs should offer different programmemes to the students with a government tuition waiver, from those who pay the tuition fees. In extreme cases, lecture times were scheduled during the break between the morning shift and afternoon shift for those with the government tuition waiver. Some presumed that this may be causing drop outsfrom the school. Hence, MoEYS and WB came up with a pilot project where a scholarship includes the cost for tuition, so that the host universities receive income for hosting those students. This would require HEIs to treat all students in the same manner, whether they have a tuition waiver or not. It is reported that the school dropout rate is beginning to decrease among students with this type of scholarship.

UNESCO Institute of Statistics studied 19,400 referee academic papers, 360 books, and 5.3 million conference presentation materials in the Scopus database in 2012 and found that the number of academic papers from Cambodia is at the same level with Laos, Myanmar, and Brunei out of all East Asia and ASEAN countries. The Master Plan for Research Development in the Education Sector 2011-2015 proposes creaing a data base of current researchers and their research groups, providing training for English academic writing, especially, in proposal and report writing, improving the environment for research, by improving access to academic journals and research equipment, in order to build HEIs' capacity for research. Furthermore, it also suggests providing incentives for lecturers who try research activities, consultations, and journal publications, which are extra activities in addition to doing lectures.

JICA's university-industry collabouration study 2015 indicates that the education and research environment including salary and other benefits do not allow those who went to post-graduate level studies to keep their motivation for research work in their original HEIs in Cambodia. Therefore, the above study report proposes raising salaries or providing incentives based on their research achievements. It also suggests creating competitive research funding and its prioritised distribution.

As shown in Chapter 5, technicians and engineers are expected to be in the greater need in the near future. However, such human resources are scarce in terms of both quantity and quality, especially, in provincial areas. Therefore, promoting student projects with problem solving methods or hands-on creative activities will be very much appreciated. Lecturers who can instruct such activities need to be immediately increased.

The numbers of students who choose to continuously study sciences are very few after the secondary schools. Lecturers that the Study Team interviewed say that those who choose the science or engineering related majors still have limited knowledge and capability in basic mathematics and science subjects. Advanced industries may not come to the areas unless they foresee an adequate amount of necessary human resources, such as technicians and engineers. There are many students who choose to become white-collar workers, and among those are students from the STEM majors. This may be one of the reasons that a practical education is not yet developed in these academic disciplines. Factories with advanced technologies do not see enough local technicians and engineers with practical skills. They hire employees from abroad, which results in higher production costs in Cambodia.

Quality is also an issue. The existing lecturers have limited capability to provide a practical-oriented education and research, especially, in the provincial HEIs. There are some academic disciplines which are foreseen as necessary for forthcoming industrial development in Cambodia, but are not yet available. This survey concludes that the required industrial structure change may not be realised in Cambodia unless these issues are carefully and urgently resolved.

Internships that students in the HEIs have been conducting are one of the potential means for developing practical-oriented knowledge and skills. However, some students indicate that certain host factories or companies treat them as additional temporary workers, and expect free-of-charge expertise from the student supervisors, and are not interested in the students creative ideas, achieved through their trials and errors. The internship programmeme is potentially one of the practical-oriented educational activities that the STEM related faculties in the provincial HEIs can also practice.

Table 7-19: Issues of Higher Education

Quantity issue	Improve enrollment ratio Invest strategically along with national development priorities (ex. STEM) Increase academic staff for improving student-lecturer ratio Develop environment so that student with whatever social and economic status can go for further studies (ex. tuition waiver, scholarship, student loan) Develop life-long education
Quality issues	Transform HEIs from educational institutions to research-oriented ones Develop environment for research (ex. Incentives for academic staff, competitive research fund) Establish quality assurance locally and link HEIs to global arena
Others	Strengthen university management Strengthen autonomy or discretion of HEIs Improve status of academic staff (ex. introduce professorship Coordinating among various ministries which administer HEIs Strengthen financial support and prioritise its allocation Develop strategy for private institutions

Source: Vision2030, EC Report 2015, Higher Education Governance January 2016

One of the key issues is the quality of students produced from the secondary education system, although it is not purely the issue of the higher education sub-sector. JICA's previous survey report on university-industry collabouration in 2015 also presented this same point of view. It is rather the inefficiency of primary and secondary level education than higher education level which results in an unsatisfactory level of basic mathematics skills for the factory workers. The university lecturers that the Study Team interviewed also indicated that the low basic academic abilities of the students in science and mathematics related subjects, sometimes caused them to drop out of school. Another concern is the low public interest in STEM related study areas and professional careers. There are currently a very limited number of students choosing STEM related majors, especially, among those in provincial HEIs. The team noticed that many mathematics major students transfer from university to teacher training colleges. This example indicates that the provincial education system is suffering a lack of STEM human resources. In conclusion, this survey proposes developing a comprehensive measure, which covers not only the higher education sub-sector but also other sub-sectors, in order to substantially expand the base of STEM human resources.

8. Technical Education Sub-Sector

8.1 Current Situation of Technical Education

The roles of delivering Technical Education and Vocational Training in Cambodia is principally shared between the General and Technical High Schools (GTHS) under the Ministry of Education, Youth and Sports (MoEYS) and the Technical and Vocational Education and Training (TVET) institutions under the Ministry of Labour and Vocational Training (MLVT).

8.1.1 Technical Education and Vocational Training under MoEYS

As of March 2016, only 3 GTHS have been administered by the MoEYS, namely 1) "Kampong Chheuteal High School" in Kampong Thom Province established in September 2001, abbreviated as "Kampong Chheuteal Institute" hereafter, 2) "Preah Norodom Sihakmoni General and Technical High School" in Kampong Chhnang Province opened up in May 2013, referenced as "Sihakmoni GTHS" hereafter, and 3) "Samdach Hun Sen ROTA Ksach Kandal General and Technical High School" in Kandal Province" inaugurated in August 2013 and mentioned as "ROTA GTHS" hereafter. Referring to the Kampong Chheuteal High School in Kampong Thom, it has been upgraded to "Institute of Technology" since August 2015 when a Sub-Decree was issued. The Institute enables the students to be enrolled from the Lower Secondary Education and up to the undergraduate level in higher education.

The following tables and descriptions outline the 3 GTHS.

Table 8-1: Number of Enrolled Students of the 3 GTHS under the MoEYS in 2015/16

Kampong Chheuteal High School (Institute of Technology) in Kampong Thom Province				
	Total # of Students, including General Course Students		**Male**	**Female**
Grade 10 (TS Year 1)	398		193	205
	Total # of Students belonging to a Technical Course	319	164	155
	Electronics	81	53	28
	Electricity	77	65	12
	Animal Husbandry	81	22	59
	Agronomy	80	24	56
Grade 11 (TS Year 2)	278		153	125
	Total # of Students belonging to a Technical Course	200	94	106
	Electronics	36	24	12
	Electricity	45	37	8
	Animal Husbandry	93	25	68
	Agronomy	26	8	18
Grade 12 (TS Year 3)	217		109	108
	Total # of Students belonging to a Technical Course	143	75	68
	Electronics	30	19	11
	Electricity	50	44	6
	Animal Husbandry	56	11	45
	Agronomy	7	1	6

Grade 10-12 (TS Year 1-3) Total	893		427	466
	Total # of Students belonging to a Technical Course	662	333	329
	Electronics	147	96	51
	Electricity	172	146	26
	Animal Husbandry	230	58	172
	Agronomy	113	33	80
Preah Norodom Sihakmoni GTHS in Kampong Chhnang Province				
	Total # of Students, including General Course Students		**Male**	**Female**
Grade 7	293		128	165
Grade 8	207		91	116
Grade 9	211		90	121
Grade 7-9 Total	711		309	402
Grade 10 (TS Year 1)	207		93	114
	Total # of Students belonging to a Technical Course	102	54	48
	Agronomy	55	20	35
	Electricity	47	34	13
Grade 11 (TS Year 2)	206		95	111
	Total # of Students belonging to a Technical Course	41	22	19
	Agronomy	12	3	9
	Electricity	29	19	10
Grade 12 (TS Year 3)	110		51	59
	Total # of Students belonging to a Technical Course	41	20	21
	Agronomy	16	3	13
	Electricity	25	17	8
Grade 10-12 (TS Year 1-3) Total	523		239	284
	Total # of Students belonging to a Technical Course	184	96	88
	Agronomy	83	26	57
	Electricity	101	70	31
Samdach Hun Sen ROTA Ksach Kandal GTHS in Kandal Province				
	Total # of Students, including General Course Students		**Male**	**Female**
Grade 10 (TS Year 1)	290		130	160
	Total # of Students belonging to a Technical Course	79	73	6
	Electricity Networking	35	32	3
	Electronics	44	41	3
Grade 11 (TS Year 2)	201		80	121
	Total # of Students belonging to a Technical Course	68	65	3
	Electricity Networking	35	32	3

	Electronics	33	33	0
Grade 12 (TS Year 3)	183		92	91
	Total # of Students belonging to a Technical Course	16	15	1
	Electricity Networking	11	11	0
	Electronics	5	4	1
Grade 10-12 (TS Year 1-3) Total	674		302	372
	Total # of Students belonging to a Technical Course	163	153	10
	Electricity Networking	81	75	6
	Electronics	82	78	4
Grade 10-12 3GTHS Total	**2090**		**968**	**1122**
	Total # of Students belonging to a Technical Course	**1009**	**582**	**427**

Source: Prepared by the Study Team

As Table 8-2 shows, Kampong Chheuteal Institute in Kampong Thom indicates that in recent years the number of students belonging to a Technical Course has been more than that of the General Course, since the Institute was established with the assistance of the Thai Princess, the expectation from the beginning was to further study in Thailand or gett a job under Thai investment. Particularly in this school year, 319 out of the 398 students registered are enrolled in the Technical Course. Another tendency indicates that the number of female students more than doubles that of male students in the subjects of Agronomy and Animal Husbandry, while the males more than double the females in Electricity and in Electronics. These facts indicate that the expectation for getting a good job, or, advancing ones academic career attract the students to study in the Technical Course.

Sihakmoni GTHS in Kampong Chhnang indicates the same kinds of tendencies.

With reference to the ROTA GTHS in Kandal Province, 163 out of 674 students are enrolled in the Technical Course. The number of enrollment in the Technical Course in Year 3 shows only 16, indicating some difficulties at the beginning to recruit the students. And, the total number of female students including those in the General Course is more than that of the male students. However, in terms of Technical Course only enrollments, the male students are dominant. The issue of Cambodia's Technical Education is that the TVET school system does not seem so attractive for basic education completers and their parents, because people do not currently value those students who are doing TVET courses, as they are assumed to only have opportunities as blue-collar workers and will be likely to earn less than those in white-collar jobs. Nevertheless, the prospect of advancing their studies or, getting a job in Thailand seems to attract students to the Technical Course.

Another survey conducted by the Department of Vocational Orientation (DVO) of the MoEYS indicates that those who chose to attend the Technical Course selected it because they lost interest in just studying at their desk, and are more interested in manually and physically practicing the technical skill in a workshop, or, they look forward to obtaining the certificate of the completion of Upper Secondary Education at the end of the Technical Course.

The following information is related to the teachers of the Technical Course of the 3 GTHS.

Table 8-2: Number of Teachers of the 3 GTHS under the MoEYS in 2015/16

Kampong Chheuteal High School (Institute of Technology) in Kampong Thom Province					
# of Male Teachers of LS: 33		# of Female Teachers of LS: 21		Total # of Teachers in LS: 55	
General Course	**Technical Course**	General Course	**Technical Course**	General Course	**Technical Course**
9	**25**	6	**15**	15	**40**
# of Male Teachers of US: 29		# of Female Teachers of US: 7		Total # of Teachers in US: 35	
General Course	**Technical Course**	General Course	**Technical Course**	General Course	**Technical Course**
18	**10**	5	**2**	23	**12**
Total Male Teachers: 62		**Total Female Teachers: 28**		**Total # of Teachers: 90**	
General Course	**Technical Course**	General Course	**Technical Course**	General Course	**Technical Course**
27	**35**	11	**17**	38	**52**
Preah Norodom Sihakmoni GTHS in Kampong Chhnang Province					
Male Teachers: 63		Female Teachers: 26		Total # of Teachers: 89	
General Course	**Technical Course**	General Course	**Technical Course**	General Course	**Technical Course**
54	**9**	23	**3**	77	**12**
Samdach Hun Sen ROTA Ksach Kandal GTHS in Kandal Province					
Male Teachers: 43		Female Teachers: 9		Total # of Teachers: 52	
General Course	**Technical Course**	General Course	**Technical Course**	General Course	**Technical Course**
33	**10**	9	**0**	42	**10**

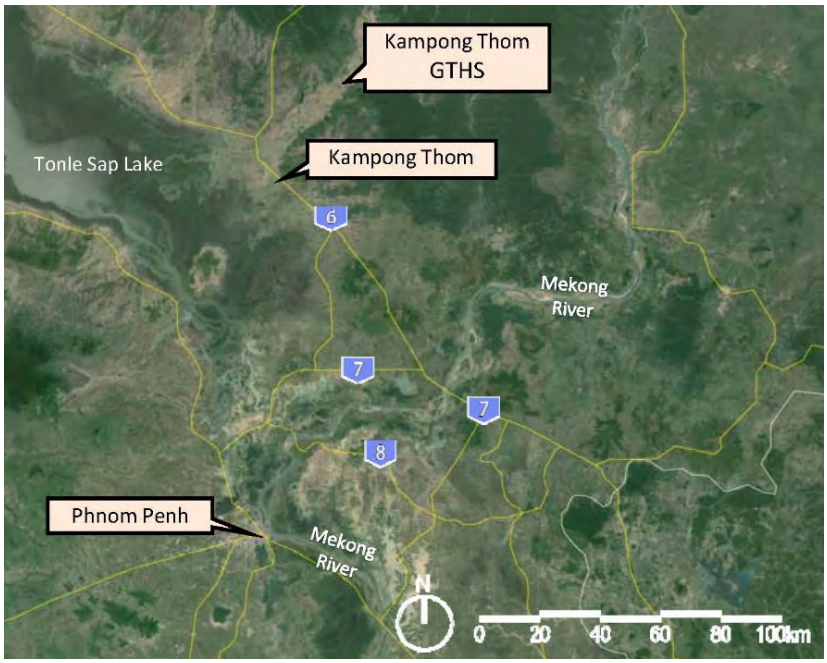
Source: Prepared by the Study Team

Currently, Kampong Chheuteal Institute has 90 teachers (f=28) which 38 staff (f= 11) are general education teachers and 52 staff (f=17) are technical teachers. Based on the interview with the director, he mentioned almost 90% of vocational staff received their degree from Thailand. Based on the report of the technical education sector it showed that among 52 technical teachers, there are 8 teachers that specialise in electronics, 10 teachers (f=1) in electricity, 15 teachers (f=8) in veterinary, 12 (f=5) in agronomy, 2 (f=0) in workshop, 2 (f=1) in tourism, and 3 (f=2) in IT. Referring to the Lower Secondary Teachers, they are encouraged and allowed by MoEYS to teach at the Upper Secondary level, due to the shortage of Technical Education teachers.

While Cambodia hasn't established a system for producing Technical Education teachers, it is a fact that the Kampong Chheuteal Institute has been accepting the role of providing Technical Education teachers to such schools as the Sihakmoni GTHS or the ROTA GTHS. Most of Technical Education teachers have never entered pre-service teacher training at NIE or at NTTI.

Present Situations of Existing Technical Education Facilities and Equipment under the MoEYS

(1) Kampong Chheuteal Institute (Kampong Thom Province)



Map made by the Study Team based upon Google Map

The institute is situated by Route 219, a 30 minute-drive to the north from the center of Kampong Thom City.

Kampong Thom City is about a 2 hour-drive from Phnom Penh.

Map made by the Study Team based upon Google Map

The site is as large as 207,200 sqm (20.72ha). Many of the existing buildings were contributed by a royal princess of Thailand. In February 2016, new workshop buildings and a solar power generation building were completed. The Thai princess intends to continue her contribution towards the insitute. The insitutes offers programmes up to bachelors' degree and continues to expand its facilities to serve as a college (university).

(2) Sihakmoni GTHS (Kampong Chhnang Province)

Map made by the Study Team based upon Google Map

The institute is situated by Route 5, a 30 minute-drive from the center of Kampong Chhnang City.

Kampong Chhnang City is about a 1.5 hour-drive from Phnom Penh.

Map made by the Study Team based upon Google Map

The site is as large as 137,500 sqm (about 13.8 ha). GTHS has a master plan, based on which facilities have been constructed one by one.

Master Plan

The left is the master plan shared by GTHS. Facilities have been constructed with financial support from the King of the country. As of today, construction of the areas indicated by dots have been completed. Construction of the remaining areas shall be implemented one by one with assistance from the King.

(3) ROTA GTHS (Kandal Province)

Map made by the Study Team based upon Google Map

The institute is a 1.5 hour-drive northward from the center of Phnom Penh. The site is in a field, about 500m off Route 8.

Map made by the Study Team based upon Google Map

The site is as large as 76,205 sqm (about 7.6ha) and surrounded by an agricultural field. The site also used to be a field. With assistance from the Government of Qatar, the Government of Cambodia constructed facilities in 2012. A workshop building was constructed with assistance from Qatar in 2015-2016.

Kampong Chheuteal Institute in Kampong Thom province receives full support from a Thai princess (Her Royal Highness Princess Maha Chakri Sirindhorn) to build its facilities. As stated, the institute covers more than secondary education and offers higher education programmes. New facilities such as classroom building are planned to be constructed with continuous support from the Thai Princess. There are a few problems with the existing facilities and equipment: the

library is too small for the capacity of the institute; the professor's/staff rooms are not big enough; and library books, textbooks, and teachers' guides are in short supply.

Sihakmoni GTHS in Kampong Chhnang was established with full support from the Royal family of Cambodia and Vietnam. It receives budgets from the Royal family, and, moreover, a Czech university offers support toward the agricultural programme. Thus, the School may continuously get assistance from donors and increase equipment little by little according to the actual needs, and therefore, full-fledged support may not be necessary at this moment.

ROTA GTHS was established with the full support from an NGO called "Reach out to Asia (ROTA)." ROTA is one of the NGOs funded by the Qatar Foundation.

The Study Team visited 2 GTHS in Kampong Thom and Kampong Chhnang to collect information on existing equipment. According to interviews, though the quantity is small, both own the minimum necessary equipment.

8.1.2 Technical and Vocational Education and Training (TVET) under MLVT

There are 39 public TVET institutions registered under the MLTV. In addition, there are 142 private TVET institutions and 72 NGO-supported TVET institutions registered under MLVT, therefore the total 253, at least[57]. With regard to the 39 public TVET institutions, as a Provincial Training Center (PTC) has been built at each of Mondolkiri Province, Preah Vihear Province and Tbong Khmum Province, now all of the 25 Provinces and municipality have at least one TVET institution. 14 out of the 39 are called National TVET Special Institute or College and provide a course equivalent to or higher than a Higher Diploma of Technology/Business Education level of education. 5 among the 14 were upgraded from PTC to Regional Training Center (RTC). The rest of the 25 institutions are either a PTC or a Vocational Training Center/School. Among them 19 institutions provide a Certificate course as long as or longer than one year as well as short-courses less than 4 months. The rest of the 6 institutions provide only short-courses.

As it is going to be mentioned in a following section, the TVET of MLVT was initiated in a pro-poor perspective, so that those who had no skill to create income, including the school drop-outs, would be able to have another chance to get training and obtain a vocational skill. Therefore, the focus of the skills to be obtained were installing or repairing electric products, home appliances or automobiles, working at facility construction, or raising agricultural productivity, and, not, focusing on those skills needed at manufacturing factories with foreign direct investment (FDI) in or around the Special Economic Zones (SEZs). In fact, as mentioned also in Chapter 5, those Japanese-invested firms who received the Study Team's interview were unable to identify any graduates or alumni of a TVET institution, and, were unaware of the existence of the TVET institutions.

In recent years, with the Strengthening of the TVET Project, assisted by ADB, they have initiated the development of a "Competency-based Skills Standard" and, since 2013/14, established the Certificate courses for PTCs, which are valid for at least a year. MLVT realised, that, unless they respond to the "progressing needs and demands of local industries, as well as, the community, they cannot meet their mandatory duties and make their social responsibilities.

Nevertheless, so far, Competency-based Training has not been realised, with a few exceptions, nor dormitories and workshops, where the students of TVET institutions can stay and obtain required knowledge and skills, were accommodated. Accordingly, TVET institutions have not

[57] http://ntb.gov.kh/tvet/instituitions.htm

been able to attract a sufficient number of students. As of March 2016, when this study mission was being carried out, a total 2,027 students were enrolled in a Certificate course of the TVET institutions. When the number is divided by 19 institutions providing the course, it means that only 106 students were enrolled per institution. Also, drop-outs were quite often. And in addition, as it is relatively a new initiative, no graduate has yet been produced. Those tendencies can be identified in below tables.

Table 8-3: The Number of Students of Sample TVET Institutions

Number of Students of PTC Kandal in 2015/16				
	Total # of Students		Male	Female
Certificate 1 (equivalent to Grade 10)	Electricity	24	20	4
	Computer Service	45	24	21
	Total	69	44	25
Higher Diploma (Equivalent to Associate Degree) Year 1	Air-Conditioning	11	11	0
	IT	11	6	5
	Total	22	17	5
Number of Students of PTC Kampong Chhnang in 2015/16				
	Total # of Students		Male	Female
Certificate 1 (equivalent to Grade 10)	Admin Service	17	12	5
	Veterinary	11	8	3
	Total	28	20	8
Number of Students of PTC Kampong Speu in 2015/16				
	Total # of Students		Male	Female
Certificate 1 (equivalent to Grade 10)	Electricity	17	16	1
	IT	15	13	2
	Total	32	29	3
Certificate 2 (equivalent to Grade 11)	Electricity	19	10	9
	IT	18	18	0
	Total	37	28	9
Certificate Level Total	Electricity	36	26	10
	IT	33	31	2
	Total	69	57	12
Higher Diploma Year 1	Electricity	52	34	18
	IT	26	23	3
	Total	78	57	21
Higher Diploma Year 2	Electricity	7	7	0
	IT	11	3	8
	Total	26	18	8
Total Number of Students	Electricity	95	67	28
	IT	78	65	13
	Total	173	132	41
Number of Students of PTC Banteay Meanchay in 2015/16				
	Total # of Students		Male	Female
Certificate 1 (equivalent to Grade 10)	Electricity	4	4	0
	IT	7	5	2
	Automotive Mechanic	11	11	0
	Construction	2	2	0
	Total	24	22	2
Drop-out	Electricity	1	1	0
	IT	1	1	0
	Automotive Mechanic	4	4	0
	Construction	1	1	0
	Total	7	7	0

Certificate 1 Number of remaining students	Electricity	3	3	0
	IT	6	4	2
	Automotive Mechanic	7	7	0
	Construction	1	1	0
	Total	17	15	2
Higher Diploma Year 1	Electricity	20	19	1
	IT	20	8	12
	Total	40	27	13
Drop-out	Electricity	15	15	0
	IT	20	8	12
	Total	35	23	12
Higher Diploma Year 1 Number of remaining students	Electricity	5	4	1
	IT	0	0	0
	Total	5	4	1
Number of Students of RTC Battambang (RPITSB) in 2015/16				
	Total # of Students		Male	Female
Certificate 1 (equivalent to Grade 10)	Computer Service	39	32	7
	Mechanic	35	34	1
	Masonry	7	6	1
	Admin Service	28	18	10
	Electricity Networking	14	14	0
	Total	123	104	19
Certificate 2 (equivalent to Grade 11)	Computer Service	50	39	11
	Mechanic	35	34	1
	Masonry	16	15	1
	Total	101	88	13
Certificate 3 (equivalent to Grade 12)	Computer Service	13	13	0
	Mechanic	17	17	0
	Total	30	30	0
Certificate Level Total	Computer Service	102	84	18
	Mechanic	87	85	2
	Masonry	23	21	2
	Admin Service	28	18	10
	Electricity Networking	14	14	0
	Total	254	222	32
	Total # of Students		Male	Female
Higher Diploma Year 1	IT	24	15	9
	Electricity	27	25	2
	Total	51	40	11
Higher Diploma Year 2	IT	32	20	12
	Total	32	20	12
Bachelor's Degree Year 1	IT	76	55	21
	Electronics	49	47	2
	Banking	34	6	28
	Electricity	22	17	5
	Total	181	125	56
Bachelor's Degree Year 2	IT	100	60	40
	Electronics	62	57	5
	Banking	57	17	40
	Total	219	134	85
Bachelor's Degree	IT	106	62	44
	Electronics	62	57	5

Year 3	Banking	37	12	25
	Total	205	131	74
Bachelor's Degree Year 4	IT	83	46	37
	Electronics	20	17	3
	Total	103	63	40
Higher Education Level Total	Total	791	513	278
Number of Students of Battambang Institute of Technology (BIT) in 2015/16				
	Total # of Students		Male	Female
Certificate 1 (equivalent to Grade 10)	Automotive Services	25	25	0
	Electricity	52	48	4
	A/C Services	14	14	0
	Construction	17	17	0
	Total	108	104	4
Certificate 2 (equivalent to Grade 11)	Automotive Services	10	10	0
	Electricity	28	28	0
	Construction	11	8	3
	Total	49	46	3
Certificate 3 (equivalent to Grade 12)	Automotive Services	5	5	0
	Agricultural Machine	23	21	2
	Electricity	14	14	0
	Drawing and Publishing	8	5	3
	Total	50	45	5
Certificate Level Total:	Automotive Services	40	40	0
	Agricultural Machine	23	21	2
	Electricity	94	90	4
	A/C Services	14	14	0
	Drawing and Publishing	8	5	3
	Construction	28	25	3
	Total	207	195	12
Higher Diploma Year 1	Automotive Services	26	26	0
	Agricultural Machine	16	15	1
	Electricity	40	35	5
	Drawing and Publishing	23	8	15
	Total	105	84	21
Higher Diploma Year 2	Automotive Services	14	13	1
	Agricultural Machine	12	12	0
	Electricity	39	37	2
	Drawing and Publishing	8	2	6
	Construction	7	7	0
	Total	80	71	9
Higher Education Level Total	Total	185	155	30
Number of Students of Svay Rieng RTC in 2015/16				
	Total # of Students		Male	Female
Certificate 1	Electricity	19	19	0

(Equivalent to Grade 10)	IT	12	6	6
	Total	31	25	6
Certificate 2 (Equivalent to Grade 11)	Electricity	11	11	0
	Total	11	11	0
Certificate Level Total	Total	42	36	6
Higher Diploma Year 1	Electricity	32	27	5
	English	85	58	27
	IT	18	11	7
	Veterinary	14	8	6
	Automotive Services	10	10	0
	Total	159	114	45
Higher Diploma Year 2	Electricity	10	10	0
	English	13	3	10
	IT	7	4	3
	Veterinary	3	2	1
	Total	33	19	14
Higher Education Level Total	Total	192	133	59
Number of Students of Polytechnic Institute of Preah Sihanouk (PIPS) in 2015/16				
	Total # of Students		Male	Female
Bridging Course (Grade 7)	48		31	17
Certificate 1 (equivalent to Grade 10)	Electricity Networking	28	26	2
	Automotive Services	13	13	0
	Admin Services	19	9	10
	Total	60	48	12
Certificate 2 (equivalent to Grade 11)	Electricity Networking	13	9	4
	Total	13	9	4
Certificate 3 (equivalent to Grade 12)	Electricity Networking	5	5	0
	Total	5	5	0
Certificate Level Total	Electricity Networking	46	40	6
	Automotive Services	13	13	0
	Admin Services	19	9	10
	Total	78	62	16
Higher Diploma Year 1	Electricity Networking	44	44	0
	IT	6	5	1
	Accounting	5	0	5
	English	14	7	7
	Total	69	56	13

Source: Prepared by the Study Team

As the table above shows, the TVET institutions under the MLVT have just started the course of the Certificate 1, which is equivalent to Grade 10 of the Upper Secondary schools under the MoEYS, since 2013/14, and the number of students enrolled in the Certificate course is still very limited.

With reference to PTC Kandal, the Electricity course of the Certificate level 1, having been initiated this school year, has only 24 students, only 4 of which are female. As for the Computer Services course, which provides the skills required for inspecting and repairing personal

computers, attracted 24 males and 21 females, therefore in total 45 students. Since PTC Kandal has Higher Diploma courses as well as Bachelor's degree courses, 68 teachers or instructors are deployed, 17 of which are female. All of them have obtained a degree equivalent to or higher than the Higher Diploma degree in Cambodia and attended the teacher training course of the NTTI. Nevertheless, most of them have no practical experience in their specialised field.

PTC Kampong Chhnang opened up the courses of Administrative Staff and of Veterinary in the Certificate 1 level. However, only 17 students and 11 students have been enrolled, respectively, therefore in total 28 students, which is less than a class in a high school. This PTC also offers the courses up to the Master's degree level, so there are 48 faculty members including the Director and Deputy Directors who have a degree at the minimum Higher Diploma degree. However, no one teaching has any practical experience.

PTC Kampong Speu has entered the second year with its Electricity course and IT course. They have attracted only 36 and 33 students, respectively of which females are only 10 and 2.

PTC Banteay Meanchay offers 4 courses in the Certificate 1 level, such as Electricity, IT, Automotive Mechanics, and Construction. However, altogether only 24 students registered, and 7 have already dropped out as of March 2016. There are some students who have just registered but do not attend the courses; therefore the courses are barely open or nearly closed. The IT course attracted only 2 female students, representing the unpopularity of the TVET institutions. As Banteay Meanchay Province borders Thailand, where a number of factories in the automobile industry are located, many students tend to be lured to low-skilled jobs in Thailand.

Meanwhile, RTC Battambang established a Computer Services course and a Mechanics course two years ago, and collected 13 and 17 students in Certificate 3, and, 50 and 35 students in Certificate 2, respectively. As a Masonry course also attracted 16 students, in total 101 students are enrolled in Certificate 2. The Certificate 1 courses set up courses of Administrative services and Electricity Networking and attracted in total 123 students.

Battambang Institute of Technology (BIT) has established 4 courses in Certificate 1-3 and attracted 207 students, in addition to the Higher Diploma courses and the Bachelor's degree course. Furthermore, the BIT has signed an MOU with KUBOTA and will receive technical assistance in curriculum development, agricultural machinery supplies, and, training opportunities in Thailand. Accordingly, the Institute is relatively popular among the students. Nevertheless, the 68 faculty members including Director and Deputy Directors have limited practical experience in their field.

RTC Svay Rieng has been struggling to attract students in its Certificate courses for Electricity and IT, as the students are more attracted to the garment industries nearby. This situation marks the phenomenon of fixing the Cambodian labour force at the status of unskilled labour-intensive industries.

PTI Sihanoukville has established Automotive Service and Administrative Service courses in addition to the Electricity Network course in Certificate 1-3. However, the total number of students is low at 78. Those who obtained a Higher Diploma can get a job at a hotel or a Power company; however, it is uncertain for those who only have a Certificate.

The above are the tendencies and the reality for the TVET institutions, and is a likely indicator of the necessity to strengthen technical education in Cambodia.

Present situations of existing vocational education facilities and equipment under the MLVT

The study on TVETs under MLVT is out of the scope of this survey, as it is intended to study technical education assistance in the education sector. Accordingly, the Study Team did not collect detailed information on TVET's under MLVT, but, shares the following information, which was collected while the Study Team surveyed the education sector.

Banteay Meanchey PTC was opened with assistance from the International Labour Organization (ILO) in 1994, handed over to MoEYS in 1999 and then transferred to MLVT in 2004. Likewise, Battambang RTC was established by ILO in 1993, and handed over to MoEYS when the project was complete. Then, RTC was transferred to MLVT in 2004. BIT was established in 1989 by the Lutheran World Federation (LWF) under a German Lutheran protestant organisation. As mentioned earlier, BIT has a partnership with Kubota, from which agricultural equipment tools were donated.

Besides, PTC Sihanoukville (PIPS), Kandal PTC, Kampong Chhnang PTC, and Kompong Speu PTC were established by ADB. Of them, PIPS and Kandal PTC were established in 2000 and 2001, respectively.

14 TVETs (7 national TVET institutions in Phnom Penh, 2 in Battambang province, and 5 RTCs) have students' dormitories, and, 25 PTCs do not have students' dormitories.

8.2 Policies related to the Technical Education Sub-Sector

With reference to Technical Education and Vocational Training, official documents describe it as a cooperative area of services to be provided between the MoEYS and the MLVT, and, therefore, do not clarifiy the ultimate responsible party. NSDP 2014-2018, the overall policy document of the Cambodian government, addresses the services, under the Chapter of Private Sector Development and Employment, as a prioritised policy and as MLVT's role that "Enhance and expand the service of technical and vocational education and training with equity."[58] On the other hand, the same documents state under the Chapter of "Capacity Building and Human Resources Development," the service as a prioritised policy and as a role of MoEYS that "Implementing the national qualifications framework to improve quality of technical and vocational education and institutionalizing coordination among and between different stakeholders."[59]

IDP places the role of "Enhance human resources development to ensure strong and dynamic industrial development through the provision of specialised skills training to address skills shortage in priority sectors by way of increasing training scholarships for engineers and technicians" under the "Lead/Responsible Institution" of MLVT and MoEYS.[60] Likewise, to "Give priority to the establishment of many technical secondary schools (both in formal education and non-formal education system) with focus on important thematics such as electricity, electronics, information and communication technology, computer science, machinery, motorcycle and automobile assembly and maintenance, agro-processing and handicraft," it is also determined under the "Lead/Responsible Institution" of MLVT and MoEYS.[61]

With reference to Education sector plans, since the Directorate General of Higher Education was transferred from the MoEYS to the MLVT in 2005, the then-sectoral plans, the "Cambodia

[58] NSDP 2014-2018, P172.
[59] NSDP, P178.
[60] IDP 2015-2025, Appendix D: Page 7 of 21.
[61] IDP, Appendix D: Page 15 of 21.

Education Strategic Plan 2006-2010" nor the "Cambodia Education Sector Support Programmeme 2006-2010" did not mention Technical Education or Vocational Training. However, the subsequent sectoral plan, called "Education Strategic Plan 2009-2013" created a sub-programme of "Technical and Vocational Education Expansion" and mandated the Vocational Orientation Department (VOD or DVO) to draft a "Vocational Orientation Policy for Secondary School" and guidelines for "Technical and Vocational Education (TVE)", and to adopt an "Elective Vocational Education Programme (EVEP)" in the Upper Secondary Education curriculum by expanding some Upper Secondary Schools.

The on-going "Education Strategic Plan 2014-2018 (ESP)" does not set up a specific section for Technical Education and Vocational Training, but, rather, incorporates it into the programme of "Secondary and Technical Education, with a view to mainstreaming it under the category." The ESP addresses the formulation of Technical Education curriculum and the implementation of Technical Education teacher training, following the formulation of a Master Plan. Furthermore, the ESP proposes the development of the regulation and mechanism on the expansion of General and Technical High Schools (GTHS). Referring to its Outcome Indicators, the ESP indicates that "the Number of GTHS will be 7 by 2018," and "Number of student enrollment in GTHS increases from 610 in SY 2012-2013 to 2000 in SY 2017-2018." The challenges that need to be overcome are the development of school facilities, equipment, and teachers in order to practice the developed Technical Education curriculum, the development of monitoring system for ensuring the quality of Technical Education, and, the assurance of the necessary operational budget for the implementation of Technical Education and the management of GTHS.

In the meantime, the policy document of the Labour and Vocational Training sector focused "to respond to the life-long needs of individuals for decent jobs or self-employment by supporting appropriate training" and "to link skills development to the demand for skills from Enterprise and communities," with the Poverty Reduction policy that "TVET can make a major contribution in poverty reduction by giving basic income earning skills to the poor." The TVET Development Plan also pays attention to the "Out of School Youth," which is following the IDP, stating "Offer a second opportunity for students to finish secondary education by establishing a testing based equivalent education system, which allows students to receive general education certificate, albeit from the non-formal education sector."[62]

Meanwhile, the Draft TVET Strategic Plan 2014-2018 has shifted the sector focus to "Transform TVET to align with evolving needs of industry and community" and to "Enhance productivity by matching skillful people to changing demands of industry and community" in its Mission. Then, the current plan envisages, as its objectives, to "Improve relationships with stakeholders especially industry and social partners" and to "Anticipate and respond to changing labour markets to better match supply and demand."

8.3 Current Situation and Issues for Ministries of Technical Education Sub-Sector

As mentioned earlier, the Technical Education and Vocational Training sub-sector has been led by the MLVT, which has a minimum of 39 institutions, whereas, the MoEYS owns only 3 schools.

This situation originated from the history of transferring the TVET business from the then-MoE, to the newly established MLVT, upon the issuance of Royal Decree 0105/003, on 17 January 2005. Since then, the DGTVET, under the MLVT has been supported principally by ADB. On

[62] IDP 2015-2025, Page 26 of 36 & Appendix D: Page 14-15 of 21

the other hand, the Royal Families in Asia have assisted the DVO under the DGE of the MoEYS in establishing the 3 GTHS.

A challenge, and a concern, is the risk of duplication of the public services owing to the ambiguous responsibilities between the two sectors. In fact, the TVET Strategic Plan addresses "The diverse TVET planning and delivery channels, management structures with unclear supervisory and regulatory responsibilities by various government bodies and ministries are key challenges for developing Cambodia TVET system".[63]

When the Study Team inquired with the DVO/MoEYS concerning the differences in roles or the division of labour in relation to the MLVT, the following explanations were given:

1. GTHS under the MoEYS requires the completion of the Grade 9 of Lower Secondary Education, while the TVET institutions under the MLVT would accept those who have dropped out of a school and not completed the G9 level. It indicates that the GTHS education in the Upper Secondary level shall be delivered on the basis of fundamental subjects' knowledge as well as the discipline and the moral required in social life obtained through the previous basic education, which differs from the provision of specific vocational skills at the TVET institutions.
2. In addition to the technical skills required for starting a business or enterprise or to get an employment from a firm, GTHS provide the education and the skills for critical, scientific and analytical thinkings, decision making and problem solving, and logical explanation and smooth communication, necessary for academic advancement and job seeking in the future life.
3. So far, the General high schools have provided the students with only the options of Natural science and Social science, after the completion of G9. By adding Technical Education, the students have another option under the line of the MoEYS education, an alternative way from the TVET institutions, which enables the Cambodian society to gain potential human resources who are expected to contribute to the country's industrial development, who might have abandoned to be enrolled in the Upper Secondary level.

On the other hand, the MLVT has been developing the Cambodia Qualifications Framework、(CQF) and the Competency-based Skills Standard, as shown in Table 8-4 and Table 8-5, so as to respond to, and meet, the labour market's requirements. The CQF was approved by Sub-Decree in March 2014, and enabled the transfer or movement between the two structures between the MLVT and the MoEYS. Nevertheless, the certificate or the diplomas issued by the TVET institutions have not yet been accredited. Therefore, it is a critical agenda item for the MLVT, to strengthen the capacity and the validity of the TVET institutions.

[63] TVET Strategic Plan 2014-2018, Page 10.

Table 8-4: Cambodia Qualifications Framework (CQF)

CQF Level	MLVT + NTB* TVET	MoEYS + ACC** Higher Education
8	Doctoral degree	Doctoral Degree
7	Master of Technology/ Business	Master Degree
6	Bachelor of Technology/Engineering / Business	Bachelor Degree
5	Higher Diploma	Associate Degree
4	Technical & Vocational Certificate III	
3	Technical & Vocational Certificate II	
2	Technical & Vocational Certificate I	
1	Vocational Certificate	

*National Training Board, **Accreditation Committee of Cambodia
Source: CAMBODIA QUALIFICATIONS FRAMEWORK, 07 February 2012, NTB/MLVT

Table 8-5: TVET Competency-based Skills Standard

PRIORITY SECTOR	JOB POSITION	CERTIFICATION LEVELS
AUTOMOTIVE MECHANICAL	Automotive servicing	C1, C2, C3
	Automotive electrical servicing	C1, C2, C3
	Automotive air conditions	C1, C2, C3
	Automotive engine rebuilding	C1, C2, C3
	Motorcycle servicing mechanic	C1, C2, C3
	Automotive body painting	C1, C2, C3
	Automotive body repairing	C1, C2, C3
CONSTRUCTION	Plumbing	C1, C2, C3
	Masonry	C1, C2, C3
	Building Electrical Wiring	C1, C2, C3
	Rough Carpentry	C1, C2
	Finishing Carpentry	C3
	Finishing Carpentry	C1, C2,
	Steel Fabrication and Fixing	C1, C2, C3
	Steel Structural Erection	C1, C2, C3
BUSINESS/ ICT	Computer Services	C1, C2, C3
	Administrative Services	C1, C2, C3
	HR Services	C1, C2, C3
	Customer Services	C1, C2, C3
	Computer Graphic Design	C1, C2, C3
	Marketing Services	C1, C2, C3
	Sales Services	C1, C2, C3

Source: ADB STVET Project Completion Report

As described, both of the TVET institutions under the MLVT and the Technical Education under the MoEYS are in a joint effort to develop each of the Technical Education and Vocational Training schemes. They are expected to complement each other with their strengths and weaknesses, rather than compete to win over limited resources and duplicate the services in the country.

Besides, while the DVO/MoEYS has clarified some differences from what the TVET institutions of the MLVT have been delivering, the DVO/MoEYS is still in the situation where they have to start from the beginning with such tasks as reviewing the Technical Education carrucula, developing the syllabi and the textbooks, and training and developing Technical teachers. In these circumstances, the ownership and the capacity of the DVO/MoEYS are demanded in order to tackle those outstanding tasks. In terms of the Technical Education sub-ector, capacity is limited compared with the Minister -ERC/TPAP TF of the Basic Education sub-sector and the DGHE-ITC of the Higher Education sub-sector. The DP

community is also limited. As the preceding 3 GTHS have been substantially established with the large assistance of the donors, the capacity development assistance to the DVO/MoEYS could be also a part of the scopes of the JICA's technical cooperation.

8.4 Current Situation and Issues of Provincial Technical Education Institutes

Upon the request from H.E. the Minister of Education, Youth and Sports "wishing to be assisted in establishing GTHS in and around the SEZs in Phom Phen, Sihanoukville, Poi Pet, and Bavet according to investing firms' demands and needs for human resource development for industrial development," the Study Team visited and studied two of the future GTHS and the existing TVET institutions located near the SEZs.

The following Tables 8-6 to 8-9 show the present status of the future GTHS located near the SEZs. The MoEYS envisages establishing one GTHS per Province/Capital, for a total of 25, increasing from the initial plan of establishing 7 GTHS, as referenced in the EPS. For this coming School Year 2016/17, the MoEYS plans to open up 3 GTHS. In the following SY of 2017/18, two additional GTHS are scheduled in Banteay Meanchay Province and in Kampot Province. Among the 3 GTHS planned to be set up for SY2016/17, Chum Pu Voan High School in Phnom Penh Capital plans to recruit 160 students for 4 classes: 80 students for 2 classes in each course of Mechanics and Electricity. Bavet High School in Svay Rieng Province planned to establish Technical Education classrooms and workshops with assistance from the Korean International Cooperation Agency (KOICA). However, KOICA informed the Study Team that the proposal for the assistance was not approved by its headquarters in Seoul. Nonetheless, the School Head of the Bavet High School explained to the Study Team that they were still going to recruit 60 students for 2 classes in each of the Electricity and Agriculture courses for this coming School Year. In addition, the Bavet High School conducted an interview with 135 Grade 9 students of the Lower Secondary school, and 44% of the interviewees replied that they were interested to be enrolled in a Technical Education course for Grade 10 and above. And accordingly, they count on a sufficient number of students to be enrolled in a Technical Education course in their 5-year plan. As Chum Pu Voan High School also has the Lower Secondary level, it can be said that they have some reserved candidates to be enrolled in their Technical Education classes in the Upper Secondary level once they are established.

Number of Students and Teachers of Future GTHS Located Near SEZs

Table 8-6: Number of Students in Chum Pu Voan High School, Phnom Penh

General Course	Number of Students in SY 2015/16		
	Male Students	Female Students	Total # of Students
Grade 7	499	396	895
Grade 8	405	383	788
Grade 9	354	329	683
Grade 10	420	453	873
Grade 11	333	362	695
Grade 12	348	400	748
TOTAL:	2359	2323	4682

Source: Prepared by the Study Team.

Table 8-7: Number of Teachers in Chum Pu Voan High School, Phnom Penh

	Number of Teachers in SY 2015/2016		
	Male Teachers	**Female Teachers**	**Total # of Teachers**
General Course	131	91	222
Technical Course	0	0	0
Total:	131	91	222

Source: Study Team prepared.

Table 8-8: Number of Students in Bavet High School, Svay Rieng

General Course	**Number of Students in SY 2015/16**		
	Male Students	**Male Students**	**Male Students**
Grade 7	55	65	120
Grade 8	57	65	122
Grade 9	70	65	135
Grade 10	66	51	117
Grade 11	49	39	88
Grade 12	45	28	73
TOTAL:	342	313	655

Source: Prepared by the Study Team.

Table 8-9: Number of Teachers in Bavet High School, Svay Rieng

	Number of Students in SY 2015/16								
	Lower Secondary Teachers			**Upper Secondary Teachers**			**Total**		
	Male Teachers	**Female Teachers**	**Total**	**Male Teachers**	**Female Teachers**	**Total**	**Total Male Teachers**	**Total Female Teachers**	**Total**
General Course	25	3	28	12	1	13	37	4	41
Technical Course	0	0	0	0	0	0	0	0	0
Total:	25	3	28	12	1	13	37	4	41

Source: Prepared by the Study Team.

At this stage, nothing is visible with these two future GTHS concerning Technical Education. The 3rd GTHS planned to be opened in 2016/17; Pouk High School in Siem Reap, has just begun to establish the Technical Education course facility. Furthermore, apart from the 3 GTHS planned, the MoEYS had planned to get funded for establishing another GTHS in Battambang Province. However, the Ministry of Economy and Finance (MEF) rejected the proposal because of the reason that there were TVET institutions under MLVT which had similar functions. Therefore, as of March 2016, when the Study Team conducted its research, it appeared that the establishment of a GTHS policy by the MoEYS was not yet going well.

When the Study Team shared these concerns with the DVO/MoEYS, it was updated that the DVO had already instructed Chum Pu Voan High School in Phnom Penh to vacate a large classroom, divide it into two and transform them into workshops, so that they can receive the necessary equipment, and subsequently, the students to be enrolled. The necessary budget had been reserved in the Ministry, according to the DVO. Pouk High School of Siem Reap also has a Technical Education building being built. Meanwhile, when it comes to Bavet High School in Svay Rieng, no realisation has yet been made.

In terms of Technical Education teacher deployment, the DVO/MoEYS has requested 1) the MLVT to share/allocate some of the experienced instructors of TVET institutions; 2) some NGOs to share/allocate some of the experienced instructors of their institutes; 3) the NIE to

train those who have already obtained a degree in a STEM subject; and 4) the Office of the Vocational Education Commission (OVEC) of Thailand to accept some Technical Education teacher candidates for an internship or a training course. Nevertheless, the quality of the available resources and the training still remains uncertain.

Concerning the resource mobilisation for the GTHS establishment and expansion, the Education Minister has requested that JICA and other development partners (DP) establish 4 to 5 GTHS in the 4 SEZ areas: Poi Pet; Bavet; Phnom Penh; and Sihanoukville in the next 1 to 2 years, while he also stated that the government confirmed during a consultative meeting in March 2016, that it would make an effort for building 5 more GTHS on its own. Meanwhile, as it takes several years to review the curricula, develop the syllabi and the textbooks, and training the teachers, etc., the MoEYS is required to have sufficient capacity for realistically planning and steadily implementing necessary activities.

Referring to the Master Plan for Technical Education at the Upper Secondary Level (2015-2019), it is stated that "Each GTHS has been allocated 50,000,000 Riel per year per school, and 600,000 Riel per student to run the programme for sustainable operations and 40,000 Riel per student for internships, according to Prakas (Regulation) 508, 2013. In fact, Kampong Chheuteal Institute replied that they had received 300 million Riel annually and 600,000 Riel per student from the Programme Budget (PB).

According to the DVO/MoEYS, "during the time when the fund allocation for Upper Secondary education in the ESP, the plan for expanding GTHS had not been forecasted out enough, so the budget for the establishment of Chum Pu Voan GTHS and Bavet GTHS was not included. Yet, today, the budget allocation for the new GTHS is quite sure."

As discussed, the establishment of the GTHS has initially been led by the assistances from the Royal families. However, the MoEYS is trying to take ownership and make voluntary efforts for obtaining a national fund. In the meantime, as their initiative and concrete action have not been conspicuous, it is expected to continuously confirm the feasibility of the GTHS expansion policy, with clarification of the different roles between the MoEYS and the MLVT and identify the areas to be cooperated among the partners.

Potential GTHS and Their Present Situations of Existing Facilities and Equipment

The Cambodian side has a plan to attach a technical high school to each of existing secondary schools in Phnom Penh and Svay Rieng province. Accordingly, the Study Team visited the respective schools.

(1) Phnom Penh: Chum Pu Voan School (a Candidate School to be GTHS)

Map made by the Study Team based upon Google Map

Chum Pu Voan high school is located by Route 4, south-west of Phnom Penh Airport.

Map made by the Study Team based upon Google Map

According to the school, as for establishing a technical high school, the school is now planning teachers training for the technical programme and curriculum with assistance from KOICA. (However, it turned out that KOICA dropped the assistance afterward.)

At this moment, there is no concrete construction plan yet, but, a plot surrounded by dots in the left satellite image, is indicated by the school as a construction site. The pond in construction plot A shall be backfilled before the construction.

(2) Svay Rieng: Bavet School (a Candidate School to be GHTS)

Map made by the Study Team based upon Google Map

The school is situated by Route 1 and a 3.5 hour-drive from Phnom Penh in the direction of south east. It is also a 30 minute-drive from Vietnamese boarder.

Map made by the Study Team based upon Google Map

Likewise, the school is now planning a teachers' training for the technical programme and curriculum with assistance from KOICA. (However, it turned out that KOICA dropped the assistance afterward.)

At this moment, there is no concrete construction plan yet, but, a plot surrounded by dots in the left satellite image, is indicated by the school as a construction site.

The two secondary schools, Chum Pu Voan in Phnom Penh and Bavet in Svay Rieng, are not yet furnished with the equipment necessary for technical programmes, as both are still general secondary schools. As stated earlier, the DVO has instructed the schools to secure 2 rooms for workshops (for practicum) and the DVO plans to procure the necessary equipment for the workshop rooms in April 2016 and afterward, and has already earmarked a budget for it.

8.5 Issues of Technical Education

(1) Prioritised Issues for Strengthening Technical Education

Responding to the present status referenced above, the issues which need to be engaged in the Technical Education sub-sector are summarised below.

1. First of all, the Cambodia government needs to clarify and differentiate the objectives and the roles to be committed between the MoEYS and the MLVT. Unless the clarification and the differentiation would be made, the two sectoral Ministries may not only provide duplicating public services but also compete with one another to acquire limited human, material, and financial resources in the country, causing conflicts and confusion, resulting in a loss of efficiency and expected outcomes. Rather, the government needs to create a complementary and supplementary relationship between the two Ministries, so that they can create synergized effects.
2. It is urgently important to review the existing curriculum of Technical Education at the Upper Secondary level, for such subjects as Electronics, Electricity, Mechanics, Agriculture, and Accounting and Management, produced by cooperation with the KOICA, in order to accommodate the needs and the demands of the manufacturing firms investing in, and around, the SEZs. During this process, it is important to make sure that the curriculum of Technical Education under the MoEYS is different from the TVET under the MLVT which stresses the safety network for those vulnerable in school enrollment or in employment.

3. It is also required to develop the syllabi of GTHS in accordance with the revised curriculum. And subsequently, it is necessary to develop Year 2 and Year 3 textbooks and teacher guides of Technical Education subjects, in addition to the ones for Year 1 developed under the technical cooperation of KOICA.
4. Another urgent task to be completed is the training/development of Technical Education teachers. This can be realised, especially, at the early stage, through the dispatch of future candidates in a tertiary education institution in-country or overseas. It is also necessary to develop a teacher career pathway for Technical Education teachers, in order to sustainably produce and develop Technical Education teachers.
5. In order to implement the contents of the revised curriculum and to produce the desired human resources for manufacturing firms investing in, and around, the SEZs, appropriate facilities and equipment need to be installed at each of the GTHS.
6. Another critical issue needs to be realised in the process of establishing GTHS is to establish close, collabourative, sustainable relationships with the manufacturing firms in, and around, the SEZs. Without practical inputs and productive learning from private firms investing in Cambodia, GTHS would end up with less effective education institutions.
7. Following the successful implementation, GTHS in collabouration with the DVO/MoEYS, is expected to share their achievements and success stories with the general public. Then, it is necessary to sensitaise and ameliorate the public understanding and impression over Technical Education in the Cambodian society.
8. Furthermore, it is essential to establish a proper monitoring system in order to regularly ensure and improve the quality of Technical Education in the long term.
9. In order to properly re-act one by one to the above-mentioned activities, the assistance to the capacity development of the MoEYS, particularly the DVO, itself is demanded.

(2) Development Partners Assistance for Technical Education and Vocational Training

With respect to the TVET businesses under the MLVT, the project being implemented under the technical cooperation with the JICA is referenced in the following Box.

Box 8-1: JICA Project for Improving TVET Quality to Meet the Needs of Industries (JICA TVET Project)

JICA TVET Project targets the enhancement of the Electricity course in Higher Diploma of the 3 pilot TVET institutions in Phnom Penh under the MLVT and aims at the human resource development, competent to diversified and value-added industries. Particularly, the Project assumes the development of skilled labour or technicians who are responsible for manufacturing production line control, along with the curriculum development and teacher training at the 3 pilot institutions, namely National Polytechnic Institute of Cambodia (NPIC), National Technical Training Institute (NTTI), and Preah Kossomak Polytechnic Institute (PPI). The Project lasts for 4 years and 6 months between September 2015 and March 2020 with the following Project Outline.

Output 1: Standard Training Package (1) for the higher diploma in electricity is developed.
Output 2: Instructors of the pilot VET institutions are able to provide training for the higher diploma in electricity based on Standard Training Package.
Output 3: System to disseminate Standard Training Package for the higher diploma in electricity to non-pilot TVET institutions is introduced.
Output 4: System to maintain and manage training facilities and equipment at the pilot TVET institutions is strengthened.
Output 5: Partnership between the pilot TVET institutions and industries is strengthened.

The TVET Project pays attention to the partnership with the industrial society, so that the JICA

distributed questionnaires and had an interview with the Manufacturing sub-group of the Japan Business Association of Cambodia (JBAC) at the stage of the Project and the curriculum formulation. "Electricity," the subject supported by the TVET Project, was also recognised in the previous Study on human resource needs for industrial development. Therefore, it is recommended to utilise the Outputs of the TVET Project and collabourate with the Project under the consultation between the MoEYS and the MLVT, when the assistance to Technical Education under the MoEYS will be designed and then proceed to completion.

The other assistance provided by DP in the TVET sub-sector under MLVT are summarised in Table 8-10, whereas, the cooperation in Technical Education under the MoEYS is referenced in 2.5.

Table 8-10: Assistance provided by Development Partners in TVET Sub-sector

DP/ Line Ministry in charge	Name of Project	Brief Summary of Project	Duration	Amount of financial contribution (million USD)
TVET Sub-sector				
ADB/ MLVT	Strengthening Technical and Vocational Education and Training (STVET) Project	1) Provision of formal vocational training in "mechanics," "construction," and "ICT and business" corresponding to industrial needs; 2) Provision of non-formal vocational training responding to local needs in view of poverty reduction; and 3) Strengthening administrative and supervisory capacity of the central and regional TVET institutions.	2010-2015	USD24.50 +RGC: USD3.02 Total: USD27.52
	Strengthening Technical and Vocational Education and Training (STVET) Project II	Identifying the gaps and some solutions between the supply side: the curriculum, teachers' capacity, facilities and students' status in TVET institutions; and the demand side with private firms seeking for human resources, through a technical assistance, and put them into a report.	2013.1-2014.12	USD0.9
	Technical and Vocational Education and Training Sector Development Programme (TVETSDP)	1) Promote the access to TVET for women and disadvantaged people who were unable to access to formal education; 2) Develop Competency assessment evaluation and teacher training; 3) Set up Sector Technical Council with participation of Employer associations in "construction," "automobile services," "Electricity services," and "manufacturing," and develop public-private partnership facilitating soft-skill development and internship programmes; 4) Develop administrative and supervisory capacity of the central and regional TVET institutions.	2015-2019	TVET sectoral policy loan: USD7.0 Project loan: USD23.0 +RGC: USD2.6 Total: USD32.6

DP/ Line Ministry in charge	Name of Project	Brief Summary of Project	Duration	Amount of financial contribution (million USD)
AFD/ GMAC	Cambodian Garment Training Institute	Constructing a vocational training institute in the Phnom Penh SEZ in a loan assistance from AFD to GMAC, aiming to replace foreign workers in the middle-class management posts with Cambodian workers. Also hiring a consulting firm for 3 years since 2016 in order to build training management capacity towards sustainable institutional management. It is generally **a private-oriented initiative**, while some essential assistance is provided by some Ministries including MLVT.	Under construction since 2015, and to be completed by 2016.9.	USD 3.26 (between 2013 and 2027 for 15-year loan)
ADB ILO UNESCO	There are several Studies and Reports on TVET Sub-sector, conducted in cooperation with ADB, ILO, UNESCO, etc. as referenced in the attached List of Reference Documents.			

Source: ADB: http://www.adb.org/sites/default/files/project-document/64050/40555-cam-rrp.pdf
http://www.adb.org/projects/46064-001/main#project-pds
http://www.adb.org/sites/default/files/project-document/174199/46064-001-tacr.pdf
http://www.adb.org/sites/default/files/project-document/82045/46064-002-rrp.pdf (cited on 18 April 2016).
AFD: Based on interviews by the Study Team to GMAC and
http://www.adb.org/sites/default/files/project-document/64050/40555-cam-rrp.pdf (cited on 18 April 2016).

9. Priority Issues and Approaches

9.1 Priority Issues in Basic Education

9.1.1 Overview of Priority Issues

The Ministry of Education, Youth, and Sports (MoEYS) has flagged the implementation of the Teacher Policy Action Plan (TPAP) as the top priority for tackling the challenges of basic education in the country. In effect, H.E. the Minister of Education, Youth, and Sports cited this at the beginning of his closing remarks at the Annual Sector Review Meeting held on 29-31 March 2016. Therefore, it is more than reasonable for theDevelopment Partners (DP) to consider the implementation of the TPAP as the sectoral top priority in the course of their support for educational reform in Cambodia. The idea is further supported by the fact that H.E. the Minister Naron himself chairs the Steering Committee (SC) of the TPAP.

The 8 priority agenda of the TPAP, referenced in his speech at the Annual Meeting, is as follows:

- Development of "Teacher Career Pathway (TCP)"
- Development and implementation of "Standards of School Principal"
- Development of "Teacher Education Provider Standards (TEPS)"
- Upgrade of Regional Teacher Training Centers (RTTC) to Teacher Education Colleges (TEC)
- Development and implementation of BA/BEd Fast Track programmeme
- Coordination and arrangement with relevant Ministries and Institutes towards improvement of Teachers working conditions, promotion, salary and benefits, etc.
- Re-deployment of Teachers
- Recruitment of outstanding human resources for Teachers, and the capacity development of the TEC and their teachers/instructors.

Among these, some of the engagements have been made by the TPAP Task Force (TF), such as the drafts of the TCP and the TEPS, planned to be ready by June 2016, the Standards of School Principals being scheduled to be available by December 2016, and the BA/BEd Fast Track course, supposed to begin in August 2016.[64] In addition, the re-deployment of teachers being considered in the TF.

The members of the TPAP TF, as of the 1st of May 2016, are referenced in Table 9-1.

Considering that the establishment of the TEC is a large scale plan, which will follow the endorsement of the TEPS final draft supposed to be available by July 2016, there is not much time left, supposing that the TEC Phnom Penh and the TEC Battambang are planned to be opened in 2018. Taking into account the tasks of the teaching and learning material development and the facility construction and renovation, a large amount of inputs will be required within the next 5-6 years. And, thus, inevitably, if Japan supports the basic education development in Cambodia, its primary attention should be directed towards the issues of the TEC establishment.

[64] The primary target of the BEd Fast Track programme is brought to "those who have been teaching at an upper secondary school despite the fact that they hold the only teacher's licence of lower secondary level," 700 of whom are supposed to participate in the SY 2016. The NIE is the institute which provides the 1st batch with the programme.

Table 9-1: Members of TPAP TF

#	Name	Affiliations	Position	Role
1	Dr. Dy Samsideth	DGE-ERC	Deputy Director General	Team Leader
2	Dr. No Fata	DGPP-ERC	Deputy Director General	DTL
3	Mr. Mao Samrithy	TTD	Deputy Director	DTL
4	Dr. Chhin Sitha	RUPP-ERC	Researcher	Member
5	Dr. Khieu Vicheanon	Inspectorate General	Deputy Inspector General	Member
6	Dr. Chey Chan Oeun	RUPP-ERC	Researcher	Member
7	Dr. Neau Vira	NIE	Deputy Director	Member
8	Mr. Ly Keang	TTD	Deputy Director	Member
9	Mr. Tep Phyorith	DoF-ERC	Director	Member
10	Mr. Ren Kun	DoPersonnel	Deputy Director	Member
11	*****	Legislation Dept	Deputy Director	Member
12	Mr. Koji Takahashi	JICA	Education Specialist	Member
13	Mr. Santosh Khatri	UNESCO	Education Specialist	Member
14	Mr. John C.F. Pereira	UNICEF	Education Specialist	Member
15	Dr. Prak Polla	MoEYS-ESDP3	Consultant	Member
16	Mr. Wim Voskuilen	VSO	Advisor	Member

Regarding the TPAP implementation, in addition to the direct interventional assistance from JICA, UNESCO, UNICEF, and VSO[65] as referenced in Table 9-1, the CDPF funds the MA Fast Track programmeme for upgrading in-service teachers of TTCs. In addition, VVOB plans to start a new project for assisting the TEC establishment from January 2017. The summary of the pledged assistance for the TPAP implementation is shown in Table 9-2. Furthermore, it is expected that the funds of the Global Partnership for Education (GPE) may also be utilised for this purpose, but it is not confirmed at this time.

Table 9-2: DP's Assistance for TPAP Implementation

DP	Status	Targets of assistance
UNICEF	【Realised】	Hiring a consultant for developing TCP
UNESCO	【Realised】	Budget support for TEPS development team activities
UNICEF SIDA, EU	【Realised】	Implementation of MA Fast Track programmeme for upgrading TTC in-service teachers through CDPF
VSO	【Realised】	Assistance for developing TEC curriculum and syllabus, including Curriculum Framework development and syllabus and teaching/learning material development for Pedagogy and Psychology
JICA	【Realised】	Budget support for organizing TEPS Consultative Workshop
	【Projected】	Project assistances for TEC establishment from 2017, including syllabus and teaching/learning material development, pre-service education/training, and facility construction and equipment procurement
VVOB	【Projected】	A project for assisting in the establishment of TEC from 2017, including class management, Math and arithmetic education, and lesson practices at a school

While the opening of TEC Phnom Penh and TEC Battambang in 2018 requires a series of preparation works under the time constraint, the reality indicates that the necessary assistance is in short supply. The following issues, in particular, require substantial assistance in the course of the TEC establishment.

- Development of TEPS
- TEC curriculum and teaching/learning material development
- TEC pre-service teacher training/education

[65] As Dr. Prak Polla; #15 of Table 9-1, belongs to ESDP3 supported by ADB, it can be said that ADB also indirectly assists with the TPAP implementation.

- TEC school management, lesson and course evaluation, and evaluation of student's learning
- TEC facility construction and equipment procurement

Counter measures against the above challenges are referenced in the following paragraphs.

9.1.2 Development of Teacher Education Provider Standard (TEPS)

The establishment of TEC is guided by the TEPS. Furthermore, the TEPS are supposed to be the standards and criteria for the in-service teacher training needs, provided by higher educational institutions. Accordingly, TPAP TF puts a high value on the TEPS development. Concerning the TEPS, it is not yet determined as of mid-April 2016, whether it would be issued as a Sub-Decree or a Prakas. If the TEPS cover all higher educational institutions managed by other Ministries, then, a Sub-Decree would be appropriate.

Drafting of the TEPS is on-going towards the TPAP retreat scheduled in mid-July 2016, therefore a progress update is supposed to be delivered at a TPAP SC meeting in May 2016. UNESCO and the World Bank have pledged their interest of substantial assistance. In effect, UNESCO has hired a consultant between mid-April and mid-June 2016, for the TEPS development team of the ERC, whose terms of reference are as follows:

- To examine and analyse the existing standards of TTC;
- To study the teacher education standards of ASEAN countries;
- To study the teacher education programmemes of ASEAN countries;
- To study the accreditation and the implementation process of the teacher education programmeme;
- To draft standards for the accreditation of the teacher education programmeme.

For these tasks, the TEPS development team has requested technical assistance from JICA as well. Possible assistance could be the introduction of the relevant legal framework in Japan, and the organisation of Consultative Workshops, with the participation of government officials and DP stakeholders as well as TTC Directors, among others.

Concerning the above referenced point, it is still uncertain who should take the role for accreditation of TEC, which is going to be a higher educational institution. Referring to the case in Japan, the Accreditation Council under the Primary and Secondary Education and Teacher Education Sub-committee of Central Education Committee of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) makes a judgement and a decision, according to the Pre-service Curriculum and Course Accreditation Criteria determined by the Sub-committee. The accreditation process includes the document examination, the oral examination, and the practical examination. The Council judges and determines the accreditation based on the 3 types of examination.

Whereas, in Cambodia:

- The Accreditation Council of Cambodia for higher education (ACC); which is an accreditation institution for higher educational institutions, in general, and, thus, has no expertise on teacher education; and
- Teacher Training Department (TTD); which is the supervisory Department under the MoEYS for the PTTC/RTTC, teacher education curriculum development, training for TTC in-service teachers and in-service teachers in general, and, thus, has neither experience nor expertise on the accreditation and the supervision of higher educational institutions.

As there has not been a higher educational institution for teacher education, no accreditation nor supervisory institute exists for this genre. Neither does a third party institute for Certification. Accordingly, and going forward, it is recommendable that the MoEYS establish a consultative council, comprised of teacher education experts, such as a Teacher Council[66], which can perform the accreditation of teacher educational institutions, the revision of the TEPS, etc. Nevertheless, as there is no such council at this stage, the ERC is expected to make a proposal for the Minister, with indications of concrete ideas of member selection, composition, and essential tasks.

9.1.3 Development of Curriculum, Syllabus, and Textbooks for Teacher Education Colleges (TECs)

With respect to the TEC curriculum development, VSO has assigned an advisor for the TTD/MoEYS since the beginning of 2016. The VSO assistance is expected to develop the TEC curriculum framework within the year 2016, and subsequently the syllabi and textbooks are developed within 2017 aiming at the opening of the TEC in 2018. Meanwhile, as mentioned earlier, the development of the TEPS is a prerequisite for the TEC curriculum development, as well as the review and revision of the existing Teacher Professional Standard.

Furthermore, the outstanding agenda extends to the mutual attestation of obtained credits with the B.Ed Fast Track prgramme, the introduction of the credit system, and so on. The shortage of experts at the higher education level is another challenge recognised at the occasion of TEC syllabus and teaching/learning material development in different subjects. With a view to developing higher educational institutes which assure the quality of teacher education, the TEC syllabus and textbook development requires a number of experts and DP assistance.

As of late April 2016, the DP who have shown the commitment for the TEC syllabus and teaching/learning material development, other than JICA, are VSO and VVOB, whose assistance is indicated below:

- VSO: The above-referenced advisor is expected to begin the syllabus and teaching/learning material development work for Pedagogy and Psychology in 2017, whereas his TOR does not exclude the work for the other subjects.
- VVOB: The VVOB-assisted project is scheduled to begin in January 2017. Interested areas include mathematics and arithmetic, lesson practices at a school, and class management. Dispatch of a Belgian expert is under consideration for the math and arithmetic cooperation.

Accordingly, assistance to the TTD[67]/MoEYS, who is in charge of the TEC establishment, and complementary assistance, where neither VSO not VVOB does assist, is expected to work with the other DP, particularly JICA, in collabouration with those two agencies, so that the syllabi and teaching/learning materials of all subjects to be taught at TEC will be well developed.

In terms of the TEC teaching/learning material development, the task does not necessarily require the drafting of textbooks, such as the primary and secondary education textbooks. Furthermore, as there is neither time nor resources available by the opening of the TEC in 2018, and the appropriate approaches expected to JICA would be shown as follows:

[66] Draft TEPS provisionally calls it “Teacher Council.”
[67] H.E. the Minister of Education stated at the workshop held on 15 March 2016 that the TTD should be in charge in MoEYS of the TEC establishment.

1) To designate a focal point TEC teacher, who holds a Master's degree and upper level English proficiency, for each subject/area, based on the TEC Curriculum Framework;
2) To let the focal points develop their concerned syllabi, indicating the lesson context, objective, contents of teaching/learning, and teaching/learning methods and strategies, through the participation in a training course in Japan or in a third country. In this case, it is important to avoid any gap or duplication of efforts among the different subjects/areas through a well coordination among DP.
3) Simultaneously with the 2nd step, to let the focal points develop a list of English references, relevant to each syllabus or lesson, which can substitute for the teaching/learning materials of the TEC (note: most students are unable to read English).
4) To let the focal points develop teacher guides of each lesson in Khmer based on the developed lists of English references. Furthermore, the focal points translate the core references for each lesson into Khmer, so that their students can utilise them as their references.

Presently, there are very few professors or instructors in Cambodia who can take a lead in the 2nd task referenced above. When it comes to the 3rd task, it would be extremely hard to identify someone who can complete the task. Therefore, such training can be realised in teacher colleges in Japan where abundant English references are available or higher educational institutes such as the NIE of Singapore in ASEAN countries.

Considering the school year of the TEC starts in November; just like the present PTTC/RTTC, the above-referenced steps should be implemented during 2017, or at the latest, by the 1st half of 2018, so that the student admission and the course work preparation can proceed for some months prior to November 2018.

9.1.4 Assistance for Teacher Training of TECs

As referenced in Chapter 6, 56 teachers of PSTTC, PTTC, RTTC, or NIE are studying in a Master's degree course in mathematics, Physics, Chemistry, and Biology, with the assistance of the CDPF. Needless to say, they are the TEC teacher/professor candidates. However, there is no such practice other than the science subjects; therefore it is an urgent matter to have the same or similar kinds of training in other subjects,[68] considering the sustainable production of TEC teachers/professors.

As the assurance of sufficient number of TEC teachers/professors is a common major concern among the MoEYS high-level officials as well as the members of the TPAP TF, it is another priority area to be assisted. Some of the options that the TPAP TF is considering are as follows:

- To get outstanding RTTC teachers/instructors enrolled in a MA degree programmeme, then after their acquisition of a MA degree, employ them as TEC teachers/professors;
- To get upper secondary teachers who have owned a MA degree enrolled in a year-long PRESET programmeme, then employ them as TEC teachers/professors;
- To coordinate and cooperate well with domestic higher educational institutions and request them to provide appropriate personnel for the TECs; or
- To newly recruit those who hold a relevant MA degree for TEC teachers/professors.

[68] For information, as of March 2015, the number of teachers at RTTC and PTTC Kandal are 47 and 34, respectively.

In addition, the 1st batch of the TEC teachers who will be deployed either at TEC Phnom Penh or Battambang are expected to be the model[69], and, accordingly, continuous brush-up training will be necessary in the following years. The following Figure 9-1 indicates the expected inputs and the timings for TEC teacher development, including the training of the focal points, developing curriculum, syllabi, teaching/learning materials in Japan or in a third country.

The following figure also indicates the in-country training before the opening of the TEC, and the review session and the syllabus revision in-country or overseas, in particular in Japan, after the completion of the 1st school year. Indeed, the ultimate goal of the TEC development is to ensure the capacity of the TEC, which can regularly practice the Plan – Do – Check – Action cycle for their sustainable development, which is in fact a missing capacity of the existing PTTC/RTTC.

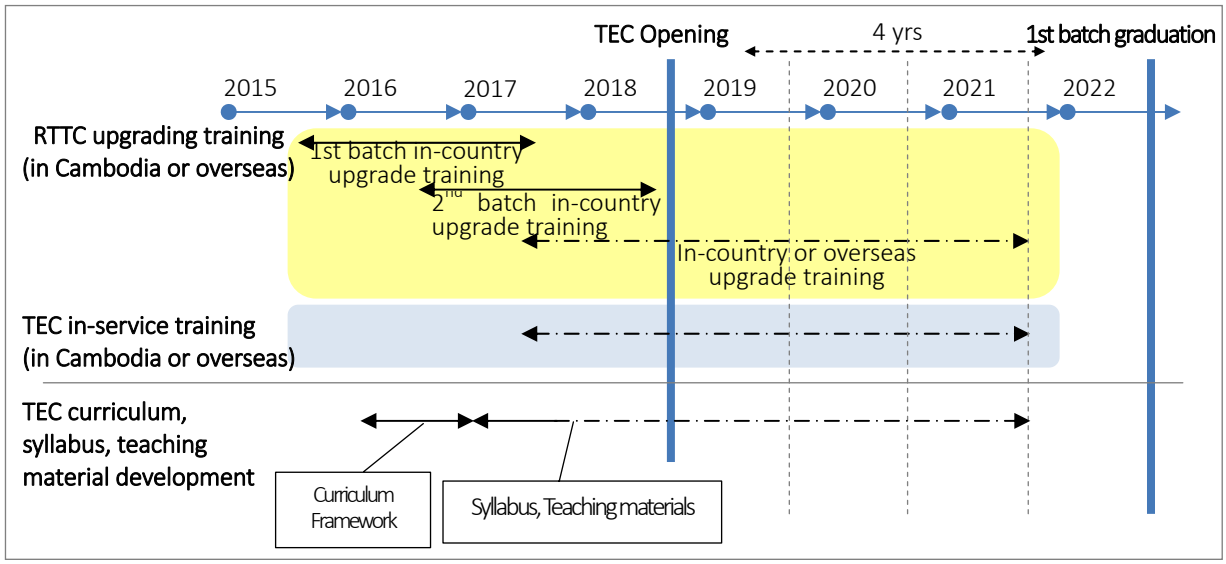


Figure 9-1: TEC Teacher Training Needs

9.1.5 Assistance for Other Soft Components of Establishing TECs

The other agenda items to be engaged in the course of the TEC establishment and its sustainable development are the followings:

- TEC School management
- Evaluation of student's learning
- Lesson and course evaluation

These issues can be a part of the scope of work of the TEPS, currently under development. However, it should be well noted that the actual performance and practice of these tasks will basically depend on each of the Directors and teachers of TEC, and, therefore, their behaviours and actions may be reflected as the performance or the quality of TEC. As the discussions on TEC so far concentrate on the process towards the establishment, the above items, the critical issues after the opening of the TEC, have not been touched yet. In order not to be always the second move, it is important to discuss and take care of these issues with the Cambodian government and proactively act for necessary action and assistance.

[69] According to the leader of the TPAP TF; Mr. Dy Samsideth, Deputy Director General of Education, "The MoEYS anticipates making one or two TEC be 'Centre of Excellence' some of whose teachers/professors hold a PhD degree," one of whose candidates is Phnom Penh TEC.

(1) TEC School Management

The core factors of school management and administration for TEC are the human resources, the material resources, and the financial resources, besides education, per se. Therefore, the primary objective of school management and administration is to properly manage the teachers, staff and the students, to effectively utilise and maintain the facility and equipment, and to ensure a necessary budget and efficiently execute it, in order to achieve the educational goals. Then, it is actually up to the capacity of the Director. As the educational goals to be achieved at TEC will be given by the government, and as the necessary budget will be allocated by the government, the pre-conditions given to each of the TECs will be the same. Accordingly, depending on the management ability of the Director, some differences can be observed from one TEC to another in several years. It is undetermined yet who are going to be selected with what criteria for the Director of each of the future TECs. However, it is sure that a versatile capability is required for the future Directors of TEC, who can not only perform well academically, by supervising students' learning and giving appropriate instructions and advice to the teachers in educational perspectives, but, also mobilise necessary resources for infrastructure development and maintenance.

As far as practical assistance, it would be effective if the appointed Directors would jointly participate in a training course, primarily targeting the TEC teachers, to learn about school management and administration, together with the teachers, which may bring value and create a team spirit and an environment for collective engagement for the TEC establishment and development among the teachers and the Directors.

(2) Evaluation of Student's Learning

Consistantly producing high quality basic education teachers is the only way for the TEC to achieve the recognition of being known as a prestigious higher educational institute, which can guarantee a qualitative education. In this view, it is necessary to obtain the capability to conduct effective student performance evaluations. The present RTTC and PTTC have accepted the students whose preceding basic knowledge and skills were relatively low; therefore it has been considerably difficult to develop their capacity by the time of their graduation from a RTTC/PTTC. Despite this fact, almost all have been able to graduate from a RTTC/PTTC and become a teacher under the current system. Therefore, it is critical to correct the student evaluations in a strict manner once the TEC is established, and its policy should not allow those students with low learning performance to graduate and become a teacher. This kind of quality control, standardised for all TEC, can be realised through the revision of the existing Teacher Professional Standards. For example, the adjustment of the level and the standardisation of the difficulty of the exams must be well coordinated among the TECs and the teachers. It is also essential to clarify the criteria and the standards of evaluation of a thesis or research paper. At the same time, it is important to educate and train student teachers on this matter, so that they can understand the concept of standards and equity for student's learning evaluation, and they can also practice it.

In the meantime, the shortage of educational evaluation experts is significant in Cambodia. Therefore, it is necessary to dispatch a number of TEC teachers to an overseas training course for a period of time, so they can learn about evaluations within their area of expertise, in the short term. In the long term, it is necessary to develop experts in educational evaluation, which, will require them to obtain a MA degree or a PhD degree.

(3) Lesson and Course Evaluation

The evaluation of a lesson or a course by students is common in higher educational institutions in Japan, in Europe, and, in the U.S. However, no TTC in Cambodia has this practice. In the

Cambodian cultural context that the young respect the elder, the children respect the parents, and the students respect the teachers, so, it is rare and not well perceived that the students can raise a question to the teachers, and, moreover, that the students can evaluate a teachers' performance.

Nevertheless, the Europeans and the North Americans have also overcome the misconceptions or the myths that "the students who have less experience and who are inmature cannot fairly evaluate the lessons," "Only the teachers who have rich experience and have achieved outstanding research results can perform a peer review," "Those teachers who are friendly and can make lessons enjoyable are better evaluated than those who can deliver better lessons in quality and in content," or "Students' evaluation depends on the title or the status of the teachers, regardless of the same level of lesson performance, " which were proved as teachers' misunderstandings or misconceptions.[70]

That Cambodia should pursue global standards, to include the introduction of students' lesson or course evaluation is necessary. The lesson or course evaluation can be also linked to the teachers' performance evaluation and the salary increase, which may motivate the teachers and lesson improvement. However, as mentioned above, since it is an unfamiliar practice in Cambodia, some DP intervention and assistance would be necessary for the introduction.

9.1.6 Other Concerns in Establishing TECs

(1) Statistical Data of Teachers

While various discussions on the TEC establishment are on-going among the members of the TPAP TF, the discussion on the physical capacity of each TEC has not yet been confirmed. It is because the number of students to be enrolled in TEC has not yet been determined. In fact, the Study Team raised the question to H.E. the Minister Naron at the occasion of the workshop held on 15 March 2015 that the number of students, teachers, and TECs was left unspecified. In other words, the prediction of the number of future teachers has not been practiced in the country, and therefore the demand for teacher has not been determined. As a result, the number of TECs to be established and the capacity of each TEC are left uncertain.

There are two scenarios of deciding the number of TEC students as follows:

Strategy 1): Admitting a uniform number of students every year; and
Strategy 2): Determining the number of admissions each year according to future teacher need projections.

The case for preschool and primary teachers, who teach all subjects, is quite simple, as they only require the information of retired teachers each year. However, since the lower secondary teachers vary subject by subject, the understanding of their status becomes more complicated. If the Strategy 1) is adopted, the calculation becomes simple, but the keeping the demand-supply balance would be difficult, particularly between the urban and the rural, as the teachers tend to prefer the urban to the rural. In some schools in the rural areas, it could cause the situation that some subjects lack a teacher, so the other teachers in different subjects are required to teach the subjects in which they don't actually have expertise. If the Strategy 2) is adopted, TEC can produce only the necessary number of teachers each year, therefore the problem of unbalanced demand-supply would be resolved. However, in the beginning, it will require the base statistical data of all lower secondary teachers in the country according to their age and teaching subject. Then, based on a census data, it can allow the prediction of the number of future students

[70] Aleamoni, L.M. (1999). Student rating myths versus research facts from 1924 to 1998, Journal of Personal Evaluation in Education, 13, 2, 153-166

Province by Province. Then, according to the student number projection, it is able to determine the number of teachers required, subject by subject, each year. For the Year N, for example, calculate the number of required teachers, and then determine the number of admission 4 years prior to the Year N (Year N – 4). The challenge is that there is no available statistical data for carrying out the calculation at this moment. Although the Study Team requested the data from the relevant offices, such as the Personnel Department of the MoEYS, no data was located. This concern was shared among DP; however any assistance in regards to the establishment of a database is not yest planned. It may be required to collect the base data of teachers in all Provinces under the framework of the JICA technical cooperation project to be implemented.

(2) School Curriculum and Textbook

The Cambodia Industrial Development Policy (IDP) 2015-2025 also refers to the school curriculum, particularly; the enhancement of soft skills and the advancement of STEM related subjects. Meanwhile, when the TEC Curriculum Framework is developed and the syllabi and teaching/learning materials of each module are developed, it is necessary to ensure the consistency between the school curriculum and textbooks and the TEC lesson contents and performance. Nevertheless, as of the end of April 2016, the timing and the method of school textbook development is uncertain, and it is possible that the development of TEC teaching/learning materials may come first before the school textbook development. In order to avoid such risk, it may be necessary, for example, to delay the process of the TEC teaching/learning material development by including the pedagogical parts which are closely related to the school textbooks in the materials for the 2nd year and above.

In addition, as referenced in the earlier Chapter on Human Resources for Industrial Development, the requests for improvement in basic education, which are mostly corresponding to the points indicated in the IDP, and made by private firms investing in Cambodia, are as follows:

[National Language (Khmer)] Improvement of ability in national language command, development of communication capacity and thinking ability

[Arithmetic/Mathematics] Improvement of understanding basic mathematical principles, development of basic math skills and performances, and development of skills to apply basic math knowledge and skills to daily life

[Social Studies] Acquisition of basic knowledge of social life, ethics and morals

Accordingly, the MoEYS is required to also adjust and revise the school curriculum and the textbooks of basic education, responding to the industrial needs and demands. At the same time the MoEYS has the responsibility for constantly producing the human resources who can respond to the industrial needs and demands, through the development of teachers who can teach, evaluate and develop those required human resources. In this view, the images indicated as follows need to be shared among all TEC:[71]

- Teachers who have a broad range of knowledge in Math and Science;
- Teachers who can develop the both soft and the hard skills of students;
- Teachers who can respond to the industrial needs and perform appropriate educational activities accordingly.

[71] These points were shared with H.E. the Minister Naron and MoEYS personnel relevant to teacher education, at the occasion of the end of STEPSAM3 Seminar held on 30 April 2016.

In order to be a teacher who can meet the above points, needless to say, the teachers themselves must 1) have mastered the necessary knowledge and the pedagogical skills in subject matter expertise; 2) be able to communicate and discuss logically with others; and 3) have owned the knowledge of social life, high sense of morals and ethics. In this manner, the required standards for the Directors and the teachers of the TEC, who deliver the comprehensive personality education, would be much higher.

(3) Strengthening the Library

A critical factor, which determines the functional capacity of a higher educational institution, is the quantity and the quality of reference books. Hokkaido University of Education, for example, which has the most books among the universities of education in Japan, owned one million eight thousand (1.008 million) books in 2015, followed by Osaka Kyouiku University, owning eight hundred eighty-four thousand (884,000) books in 2014. The other provincial universities, such as Miyagi University of Education with three hundred sixty-five thousand (365,000) books in 2015 and Nara University of Education with three hundred thirty-two thousand (332,000) books in 2015, are equipped with over three hundred thousand books.[72] Thanks to these available references, the students are able to perform various kinds of research and studies.

Unfortunately, the universities in Cambodia do not seemt o put the same high value on their libraries. According to the telephone interviews conducted by the Study Team, RTTC Phnom Penh owns twenty thousand (20,000) books, while RTTC Battambang possesses only three thousand (3,000) books. In order to be able to meet the ASEAN standard for research and study, when RTTCs are upgraded to TECs, at least forty thousand (40,000) books are required, so as to have several copies of each necessary reference book, required for their course work. Furthermore, it is necessary to have librarians or experts who can make the selection of essential books for the TEC. Therefore, at the occasion of the TEC teacher training, it is necessary 1) to make lists of reference books, when the TEC teachers prepare the syllabi, under the supervision of a foreign expert; and 2) to order and purchase the books referenced in the lists, so that those essential references are available by the time of the TEC opening. It would be ideal if this kind of preparation can be included in the JICA-assisted project framework.

9.1.7 Assistance for Facilities and Equipment for Establishing TECs

(1) Necessity of Construction of New Buildings and Procurement of New Equipment towards Establishing TEC

As previously stated, the curriculum of TEC will be developed based upon TEPS after the end of June 2016, but, there is yet to be put forth a concrete plan as to how many pre-service teachers shall be trained in each TEC. Presently, no official document is available to refer to in planning construction of new buildings and equipment procurement towards establishing TEC. Thus, by referring to the Japanese pre-service teachers' training curriculum shown Table 9-1, the Study Team proposes equipment to be procured. In addition, this report discusses the necessity of the construction of new buildings and procurement of new equipment, on the assumption that a total of 4,000 pre-service pre-primary, primary and lower secondary teachers will be trained annually.

The Study Team assumes that 10 or more TECs will be established all over Cambodia, based upon discussions by TPAP TF. There are currently 6 RTTCs and 18 PTTCs in Cambodia. As

[72] Hokkaido University of Education https://s-opac.sap.hokkyodai.ac.jp/library/sites/default/files/2015-6.pdf
Osaka Kyoiku University http://www.lib.osaka-kyoiku.ac.jp/gaiyo/annual/2014.pdf
Miyagi University of Education http://library.miyakyo-u.ac.jp/banner/about/gaiyo2015.pdf
Hyogo University of Teacher Education http://www.nara-edu.ac.jp/ADMIN/SECRETARY/book.pdf
(all accessed in 11 May 2016)

discussed in Chapter 6, the existing RTTC and PTTC have a capacity to train only about 500 pre-service teachers and it is clear that the 6 existing RTTCs and their nearby PTTCs are not sufficient for the future demand. Accordingly, the Study Team proposes to establish 6-10 TECs in the near future in order that about 4,000 pre-service pre-primary, primary and lower secondary teachers will be trained per year. Based upon this proposal, the Study Team has put together a plan for the construction of new buildings and the procurement of new equipment as follows:

The Study Team proposes that Cambodia initially integrates the 6 existing RTTCs (Phnom Penh, Kandal, Takeo, Prey Veng, Kampong Cham and Battambang) and 6 existing PTTCs in the respective provinces to upgrade them as TECs. And then, Cambodia shall upgrade additional 4-6 existing PTTCs to establish TECs, thereby establishing 10-12 TECs in total. Assuming that a total of 4,000 pre-service teachers will be trained annually, the admission quota of each TEC is about 300-400 pre-service teachers per year. As TECs offer a 4-year programme, the total capacity of each TEC will be about 1,200-1,600 students. However, there are plans to open courses for in-service teachers and bachelor's degree holders as well. Moreover, due to possible budget constraints, only 8-10 TECs may be established. Considering these points, the Study Team proposes two plans: the first plan, shown in Table 9-4, assumes a TEC of about 1,200 students and; the second plan, shown in Table 9-5, assumes a TEC of about 2,000 students.

Table 9-3: Assumed TEC Curriculum

	Pre-primary	Primary	Lower secondary	Others
Prerequisite subjects	Studies in Contemporary Teaching Profession			
	Education Basic Theory			
	Education History			
	Phycology of Development and Learning			
	Sociology of Education			
	Education Systems (Education Law, Education Administration, etc.)			
	Subject Teaching Method			
	Education Method Theory			
	Research and Analysis Method			
	Studies in Moral Education			
	Student Guidance Method			
	Method for Inclusive Education, and Special Need Education			
	ICT/Media workshop			
	Basic Foreign Language			
	Child Education	National Language		
	Teaching Method	Social Studies		
	Childcare (Health)	Mathematics		
	Childcare (Relationship)	Basic Science		
	Childcare (Environment)	Music		
	Childcare (Language)	Art		
	Childcare (Music)	Health and Physical Education		
	Childcare (Art)	Life skills (Home economics, Carpentry etc.)		
	Childcare(Culture)	Foreign Language of Choice		
	Child Clinical Phycology	Method of Special Activities		

Source: Prepared by the Study Team

Table 9-4: Necessary Size and Facilities for a TEC of 1,200 Students

Type of Pre-service Training	Pre-primary	Primary	Lower secondary	Others
No. of students accepted (by year)	50	150	50	100-200
Duration of programme	4 years	4 years	4 years	1-2 year
Total No. of Students	200	600	200	200
	1,000			200
	1,200[73]			
No. of necessary lecture rooms	8	24	8	8
Total no. of necessary lecture rooms	**48**			
Necessary subject rooms	Science labouratory 1(Physics) + 1 attached room for preparation			
	Science labouratory 1(Chemistry) + 1 attached room for preparation			
	Science labouratory 1(Biology) + 1 attached room for preparation			
	Music room			
	Art room			
	Carpenter room			
	Home economics room			
	ICT Labouratories 2			
	Library (With a sufficiently large study space) and language labouratories			
	Student toilet			
Hall	Capacity of 500-600			
Sport field				
Student dormitory	Male student dormitory			
	Shower and toilet for male student			
	Female student dormitory			
	Shower and toilet for female student			
Cafeteria	Cafeteria with kitchen			
Administration Building	Director's room			
	Vice director's rooms 2 or 3			
	Administration Office 1 (Curriculum department)			
	Administration Office 2 (Student services)			
	Meeting room (Large 1, Middle 2, Small 2)			
	Archive room			
	First-aid room			
	Staff toilet			
	Rooms for professors	Rooms for professors	Rooms for professors 1 (Natural science)	
			Rooms for professors 1 (Social science)	
			Rooms for professors 1 (Language)	
Staff dormitory				

[73] At this moment, as there is no standard on the number of students per lecture room in Cambodia, the total number of students is calculated on the assumption of 25 students per lecture room, taking into account the improvement of quality education. Laos, an adjacent country to Cambodia, has established its standard at 20 students per professor and endeavored to meet the standard. In addition, the Lao standard states that 1.6 sqm per student is an ideal space for educational environment. The Study Team temporarily assumes 64 sqm per lecture room, which can accommodate 40 students per lecture room. (64 sqm / 1.6 sqm per student) Based on this assumption, the maximum capacity of this TEC is 1,920 students.

Table 9-5: Necessary Size and Facilities for a TEC (Draft) of 2,000 Students

Type of Pre-service Training	Pre-primary	Primary	Lower secondary	Others
No. of students accepted (by year)	100	250	100	100-200
Duration of programme	4 years	4 years	4 years	1-2 year
Total No. of Students	400	1,000	400	200
	1,800			200
	2,000[74]			
No. of necessary lecture rooms	16	40	16	8
Total no. of necessary lecture rooms	**80**			
Necessary subject rooms	Science labouratory 1(Physics) + 1 attached room for preparation			
	Science labouratory 1(Chemistry) + 1 attached room for preparation			
	Science labouratory 1(Biology) + 1 attached room for preparation			
	Music room			
	Art room			
	Carpenter room			
	Home economics room			
	ICT Labouratories 2			
	Library (With a sufficiently large study space) and language labouratories			
	Student toilet			
Hall	Capacity of 500-600			
Sport field				
Student dormitory	Male student dormitory			
	Shower and toilet for male student			
	Female student dormitory			
	Shower and toilet for female student			
Cafeteria	Cafeteria with kitchen			
Administration Building	Director's room			
	Vice director's rooms 2 or 3			
	Administration Office 1 (Curriculum department)			
	Administration Office 2 (Student services)			
	Meeting room (Large 1, Middle 2, Small 2)			
	Archive room			
	First-aid room			
	Staff toilet			
	Rooms for professors	Rooms for professors	Rooms for professors 1 (Natural science)	
			Rooms for professors 1 (Social science)	
			Rooms for professors 1 (Language)	
Staff dormitory				

[74] As is the case with 1,200 student capacity, the maximum capacity of this TEC is 3,200 students.

9.1.8 Facilities and Equipment Plan

The Study Team confirmed with MoEYS that in establishing TECs, it is realistic that, as an initial step, the RTTC and the PTTC in each city of Phnom Penh and Battambang will be integrated, taking advantage of existing facilities, rather than finding a new construction plot to build brand new facilities.

Based on the above confirmation and the student enrollment assumption described in 9.1.6, the Study Team proposes that the following facility and equipment are necessary to implement the curriculum.

(1) TEC Phnom Penh

Legend :
Buildings marked out in Red: ①②③ of the existing RTTC and ①② of the existing PTTC **to be renovated**
Buildings marked out in Yellow:④ of PTTC and ⑥of RTTC **to be demolished and replaced with new buildings**
Plot surrounded by Yellow dots: **New construction plot**

Case : TEC of 1,200 Student Capacity

For planning purposes, the following points are to be considered.

1. Lecture room: Presently, there are 4 buildings in the RTTC (①②③⑤) and 2 buildings in the PTTC (①②) respectively. In the existing lecture buildings, a part of lecture rooms is used for the director's room, professors' rooms, and special rooms. To address this situation, the Study Team proposes to construct an administrative building and a special lecture building so that the lecture rooms currently used as administrative and special purposes shall be again used as lecture rooms. Based upon this proposal, the 5 existing lecture buildings (marked in red in the above satellite picture) shall only be renovated by repainting interior and exterior walls, repairing partition walls, renewing window and door, repairing roofs, etc.
2. Administration, special lecture rooms, and library building (④ in the PTTC marked in yellow) and Hall building (⑥ in the RTTC marked in yellow): They shall be

demolished to be replaced with new buildings respectively on the same plots or on the vacated plots shown by the RTTC. (Northwest or east of building ⑤ in the RTTC) .

3. Student and staff dormitory: There is each of 1 student and staff dormitory in the RTTC (building ⑦) and the PTTC (building ⑤), each of which is 15-17 year-old and 2-storied RC (approx. 160 capacity). In addition, presently, a new dormitory building of 3-storied RC (approx. 150-200 capacity) is being constructed (building ⑧). Accordingly, no additional dormitory building is proposed at this moment. Nevertheless, since the 2 existing dormitories (buildings ⑤ and ⑦) are not well-maintained, they need minor maintenance work such as tidying up the surrounding, cleaning, repainting, fixing, etc. The Study Team proposes that these minor maintenance works be borne by the Cambodian side; thereby, not including them in the JICA's assistance plans.

a) No. of lecture rooms to be constructed: 5 out of the existing 6 lecture buildings in the RTTC/PTTC are old and 2-storied RC. Table 9-6 shows the number of necessary lecture rooms.

Table 9-6: No. of Lecture Rooms Necessary at TEC Phnom Penh (Case: 1,200 Students Capacity)

<table>
<tr><td rowspan="2">Planned components</td><td rowspan="2">Lecture room
Professors room</td><td>Pre-primary：8 rooms
Professors' room for the above：1 room
（equivalent to 1 lecture room space）
Primary：24 rooms
Professors' room for the above：1 room
（equivalent to 1 lecture room space）</td><td>Lower secondary: 8 rooms
Professors' room for the above-1：1 room
（equivalent to 1 lecture room space）
Professors' room for the above-2：1 room
（equivalent to 1 lecture room space）
Professors' room for the above-3：1 room
（equivalent to 1 lecture room space）</td></tr>
<tr><td>Planned Lecture rooms</td><td>48 + 5
53</td><td>Others: 8 rooms</td></tr>
<tr><td rowspan="2">No. of lecture rooms to be used continuously at the RTTC</td><td>25 +*11
36</td><td colspan="2">Lecture building ①：8 lecture rooms are used for administrative purposes.
Lecture building ②：6 rooms. 2 are used for home economics workshop rooms.
Lecture building ③：7 rooms. 1 room is used for equipment storage.
Lecture building ④: 12 rooms.

*No. of lecture rooms used for different purposes than an original purpose.</td></tr>
<tr><td rowspan="2">No. of lecture rooms to be used continuously at the PTTC</td><td>12 +*2
14</td><td colspan="2">Lecture building ①：4 rooms. 2 rooms are used for administrative purposes.
Lecture building ②：8 rooms.

*No. of lecture rooms used for different purposes than an original purpose.</td></tr>
<tr><td>No. of necessary lecture rooms to constructed</td><td>3</td><td colspan="2">3 lecture rooms are additionally needed. However, considering that 2 rooms have been equipped with network system in the RTTC and it is deemed appropriate to continue using the rooms, 2 more lecture rooms are necessary. Thus, a new building of 5 lecture rooms shall be necessary to be constructed.</td></tr>
</table>

b) Administrative building: A new building shall be built on the plot shown by the RTTC (Northwest or east of building ⑤ in the RTTC). Table 9-7 shows necessary components in the administrative building.

Table 9-7: Necessary Components in the Administrative Building (Draft) (Capacity of 1,200 Students)

Planned components	Director's room	Vice director's room	Curriculum dept. office	Student services	Meeting room (L)	Meeting room (M)	Meeting room (S)	Archive room	First-aid room	Staff toilet (M)	Staff toilet (F)	Pre-primary/Professors room.	Primary/Professors room.	Lower secondary/Professors room. 1	Lower secondary/Professors room. 2	Lower secondary/Professors room. 3
No. of rooms	1	2	1	1	1	2	2	2	1	1	1	These rooms shall be constructed in the lecture building				

c) Special lecture room: A new building with components shown Table 9-4 shall be built on the plot shown by the RTTC (northwest or east of RTTC ⑤ building) . A library and language labouratory shall be planned in a new library building.

d) Library: As above, a new library building shall be planned, on the plot where the dilapidated library building (building ④) stands now in the PTTC. The old building shall be demolished.

e) Assembly Hall: A hall building of 500-600 student capacity shall be built on the plot where an unused old hall building (building ⑥) stands now in the RTTC. The old building shall be demolished.

f) Cafeteria: A cafeteria of the component of Table 9-2 shall be built in the northwest or east of RTTC building⑤.

g) Sport field: The existing football ground can be used as a sport field assumed in Table 9-2. Accordingly, no new sport field shall be planned.

Case : TEC of 2,000 Student Capacity

Points to be considered are as the same as the case of 1,200 capacity.

a) Lecture room: As stated, 5 out of the 6 existing lecture buildings of 2-storied RC in the RTTC and PTTC are old and need renovation work. Table 9-8 shows the number of necessary lecture rooms.

Table 9-8: No. of Lecture Rooms Necessary at TEC Phnom Penh
(Case: 2,000 Students Capacity)

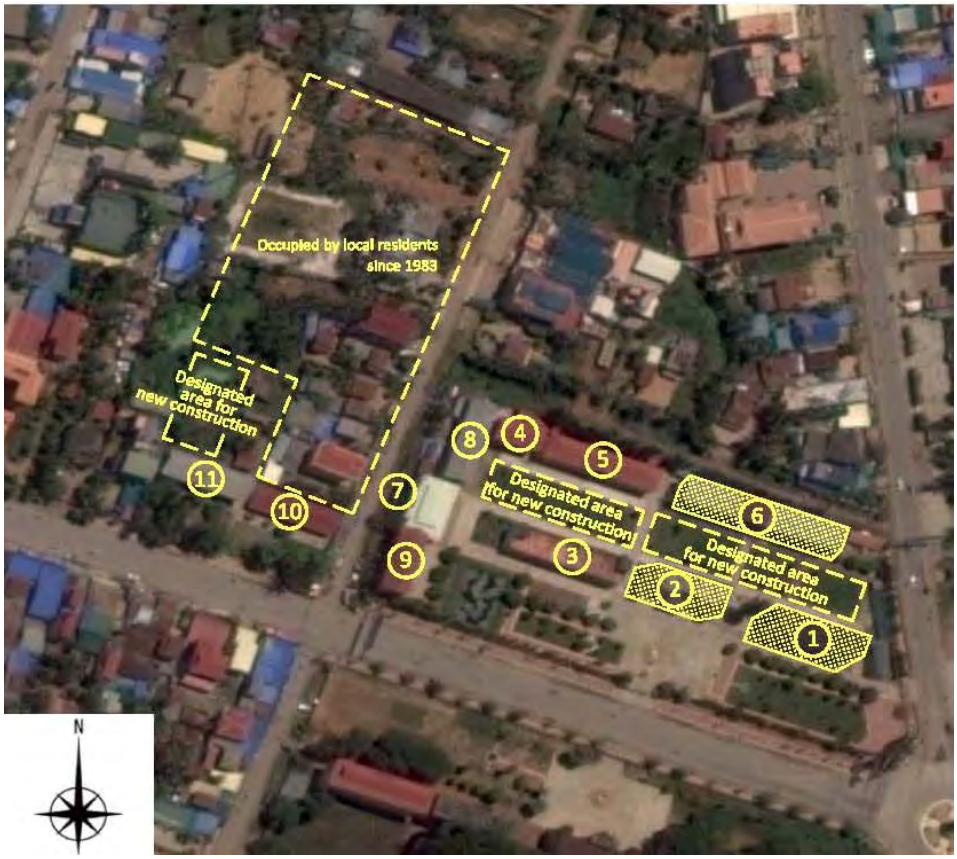
<table>
<tr><td rowspan="2">Planned components</td><td rowspan="2">Lecture room
Professors' room</td><td>Pre-primary：16 rooms
Professors' room for the above：1 room
（equivalent to 1 lecture room space）
Primary：40 rooms
Professors' room for the above：1 room
（equivalent to 1 lecture room space）</td><td>Lower secondary: 16 rooms
Professors' room for the above-1：1 room
（equivalent to 1 lecture room space）
Professors' room for the above-2：1 room
（equivalent to 1 lecture room space）
Professors' room for the above-3：1 room
（equivalent to 1 lecture room space）</td></tr>
<tr><td>Planned Lecture rooms</td><td>80 + 5
85</td><td>Others: 8 rooms</td></tr>
<tr><td>No. of lecture rooms to be used continuously at the RTTC</td><td>25 +*11
36</td><td colspan="2">Lecture building ①：8 lecture rooms are used for administrative purposes.
Lecture building ②：6 rooms. 2 are used for home economics workshop rooms.
Lecture building ③：7 rooms. 1 room is used for equipment storage.
Lecture building ④: 12 rooms.

*No. of lecture rooms used for different purposes than an original purpose.</td></tr>
<tr><td>No. of lecture rooms to be used continuously at the PTTC</td><td>12 +*2
14</td><td colspan="2">Lecture building ①：4 rooms. 2 rooms are used for administrative purposes.
Lecture building ②：8 rooms.

*No. of lecture rooms used for different purposes than an original purpose.</td></tr>
<tr><td>No. of necessary lecture rooms to constructed</td><td>35</td><td colspan="2">35 lecture rooms are additionally needed. However, considering that 2 rooms have been equipped with network system in the RTTC and it is deemed appropriate to continue using the rooms, 2 more lecture rooms are necessary. Accordingly, a total of 37 lecture rooms shall be needed. On top of this, it is necessary to plan an even number of lecture rooms. As a result, a total of 38 lecture rooms, that is 3 buildings of 10 lecture rooms and 1 building of 8 lecture rooms shall be planned.</td></tr>
</table>

As for b) Administrative building, c) special lecture room, d) library building, e) hall building, f) cafeteria, and g) sport ground, the respective plans are the identical to the case of 1,200 capacity.

(2) TEC Battambang



Above: RTTC Battambang Map made by the Study Team based upon Google Map

Legend :
Buildings marked out in Yellow: ①②⑥ **to be demolished and replaced with new buildings.**
Plots surrounded by Yellow dots: **New construction plot**

Below : PTTC Battambang

Map made by the Study Team based upon Google Map

Case : TEC of 1,200 Student Capacity

In establishing a TEC in Battambang, the Study Team proposes that the Cambodian side shall first and foremost secure a new construction plot. As previously described, the existing RTTC and PTTC are located about 1.5km away from each other. On top of that, there have been unlawful inhabitants in a part of the existing RTTC campus since 1983, making campus extension difficult. Furthermore, the existing PTTC campus is small, leaving little space for establishing a full-size TEC within. Accordingly, TEC facilities are likely to scatter in several plots, which is not favorable as a new higher education institution.

However, the Study Team proposes the following plan, if it is not possible for the Cambodian side to secure a new construction plot.

1. Lecture room: At present, there are 4 lecture buildings (①③⑤⑥) in the RTTC and 2 lecture buildings in the PTTC. Among them, the building ⑥ is over 50 year-old and needs to be replaced with a new building. Likewise, the lecture building ① of 4-storied RC, a part of which is used for administration purposes, is 51 year-old, and thus needs to be replaced. On the other hand, the lecture buildings ③ and ⑤ in the RTTC and the lecture building ⑤ in the PTTC are about 7-14 year-old and the lecture buildings ② a-d in the PTTC are about 20 year-old, and all of them are in a good condition and can be used continuously. However, in establishing a TEC, they need minor maintenance work such as fixing and repairing. The Study Team proposes that this minor maintenance work be borne by the Cambodian side; thereby not including it in the JICA's future assistance plans.
2. Administration, special lecture room, library (①and②), and Hall (⑦): Buildings ① and ② shall be demolished and replaced with new buildings. The hall building (⑦) is too small for a TEC, thus a new building shall be built separately on the plot (between ①② ③and ④⑤⑥)shown by the RTTC.
3. Student/Staff dormitories: There are 2 male dormitories in the RTTC, one of which is 17 year-old 2-storied RC and wooden structure (RTTC building ⑪, accommodation capacity of 160 students and 6 staffs) and the other of which is 30 year-old single-storied RC (RTTC building ⑩, accommodation capacity of 80 and 6 staffs). Likewise, there are 2 female dormitories, one of which is 30 year-old 2-storied RC and wooden structure (RTTC building ⑧, accommodation capacity of 160 students and 12 staffs) , and the other of which is 17 year-old 2-storied RC (RTTC building ⑨, accommodation capacity of 120 students and 12 staffs). Thus, a total of 4 dormitories exist. The Cambodian side requested the Study Team to consider planning a new male dormitory. Given this request, the Study Team proposes to construct a new male dormitory building of 2-storied RC with 8 rooms in the north of building ⑪ in the RTTC.

   In the PTTC, there is a male dormitory building of 16-year old and 2-storied RC (PTTC building ④) with accommodation capacity of 60 students. Likewise, there are female dormitory buildings of 20-year old and 2 storied RC (PTTC buildings ⑥⑦) with combined accommodation capacity of 160 students. Thus, there are a total of 3 dormitories, all of which are poorly maintained and need minor maintenance work such as tidying up the surroundings, cleaning, repainting exterior and interior walls, fixing, repairing, etc. The Study Team proposes that these minor maintenance works be borne by the Cambodian side, thereby not including them in the JICA's assistance plan.
4. Considering the existing facility conditions, unavailability of a construction plot, and easy use of the campus, the Study Team proposes that a facility for pre-primary pre-service

teacher training be planned in the PTTC and that facilities for primary and lower-secondary pre-service teacher training and other training programmes be planned in the RTTC, respectively.

a) No. of lecture rooms to be constructed: Table 9-9 shows the number of lecture rooms necessary to be constructed for the PTTC and RTTC respectively.

Table 9-9: No. of Lecture Rooms Necessary at PTTC/RTTC (Case: 1,200 Students Capacity)

[Pre-primary pre-service teachers' training facility to be planned in the PTTC]

Planned components	Lecture room / Professor's room	Pre-primary：8 rooms Professors' room for the above：1 room （equivalent to 1 lecture room space）	
Planned Lecture rooms	8 + 1 **9**		
No. of lecture rooms to be used continuously at the PTTC	**14**	2a-2d Lecture building：8 lecture rooms. 2 of them are used for administrative purposes. Lecture building 2: 8 lecture rooms. *No. of lecture rooms used for different purposes than an original purpose.	
No. of necessary lecture rooms to constructed	**-**	The existing lecture rooms are sufficient, and thus no additional lecture rooms are planned. **However, renovation work is necessary.**	

[Primary, Lower-secondary pre-service teacher training and BA/BS +1 student pre-service teacher training facility to be planned in the RTTC]

	Lecture room / Professors room	Primary：24 rooms Professors' room for the above：1 room （equivalent to 1 lecture room space）	Lower secondary: 8 rooms Professors' room for the above-1：1 room （equivalent to 1 lecture room space） Professors' room for the above-2：1 room （equivalent to 1 lecture room space） Professors' room for the above-3：1 room （equivalent to 1 lecture room space）
Planned Lecture rooms	40 + 4 **44**		BA/BS + 1-year course: 8 rooms
No. of lecture rooms to be used continuously at the RTTC	**20**	Lecture building ①：To be demolished and replaced with a new building. Lecture building ③：10 rooms. Lecture building ⑤：10 rooms. Lecture building ⑥: To be demolished and replaced with a new building.	
No. of necessary lecture rooms to constructed	**24**	The necessary lecture rooms shall be newly built after demolishing the existing lecture buildings. As for lecture building ⑥, presently, a part of it is used by a secondary school. Thus, a new building plan shall be made taking into alternative for the secondary school.	

b) Administrative building: A new building shall be built on the plot shown by the RTTC (RTTC Battambang Map: between buildings ①②③and ④⑤⑥).

Table 9-10: Necessary Components in the Administrative Building (draft) (Capacity of 1,200 Students)

Planned components	Director's room	Vice director's room	Curriculum dept office	Student services	Meeting room (L)	Meeting room (M)	Meeting room (S)	Archive room	First-aid room	Staff toilet (M)	Staff toilet (F)	Pre-primary/Professors' room	Primary/Professors' room	Lower secondary/Professors room 1	Lower secondary/Professors' room 2	Lower secondary/Professors' room 3
No. of rooms	1	2	1	1	1	2	2	2	1	1	1	These rooms shall be constructed in the lecture building				

c) Special lecture room: A new building with components shown in Table 9-4 shall be built on the plot shown by the RTTC (RTTC Battambang Map: between buildings ①②③and④⑤⑥) . A library and language labouratory shall be planned in a new library building.

d) Library: As above, a new library building shall be planned on the plot shown by the RTTC (RTTC Battambang Map: between buildings ①②③and④⑤⑥) .

e) Assembly Hall: There is an existing hall building built in 2004, size of which is 16 m x 24 m (384sqm). Though the existing building is smaller than the size stipulated in Table 9-4, there is no space for extension. A further study is required.

f) Cafeteria: There are cafeterias of the size stipulated in Table 9-4 both in the RTTC and in PTTC respectively. In establishing a TEC, since the existing cafeteria in the RTTC is a temporary one, the Study Team proposes that the building be replaced with a new one. On the other hand, the existing cafeteria in the PTTC needs only a minor maintenance work, which shall be borne by the Cambodian side. Accordingly, the Study Team shall not propose it to be included in the JICA's assistance plans.

g) Student/staff dormitories: There currently exist male and female dormitories in the RTTC and PTTC respectively and there are a total of 7 dormitory buildings. The male dormitories (Figure 6-18, building ⑩ and ⑪) are outside the campus and beyond the unlawfully occupied street. As the RTTC requests extension of the dormitories, a further study is required.

h) Sport field: Neither of the RTTC nor of PTTC has an enough space for a sport field of the size stipulated in Table 9-4. Thus, further discussions are necessary with the RTTC and PTTC. Considering this sport field, it is desirable that the Cambodian side secures a new construction plot.

i) Equipment: As for required equipment for a TEC, refer to the "Equipment List" in the Annex.

Case: TEC of 2,000 Student Capacity

Points to be considered are identical to the above (2); 1,200 capacity case. However, as the available construction plot is smaller than that of Phnom Penh, it is desirable that the Cambodian side secure a new construction plot in establishing a TEC of 2,000 student capacity.

a) No. of lecture rooms to be constructed: Table 9-11 shows the number of lecture rooms necessary to be constructed for the PTTC and RTTC respectively.

Table 9-11: No. of Lecture Rooms Necessary at PTTC/RTTC (Case: 2,000 Students Capacity)

[Pre-primary pre-service teachers' training facility to be planned in the PTTC]

Planned components	Lecture room Professor's room	Pre-primary：16 rooms Professors' room for the above：1 room （equivalent to 1 lecture room space）	
Planned Lecture rooms	16 + 1 **17**		
No. of lecture rooms to be used continuously at the PTTC	**14**	2a-2d Lecture building：8 lecture rooms. 2 of them are used for administrative purposes. Lecture building 2: 8 lecture rooms.	
No. of necessary lecture rooms to constructed	**3**		

[Primary, Lower-secondary pre-service teacher training and BA/BS +1 student pre-service teacher training facility to be planned in the RTTC]

	Lecture room Professors room	Primary：40 rooms Professors' room for the above：1 room （equivalent to 1 lecture room space）	Lower secondary: 16 rooms Professors' room for the above-1：1 room （equivalent to 1 lecture room space） Professors' room for the above-2：1 room （equivalent to 1 lecture room space） Professors' room for the above-3：1 room （equivalent to 1 lecture room space）
Planned Lecture rooms	64 + 4 **68**		BA/BS + 1-year course: 8 rooms
No. of lecture rooms to be used continuously at the RTTC	**20**	Lecture building ①：To be demolished and replaced with a new building. Lecture building ③：10 rooms. Lecture building ⑤：10 rooms. Lecture building ⑥: To be demolished and replaced with a new building.	
No. of necessary lecture rooms to constructed	**48**	The necessary lecture rooms shall be newly built after demolishing the existing lecture buildings or shall be built between buildings①②③ and ④⑤⑥. As for lecture building ⑥, presently, a part of it is used by a secondary school. Thus, a new building plan shall be made taking into alternative for the secondary school.	

As for b) Administrative building, c) special lecture building, d) library building, e) hall building, f) cafeteria, g) student/staff dormitory building, h) sport field, and i) equipment, the respective plans are the identical to the case of 1,200 capacity.

9.1.9 Selection Criteria and Situation in the Planned Site of TECs

The following points and procedures need to be considered, in establishing TECs.

(1) Codes and Regulations to be Followed in Constructing a New Building

Building Code, Standard and Permit

In Cambodia, there is no building code equivalent to the "Building Standard Acts" in Japan. Thus, in designing buildings, it is allowed to follow the standard of developed countries such as JIS (Japan), ASTM (US) and BS (Britain).

As for a building permit, the local government issues it for a building of less than 3,000 sqm floor area; while the Ministry of Land Management, Urban Planning and Construction (MLMUPC) issues for a building of 3,000 sqm or larger. In the event that the total floor area of a multiple number of buildings exceeds 3,000 sqm and the size of each building is less than 3,000 sqm, one applies for a building permit to the local government. On the other hand, if the total floor area of a building exceeds 3,000 sqm by extension, either horizontally or vertically, one applies for a building permit to MLMUPC.

Issues to be Considered for Designing TEC Building

Regarding primary and secondary school buildings, there is the standard design which stipulates the size of a lecture room, width of staircases, width of a corridor, etc. However, there is no such building design standard for a TTC or higher education facilities. Therefore, each development partner usually designs an architectural plan without much regard to regulations, based upon the needs of each facility.

When designing a TEC building, it is deemed important to consider the following issues.

1) To secure a comfortable educational environment in the hot and humid climate
   - ① Plan openings to allow maximum natural ventilation and natural lighting (securing comfortable education environment without using artificial lighting and air-conditioners as much as possible)
   - ② Plan the high ceiling to secure air volume per person
   - ③ Plan a large eave to avoid rain and the direct sunlight
   - ④ Plan a building east-west axis
   - ⑤ Plan a ceiling to insulate the noise of rain

2) To use land effectively

   When the plot available for a building extension is small, for the sake of effective use of such a small plot, a building needs to be medium-rise (3 to 5-storey building). In the case that a brand new building is to be constructed in a plot where there is an existing building to be demolished, it is necessary to discuss who demolishes the building and the timing of the demolishing works beforehand. Furthermore, a construction plan must be carefully made to separate circulation of students and construction vehicles.

3) To cope with flooding

   Owing to the poor infrastructure, flooding often occurs in an area where there is a river or a lake in the rainy season due to torrents. Thus, the ground floor level needs to be set sufficiently high to avoid the building getting submerged.

4) To countermeasure against theft

   To protect expensive equipment, teaching materials and chemicals from the theft during the night and during holidays, the lecture room windows and doors shall be of steel and a grill shall be installed at the entrance of any staircases on the ground floor.

(2) Local Architectural Consultants and Construction Companies

Local Architectural Consultants

Currently, there are about 20-30 architectural consultants in Phnom Penh and they are categorized into the following 3 types based on to the registration criteria by the Ministry of Construction.

Category 1: Individual consultants
Category 2: Middle-sized consultants
Category 3: Foreign consultants (US, Britain, Singapore, etc.)

Individual consultants usually have little experience in drafting documents and construction supervision of a certain level required by development partners. Accordingly, it is not appropriate to employ an individual consultant for a building to be constructed with Japanese financial assistance. On the other hand, there are a few middle-sized local consultants with enough experience and competitive staff, who may meet the high level requirements by development partners. Thus, it is possible to employ such middle-sized local consultants. Lastly, foreign consultants are well experienced with a high skill, and accordingly, their consultant fee may be equal to or more costly than the fee for employing a Japanese consultant. Thus, it requires a careful cost examination when hiring a foreign consultant.

Local Construction Companies

Construction companies are required to register with the following authorities in order to do business legally in Cambodia.

① Office Registration: MLMUPC
② Patent Registration: Ministry of Economy and Finance (MOEF)
③ VAT Registration: MOEF
④ Office Registration: MOEF (Procurement Department)
⑤ Company Registration: Ministry of Commerce

Companies are classified into 3 grades depending on their capacity, regarding the registration with MLMUPC. However, in general, every tender is open to all companies regardless of their grades. As the required technical level of construction is relatively high due to the construction of medium-rise buildings including piling, it is deemed important that only large-sized construction companies with sufficient technical capabilities are invited for a tender.

In Phnom Penh, there are about 10-20 construction companies with experience of school construction projects by development partners, and the capability to complete the construction at a required quality in a given timeframe. Thus, it is deemed important to set a pre-qualification to employ good construction companies. Although there are construction companies in middle-sized cities in provinces, their technical capacities are far insufficient compared to their counterparts in Phnom Penh.

(3) Procurement of Construction Materials and Machinery

Procurement of Construction Materials and Machinery

There are a large number of suppliers which import construction materials in Cambodia, many of which are in Phnom Penh. A variety of construction materials from neighboring Asian countries are also available in the market. Domestically produced concrete aggregate, cement and lumber are easily available. However, today, the majority of the cement available in the market is from Thailand or Vietnam, as two Cambodian cement companies are not able to keep up with the recent construction rush and thus their production are in short against the demand.

Steel and reinforcing bars produced in Thailand and/or Vietnam are also available in the market, which have acceptable quality as European and/or Japanese companies have transferred manufacturing skills to companies in those countries.

Construction machinery can be leased; however, middle or large size construction companies usually own them. Accordingly, it is possible to use construction machinery locally available in constriction of higher education facility buildings.

Procurement of Equipment

There are local suppliers which manufacture simple teaching materials (such as posters, wooden puzzle, cooking tools, etc.) used at primary and secondary education levels in Cambodia. But most of the teaching materials such as science equipment used at primary and secondary education, and ICT apparatus, tools, machines, and analytical equipment needed at technical high school or higher levels are imported from Japan or other third countries. There are a few agents which sell the equipment in Phnom Penh, though the number is limited when it comes to agents handling Japanese products. Moreover, as for large-size and/or expensive equipment, they are not always in stock and such equipment are sold upon receiving orders.

Concerning the procurement of consumables and spare parts, it is possible to procure them if they are for the equipment procured through an agent. If not, it is necessary to procure them from neighboring countries such as Thailand, Vietnam, Singapore and Malaysia through an agent. This is particularly true in regards to consumables and spare parts for Japanese products.

Additionally, as for repair of procured equipment, there are few agents with a technician who can repair or change spare parts based upon diagnosis. Thus, it is important to take it into account and confirm before procuring the equipment.

9.1.10 Project Implementation, Management, and Maintenance

(1) Facility Management and Maintenance of RTTC

When there is a necessity for the expansion or renovation of the facilities of RTTC, the issue is first reviewed internally, then an informal request will be made to the Provincial Office of Education (PEO) in charge. The POE forwards the expansion or renovation plan to the MoEYS. Only after the MoEYS' endorsement of the proposal, RTTC needs to make a formal request to the MoEYS through the POE. Upon the formal request, the MoEYS seeks for available resources internally and externally. When an available budget is identified and secured, the proposed expansion or renovation can be realised. In case there is a contact with a DP locally, RTTC may directly request the DP for assistance.

Concerning the management and maintenance of facilities, each RTTC is in charge. Regular maintenance including the cleaning and the repairing of facilities is financed with the annual budget allocated from the POE. Each budget costs up to US$750 and each RTTC can request a maximum of 4 times a year. In case the budget is insufficient, students do the cleaning instead of hiring a cleaner, and repairing cost may be financed by a students' family contribution.

(2) Equipment Management and Maintenance of RTTC

When RTTC procures equipment, the request is made to the MoEYS via the POE by submitting a list of equipment needed to be procured. The MoEYS allocates either recurrent budget or programme budget (PB) for procurement. However, due to the limited allocation of budget, it is the common situation that RTTCs are not fulfilled with essential equipment for their lessons.

Regarding the cost of purchasing consumables and replacing parts of products, for repairing and maintenance of equipment, the PB and the contribution from students will finance the cost. In most cases, as the number and the sorts of equipment installed in RTTC is limited, most of the maintenance costs can be financed within the RTTC budget. Meanwhile, the network

computing system installed by a service firm based in Phnom Penh, with assistance from ADB, requires technical services by the firm in Phnom Penh, which may cause some inconvenience. Taking this situation into account, each RTTC is recommended to secure a budget for maintenance.

9.1.11 Expected Effectiveness, Issues, and Suggestions

With the expansion and the upgrade to the TEC by the integration of RTTC and PTTC, the following effects are expected to occur:

1) An expanded and upgraded TEC will have the capacity of twice or three times that of the existing RTTC and PTTC, which can currently accept a maximum of 500 students and 200 students, respectively.
2) Upgraded facilities and equipment enable the teachers and the students to practice a more practical and higher level of experimental lessons.
3) 4-year Bachelor's degree education of TEC, extended from the current 2-year Associate degree education, allows the future basic education teachers to learn and obtain essential knowledge and pedagogical skills for better basic education.
4) Enhanced motivation for the upgraded teacher education is expected in the favourable learning environment with the newly constructed and renovated facilities.

9.1.12 Environment and Gender Issues

(1) Forest Conservation Policy

Taking the price increase of wood into consideration, owing to the Cambodian government policy of logging regulation in order to protect forest resources and the subsequent reduction of timber production, it is recommended to utilise some alternative materials such as steel.

(2) Consideration for Disabled People

In order to avoid the inconveniences of the facilities for those physically challenged, the facilities to be constructed should be equipped with a ramp, and a wider toilet booth, so that people in a wheelchair can have access.

(3) Gender Consideration

The toilet and its entrance must be separated between one for male and another for female. Particularly, the facility of engineering education tends to be filled with far more male students than female; nonetheless, a sufficient number of toilet booths exclusively for the females must be built and there should be no sharing of toilets between sexes.

(4) Measures to be Taken toward the Residents around the Facilities

All 6 RTTCs are located in a city area. It is assumed that the expansion and the rehabilitation of the facilities will be conducted inside the existing RTTC property. However, there is a concern with those who have unlawfully occuppied and resided in the land property of RTTC Battambang for many years. In order to upgrade the function of the TEC expanding from the RTTC, it would be required to utilise the land presently occupied by the squatters. In case their evacuation or move is required, proper coordination and arrangement by the Cambodian government would be necessary.

9.2 Assistance for Establishment of Higher Technical Education Faculties

IDP 2015-2025 sets a goal of transforming Cambodian industries from labour-intensive to skill-intensive. The Study Team observed in Phnom Penh's SEZs that some large scale factories try to improve the current labour-intensive production lines with increased production capacity in order to accommodate the manufacturing of mechanical parts. Some factories showed interest in automation technologies for mass production. However, this is not easy because of an overwhelming lack of local engineers both in terms of quality and quantity. Factories react to this by either providing further training to workers in third countries and in the ones of their origin, or employing foreign engineers. These are the additional costs which consequently keep Cambodia's international competitiveness low. Therefore, this survey proposes to multiply the number of HEIs with engineering majors in order to cope with the soaring needs of local engineers, especially in the eastern and western border areas.

9.2.1 Necessity, Feasibility, and Expected Impacts of the Assistance for University of Battambang, Svay Rieng University

Apart from Phnom Penh, the need for local engineers is also high in the border areas with Thailand and Vietnam where several SEZs are situated. However, all of the HEIs that offer engineering majors, except one university, are located in Phnom Penh. Several HEIs have a Faculty of Science and Technology which commonly serves for providing work forces in both the capital and provincial areas as well as public and private HEIs. However, the Study Team finds there are some challenges in the faculty, such as less opportunity of basic and specialised labouratory works, graduation thesis with labouratory experiment and data analysis for students, Incentives for lecturers are based on the number of lectures which does not encourage them to do research work. Many graduates go to Phnom Penh for jobs which consequently contribute to the shortage of local engineers and technicians in the provinces. Hence, the factories in the provinces face challenges in adopting automation due to the unavailability of local engineers and technicians. This is one of the reasons why factories, other than garment, are not moving to the provinces.

ITC has the most potential to provide practical engineering education and research in Cambodia, followed by the newly established RUPP Faculty of Engineering. IDP proposes promoting industrialisation in the provinces through developing industrial clusters along with Thailand-plus One and Vietnam-plus One Strategy. Such strategies require provincial HEIs to play the role of providers of high-quality human resources to industries as well as developing new technologies for them. UBB and SRU are the national universities positioned at West and East side of the borders along the Southern Economic Corridor which is crucially important for Cambodian economic development. It is expected that UBB and SRU become capable of taking on such roles for the industrialisation in the regions, especially, for the SEZs at the border areas.

9.2.2 Assistance Components, Types, Scale, and Schedule

However, these two universities have many challenges which permit only limited capability for producing necessary human resources and technologies for industrialisation in the areas. Hence, this survey proposes to have ITC first create a critical core of engineering human resources, and, then, utilise the core for expanding quality engineering education and research in the provinces.

(1) Labouratory-based Education and Research (LBE)

ITC has recently set a strategy to introduce Labouratory Based Education (LBE), which is a common practice in Japanese engineering HEIs. The institution has a plan to do so initially at Electrical and Energy Engineering (GEE), Industrial and Mechanical Engineering (GIM),

Geo-Resources and Geotechnical Engineering (GGG), and, Information and Communication Engineering (GIC), where Japanese universities have been cooperating in the past several years. The remaining three departments namely Chemical Engineering and Food Technology (GCA), Civil Engineering (GCI), and Rural Engineering (GRU) will follow in the second stage. In parallel, if UBB and SRU manage to have their young and promising lecturers or students go to ITC's fulltime post-graduate programmeme, LBE can then be transferred to these two universities. It may also be possible through having ITC's existing post-graduate students to go and serve in the provincial HEIs as part-time assistant lecturers or demonstrators. The third stage can be expected as the one for a full-scale dissemination of LBE to provincial HEIs such as UBB and SRU.

Box 9-1: The Characteristic of Engineering Education in Japan: LBE (Labouratory-Based Education)

Development of quality engineers has become a major need in developing countries, and JICA has been responding to it by introducing Labouratory Based Education (LBE) to engineering education in universities. Whereas, in general, course work and individual guidance are the cornerstones of engineering education in the United States, and many of European countries, engineering education in Japanese universities emphasises research activities implemented on a labouratory-by-labouratory. At a labouratory, which is headed by faculty members and composed of post-doctoral students, graduate students, and 4th-year undergraduate students, students can obtain not only expertise and problem-solving ability but also soft skills such as management and communication skills by practical education through research. Also, in a labouratory, besides teaching by a faculty staff to the students, there are various interactions such as assistance to academic staff's research by students, teaching to younger students by senior students, and mutual learning among students. These interactions will contribute to improving students' communication skills, cooperativeness, management skills, and leadership. Human resources equipped with such skills are very highly valued by companies after their graduation. Therefore, JICA is actively promoting LBE in its assistance programmes such as receiving international students to Japan, and establishing /strengthening engineering education in universities in developing countries. In doing so, JICA supports other related activities together such as improvement of course work, capacity development of faculty members and development and maintenance of research equipment as prerequisite to introduce LBE.

Source: Japan Brand ODA, Development of Human Resources in Engineering Field with Practical Skills through Research Activities in a Team, LBE (Labouratory-Based Education)
http://www.jica.go.jp/english/publications/brochures/c8h0vm000000k9k0-att/japan_brand_06.pdf (accessed on 28th May 2016)

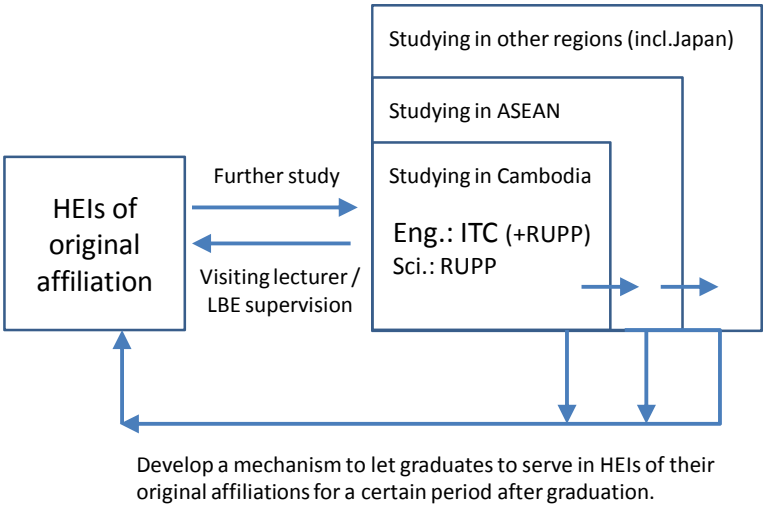
(2) Scholarship for Full-time Master Students

ITC's current post-graduate students are part-time students who come to the campus in the evening or weekend. The institution indicates the necessity of having them as full-time so that they can devote their time and effort in conducting research project in LBE style. One of the ideas for encouraging them to be full-time students is providing tuition waiver and scholarships to them. This survey proposes to create a waiver and scholarship scheme for those who wish for academic careers. Such opportunities can be granted to young and promising scholars with some requirements such as LBE and PBL introduction to provincial HEIs, being part-time assistant lectures, etc. Furthermore, this survey recommends adding a condition that the scholarship students will serve in provincial HEIs for a certain period of time after graduation.

(3) Cambodian SEED-Net (CEED-Net)

ITC's goal is to grow into a Host Institution in the AUN/SEED-Net project. In order to meet this goial, this survey proposes to form a SEED-Net-like hosting system, tentatively called Cambodian Engineering Education Development Network: "CEED-Net", at the post-graduate

academic programmemes in ITC (and potentially in RUPP), where young and promising lecturers or students are trained.



Source: Prepared by the Study Team

Figure 9-2: Flow of Students in CEED-Net

The original AUN/SEED-Net Project will be continuing throughout its phase three periods. This survey recommends providing opportunities for further studies to not only the young lecturers and excellent students from ITC, but also the ones from RUPP, UBB, and SRU through the AUN/SEED-Net Project.

This survey also attempts to estimate an approximate overall cost for such study programmeme using the following unit costs. Initially, the master level study at ITC will be US$7,400 for two years (tuition of US$1,000 a year, research fee of US$600 for two years, and a monthly staple of US$200). Then, the master level study at AUN/SEED-Net Host Institutions will be JPY2,000,000 per student, and post-graduate studies in Japan will be JPY6,500,000 per student for a two years master study, and JPY11,250,000 per student for a three years doctoral study.

The average number of students going to AUN/SEED-Net from ITC is 30 for the period between 2015 and 2016. This survey also uses the same figure for the average number of students for going for further study in the next 9 years until 2025. As shown in the following tables, the total number of students derived is 270, of which 112 (40%) are for local masters, 127 (47%) for ASEAN masters and doctors, and 18 and 14 for masters and doctors, respectively, in Japan. The total cost estimated is approximately JPY640 million.

Table 9-12: Estimated Number of Students for CEED-Net

	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Master study in Cambodia	2	2	2	2	14	18	20	24	28	112
Master & PhD in ASEAN	14	14	14	14	14	14	14	14	14	126
Master study in Japan	2	2	2	2	2	2	2	2	2	18
PhD study in Japan	1	1	1	1	2	2	2	2	2	14
Total number of students	19	19	19	19	32	36	38	42	46	270

Source: Prepared by the Study Team

Table 9-13: Estimated Cost of CEED-Net

Types	Per student cost (JPY)	# of student	Total (JPY)
Master study in Cambodia	820,000	112	91,840,000
Master & PhD in ASEAN	2,000,000	126	252,000,000
Master study in Japan	7,900,000	18	142,200,000
PhD study in Japan	11,250,000	14	157,500,000
		Total	643,540,000

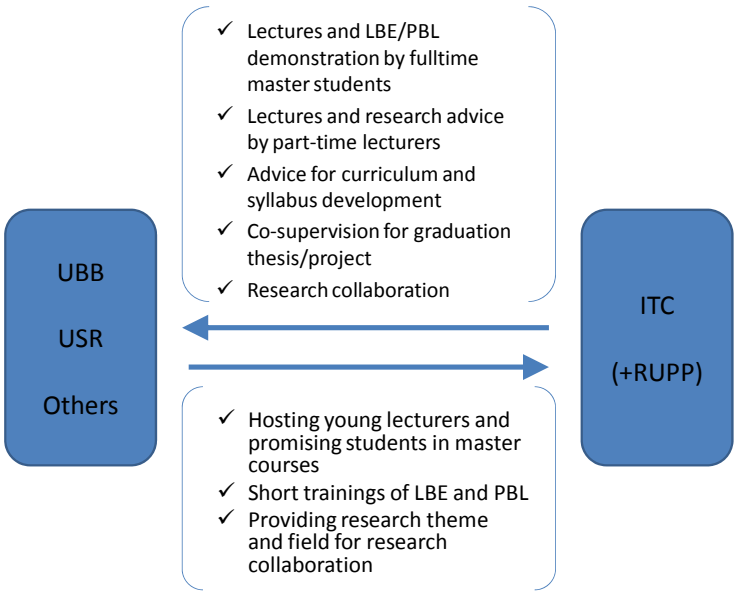
Source: Study Team

As Table 9-12 shows, the survery team estimated 14 students would be expected for Master and Ph.D. courses in ASEAN countries through AUN/SEED-Net. It would be good to open the opportunities for RUPP, UBB, and SRU, inclusive of ITC. It would also be effective to provide OJT to employees working for Japanese firms in the SEZs by establishing a version of the "Abe Initiative" for Cambodia.

It is expected that 14 masters and doctors in ASEAN will be matriculated through AUN/SEED-Net. This survey proposes that not only ITC young lecturers and promising students, but also the ones from RUPP, UBB, and SRU are included. In addition, the Study Team suggests an idea for a "Cambodian ABE Initiative" where young and promising factory workers from SEZs are to be sent for further studies that includes OJT opportunities in affiliated companies in ASEAN or Japan.

(4) Project-based Learning

RUPP Faculty of Engineering has been trying to develop course works with Project-based Learning (PBL) for all grades after Foundation Year, which includes contests between student groups. This survey suggests that both LBE and PBL models developed by ITC and RUPP respectively are to be transferred to the provincial HEIs. There is additional content that we expect ITC and RUPP can offer for other universities, which is shown in the following figure.



Source: Prepared by the Study Team

Figure 9-3: Collabouration Model between ITC and Other HEIs

Box 9-2: Engineering Education Model with Project-based Learning (PBL) – Total Designing of Environment for Engineering Education Aiming for a New Standard

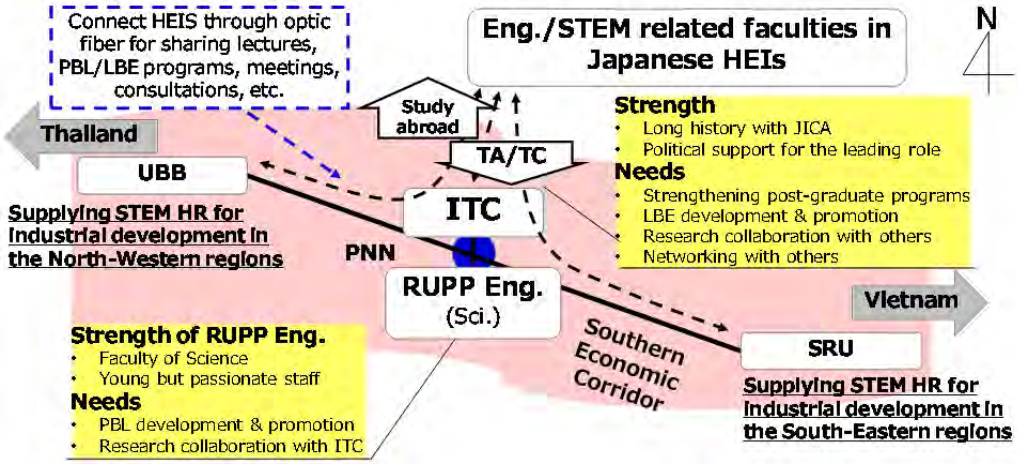
Rapid technological development has brought a highly advanced information society. Lectures, labouratory experiments, and practical exercises that traditionally provided for engineering major students are no longer effective for covering what current engineering-related fields stretch. It does not stimulate their interest in advanced engineering technologies. Project-based Learning (PBL) offers opportunities for student groups trying to find their own solutions for project themes, which is usually an open end problems. Student groups set their project frameworks, project plan, and implement it by themselves. Through this process they realise the importance of regular lectures and labouratory works and being motivated for finding solutions for their problems. Students gain practical skills such as problem finding, logical thinking, modeling, designing and presentation, which are not usually acquired in traditional lectures.

Source: Kyutech (http://www.mns.kyutech.ac.jp/~nakao-m/pbl/about.html, accessed on 29th May 2016)

(5) Collabouration among HEIs with ITC in the Centre

In order to realise the above-mentioned programmemes, this survey recommends forming a network of HEIs which have engineering related majors. For instance, there is a plan to build STEM buildings for ITC and RUPP. This survey proposes to use these facilities as the centres for LBE and PBL practical trainings. It is ideal if an arrangement is made for providing the necessary equipment for such training as soon as possible, including covering the dissemination stage to the provincial HEIs. The team expects that this may encourage collabourative research between the HEIs in the capital and provinces as well as HEIs and industries, especially, in the SEZs.

Resources for engineering education and research are limited in Cambodia in terms of human, intellectual, and physical resources. Therefore, this survey suggests sharing the resources among all engineering-related faculties and departments in the country. For example, connecting the engineering-related HEIs with high speed internet networks using fiber optic cables, so that the human and intellectual resources can be effectively shared. If video conference systems are also provided, then, not only would the lectures of unavailable courses in provinces, but also consultation for the new curriculum and syllabus, may be offered for the faculties and departments in the provinces. Additionally, Japanese universities which have been collabourating with ITC might also offer support. The following figure illustrates the networking and collabouration between ITC and other universities such as RUPP, UBB, and SRU.



Source: Prepared by the Study Team

Figure 9-4: Networking between ITC and Other HEIs

There are some points of attention in collabouration among these institutions which will be discussed below.

University-industry liaison and student career support

It is expected that students will gain the practical skills required by the industries in SEZs through introducing the above-mentioned LBE and PBL practices. For the HEIs to produce competitive graduates for anticipated advanced industries in Cambodia, they have to continuously improve their curriculum and syllabus by closely reflecting the needs of the industries. This study indicates the need of building the capacity of the university-industry liaison office for this purpose. In addition, the student career service of HEIs can be strengthened in order to effectively match students and industries.

Incentive mechanisms

The current incentive for university lecturers is provided based on the number of lecturers that they conduct. However, LBE and PBL requires lecturers to take more time for preparation as well as maintain close supervision during project implementation so that less lectures are expected for those who are involved in LBE and PBL. Therefore, the survey proposes creating additional incentive mechanisms so that more lecturers will take responsibilities for LBE, PBL, and further research works other than just lectures. This may include paying hours for LBE and PBL instructions and supervisions, providing rewards according to achievements such as graduation thesis done by LBE, students' project report of PBL, journal papers based on the researches conducted through LBE.

A competitive research fund can be another type of incentive, especially, for those who recently came back from PhD studies overseas. If such young lecturers are assigned in LBE and PBL supervision, some special preferences can be considered in selection process, so that LBE and PBL projects can be easily linked to the research works that may potentially be published in academic journals.

Moreover, creating academic position of "professors" for those who have made significant contribution in the academic society may be considered as one of the incentives.

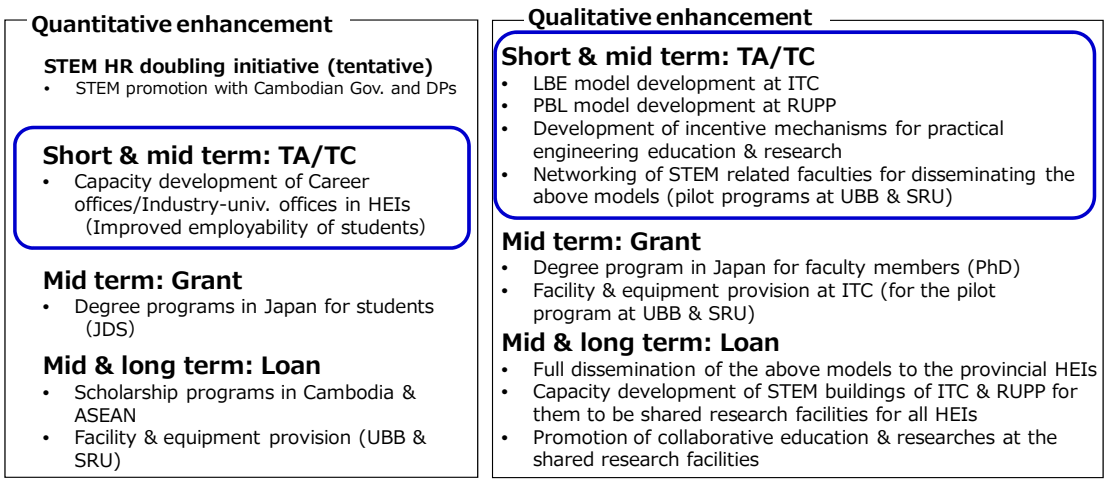
Establishing new faculties and departments

There are several engineering majors, such as Industrial Engineering, and Material Engineering, which are not currently available in Cambodia, but, are expected to be necessary for anticipated industrial development. This study suggests creating core experts for these newly emerging academic fields, initially through AUN/SEED-Net, JDS, and other scholarship schemes. Additional arrangement can be considered by using financial assistance such as a Yen Loan.

STEM human resource doubling initiative

The Cambodian society needs an unprecedented increase in their youth going for STEM-related majors in order to realise the above-mentioned industrial development. This has to be materialized also through an unprecedented effort by the Cambodian government and DPs, not only in higher education but also in the general-education sub-sector.

The following figure illustrates the above-mentioned cooperation programmemes.



Source: Prepared by the Study Team

Figure 9-5: Proposed JICA Cooperation

9.2.3 Facility and Equipment Plan

ITC has been preparing for the construction of an additional building for research activities using the LBE method. In parallel, RUPP Faculty of Engineering, which is trying to develop the PBL method, also has a similar construction project for both the Engineering and Science faculties. In contrast, UBB and SRU have not been equipped with such specialised facilities for practical education and research. This survey attempts to come up with such physical facilities for UBB and SRU with the following minimal functions.

1) Basic physics labouratory, basic chemistry labouratory: one unit each
2) Faculty office: one unit
3) Lecturer's office + LBE room ("kenkyushitsu") + labouratory: 6 units

This study estimates the number of students for UBB and SRU Faculty of Science and Technology using the following table. 600 will be used as an approximate total number of students for both faculties for calculating the construction cost of the education and research facility.

Table 9-14: Estimated Number of Students in UBB

	Foundation	Year 2	Year 3	Year 4	Total
Information Technology	50	45	40	35	170
Civil Engineering	50	45	40	35	170
Mathematics	50	45	40	35	170
Nuclear Engineering	25	20	15	10	70
					580

Source: Prepared by the Study Team

Table 9-15: Estimated Number of Students in USR

	Foundation	Year 2	Year 3	Year 4	Total
Computer Science	55	50	45	40	190
Mathematics	55	50	45	40	190
To be determined	55	50	45	40	190
					570

Source: Prepared by the Study Team

Equipment for LBE and PBL

ITC and RUPP will soon have new buildings for education and research which is financed by the Cambodian government. This survey suggests using these facilities as centres for training young lecturers and students on LBE- and PBL-style education and research. However, financial arrangement has not yet been put for the equipment cost for these facilities at the time of this survey. This study thinks that it can be an important asset if necessary equipment is secured for disseminating LBE and PBL. The equipment can be used as common facility for STEM related faculties and departments which take LBE and PBL into their practice and foresee collabourative research between each other.

Networking of STEM related HEIs and research institutions through fast internet

Resources for STEM related academic areas including engineering are limited in Cambodia in terms of human, intellectual, and physical resources. This study suggests creating some mechanism to share the resources among STEM-related faculties and departments in the country. For instance, connecting them with high speed internet networks, so that they can share the lecturers through a video conference system, LBE and PBL instruction and supervision, and, advice and supervision for thesis and graduation projects.

9.3 Assistance for Establishment of General Technical High Schools (GTHSs)

9.3.1 Necessity, Relevance and Expected Effects of Assistance for GTHSs Linked with SEZs

(1) Necessity for Assisting Technical Education

As discussed from Chapter 2 to Chapter 5, Cambodia envisages transforming its labour-intensive industry to a skill-based industry by 2015 in its Industrial Development Policy (IDP). This vision was made in the context that Cambodia's labour intensive industry, which had taken advantage of its low wage and abundant labour force, will start to lose its advantage, as the wages are getting higher and population growth is slowing down.

In the process of restructuring the supply chain as a result of intensifying competition and economic integration in the ASEAN region, Cambodia, owing to its low local procurement and production rates of raw materials and parts, is likely to suffer from de-industrialisation or to remain a low value-added and low technological industrial country in the future. To summarise, the development of Cambodia as a nation may slow down.

Japanese companies investing in Cambodia point out a lack of capable human resources, especially technicians and middle-class managers who can take up maintenance of machinery and electrical equipment of factories and production line, who can manage inventory and labour control, who can improve the productivity, and who can control the quality. Such human resources are in particular limited in the provinces.

Thus far, foreign companies have coped with this lack of human resources by dispatching managers from their own country or third countries despite the high cost. Or, due to its high cost associated with dispatching managers and technicians, foreign companies just avoid investing into Cambodia. Owing to this problem, Cambodia loses precious chances to further develop its industry. Therefore, it is necessary that Cambodia develops its human resources meeting the requirements of potential foreign investors thereby improving the productivity of Cambodian labour and its competitiveness.

(2) Relevance of Assistance to Technical Education in and around SEZs

Cambodia has maintained an annual economic growth rate of over 7%. But the past economic growth has been led by foreign direct investment, as domestic financial resources are still limited. In particular, foreign companies in SEZs are granted privileges by tax exemptions or tax reduction by a 2005 government ordinance concerning SEZs, and the foreign direct investment into the SEZs has been on the rise since 2006. Additionally, the types of businesses is more varied - from garment and plastic production industries in the early 2000s to machinery, metal, and electronics industries today – and this trend contributes to diversify the industrial base in Cambodia. For the sake of maintaining the growth momentum and diversifying the industrial base at the same time, it is appropriate for JICA to assist Cambodia in establishing technical education institutions in and around SEZs. Furthermore, the IDP considers SEZs as an important tool to boost the economy in the provinces. It is understandable that the Minister of Education, Youth and Sport who had been an official of MOEF has requested JICA to assist the technical education institutions in and around 4 SEZs.

(3) Justifications for Assisting Technical High Schools with the MoEYS's Initiative and Expected Effects

The following points are justifications for the Government of Japan to assist the MoEYS's initiative in promoting technical education in Cambodia.

1) Private companies investing in or around SEZs, particularly, manufacturing companies, have strong demands for technicians who can take up electrical equipment or machinery maintenance work. Thus, it is necessary that Cambodia shall be equipped with a system to develop such human resources who can meet the demands.

2) Private companies investing in or around SEZs, particularly, manufacturing companies, have strong demands for managers with a skill of optimizing the production line, of controlling quality and/or coordinating relevant departments to improve the quality of products. Thus, it is necessary that Cambodia shall be equipped with a system to develop such human resources who meet the demands.

3) Furthermore, in addition to the required skills mentioned in 1) and 2), technicians and managers need to be equipped with sufficient English communication skills, particularly among those working for foreign companies, to include the required discipline and morals which are nurtured in basic education and family life. Thus it is necessary that Cambodia shall be equipped with a system to develop such a basic but indispensable human skill in basic education system.

4) By doing so, the private companies investing in SEZs may reduce the training costs for basic literacy, numeracy, and soft human skills, which they have spent for their workers. As a result, the productivity of the workers and companies are expected to improve.

Presently, TVETs under the MLVT offer technical and vocational training programmes. Nevertheless, as discussed in the previous chapter, the technical and vocational training programmes of TVET focus more on simple skills necessary for repairing home appliances at homes and hotels, or on repairing cars and motorcycles, which may be useful in daily life or in the tourism industries. These days, TVETs offer certificate courses equivalent to upper secondary education, but have yet tp offer a programme to develop technical skills required by private companies. As a result, private companies in SEZs do not employ TVET graduates, and consequently the enrollment of TVETs remains below expectations.

Likewise, GTHSs under MoEYS fail to offer programmes to develop human resources required by SEZs.

1) The 3 existing GTHS focus their programmes on developing skills required for employment or study in Thailand, or skills required for local agriculture industry, animal husbandry, tourism industry and clerical jobs. And, they do not necessarily develop students' skills to become technicians or managers required by manufacturing companies in and around SEZs.
2) GTHSs do not have a curriculum to train students with English communication skills required by foreign companies and to develop their soft skills such as basic knowledge, discipline, and morals, though such soft skills are deemed more essential than technical and management skills by foreign companies in and around SEZs.

To summarise, the demand and supply by companies and educational institutions, respectively, do not match (Figure 9-6). Therefore, MoEYS's initiative to promote technical education at secondary educational level to develop technicians and managers needed by manufacturing companies in and around SEZs is eagerly awaited.

With the MoEYS's initiative to establish GTHSs in and around SEZs, it is expected that GTHSs shall educate students with a G9 level education and develop human resources employable by private companies, as the curriculum includes basic education.

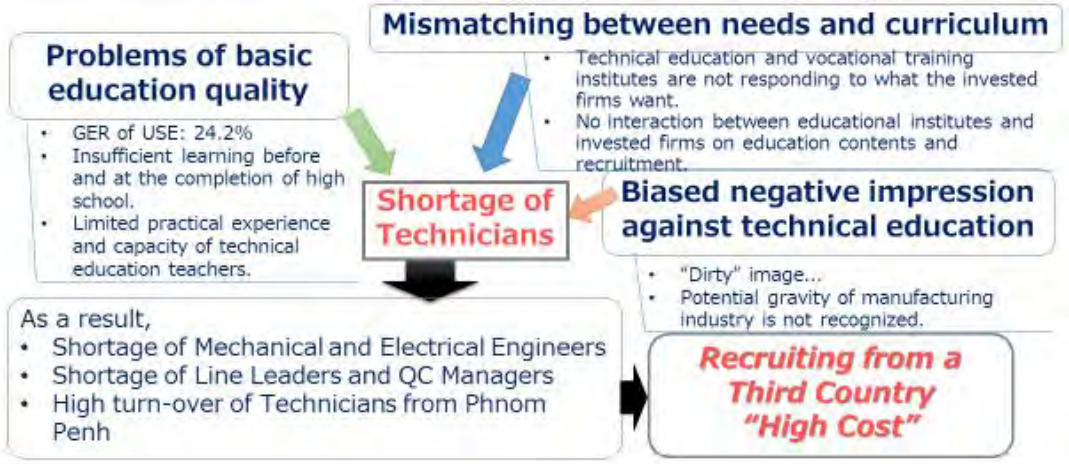


Figure 9-6: Shortage of Technicians and Managers In and Around SEZs

(4) Relevance to Establish Satellite Schools of GTHS and Its Expected Effects

As discussed in the previous chapters, as an initial step, MoEYS has a plan to open a new technical programme in existing Chum Pu Voan high school near the PPSEZ, Bavet high school is surrounded by several SEZs in Bavet, Svey Rieng province, and Pouk high school is near tourist attractions in Siem Reap province. By doing this, the 3 high schools will be transformed into GTHS. Nevertheless, it is important to bear in mind that in opening GTHSs, MoEYS needs close coordination and cooperation from private companies investing in and around SEZ. Otherwise, GTHSs may end up in becoming schools similar to TVETs and in providing education overlapping with the existing TVETs. Therefore, for the sake of successfully establishing GTHSs under the MoEYS's initiative, it is essential for MoEYS to secure close cooperation from private companies such as having staff members of private companies as lecturers, renting workshop equipment, having GHTS graduates employed, etc.

While Chum Pu Voan GTHS and Bavet GTHS are located in cities and shall admit students living in the cities, it is also deemed effective to establish satellite schools of GTHS in or around SEZs. The satellite schools shall have dormitories to accommodate students working in SEZs so that they can work during the daytime and study at school in the evening or on the weekend. Teachers are dispatched to the satellite schools from their home GTHS in the city. In this way, the teachers may be exposed to updated information on the different industries. And, it is easier for the private companies to dispatch part-time lecturers and send their workers as students to the satellite GTHSs which are located in or around SEZs. Thus, it is beneficial for private companies to have the satellite schools located nearby.

(5) Training for Technical Teachers for GTHSs

As discussed in the previous chapters, there are only two training paths for Cambodian students to become technical teachers. One is that he or she enrolls in Kampong Chheuteal and then studies in Thailand to earn a degree. The other option is that he or she enrolls in a TVET to earn a degree. Technical teachers are in very short supply, and, teachers with working experience in their relevant field, after having completed the course in NIE, are also very much limited. Henceforce, it is necessary that the Cambodian side secures enrollment quotas in technical education institutions abroad, thereby, increasing the number of technical teachers in the interim.

The majority of in-service technical teachers also lack working experience in the technical field and furthermore, many of them have not been trained in pedagogy. Thus, it is necessary for in-service teachers to be granted a chance to do an internship or training course abroad to improve their skills.

Lastly, high school teachers will be required to at least to have a master's degree in the future, and accordingly, it is required that Cambodia establishes a system and the capacity to domestically train the required number of technical teachers, possibly in collabouration with the Engineering Education Sub-sector.

9.3.2 Facilities and Equipment Plan

As discussed in Chapter 8, the curriculum of technical high schools was put together with technical assistance from KOICA, in such subjects as Electronics, Electricity, Meachanics, Agriculture, and Accounting and Management, though it has not been widely implemented yet. Henceforce, MoEYS and its development partners are expected to work together so that the curriculum is revised, agreed upon and implemented across the country. Table 9-16 shows the standard curriculum adopted across technical high schools in Japan. Based upon this Japanese curriculum and the assumption of a 300 student capacity, the Study Team puts together the possible size and components of a GTHS facility in Table 9-17 and Table 9-18. Table 9-17 shows a set of facilities in a GTHS within the compound of an existing high school, while Table 9-18 shows a set of facilities in a satellite GTHS evening school in an SEZ.

Table 9-16: Assumed Curriculum of Technical Programme at GTHS

	Electricity course	Mechanics course	Industrial engineering course
General subjects	National language (Khmer)		
	Geography and history		
	Civics		
	Mathematics		
	Science		
	Physical and health education		
	Art		
	Foreign language (Technical English)		
	Home economics		
	Information science		
Technical Course subjects	Basic industrial technology		
	Research and study		
	Workshops		
	Basic electrical engineering	Technical drawing	Industrial engineering drawing
	Electrical equipment	Basic science and math for industrial engineering	Basic information technology
	Electric power technology	Basic information technology	Production system technology
	Electronics	Production system technology	Facility planning
	Electronic control	Basic environmental engineering	Air conditioning system
	Communication technology	Machine work	Sanitary and disaster prevention equipment
	Electronics information technology	Mechanical design	Civil engineering works
	Hardware technology	Motor	Electrical works
	Software technology	Electronic machinery	Basic science and math for industrial engineering
	Computer system technology	Mechanical design drawing	Architectural structure
	Information processing engineering	Information processing engineering	Environmental studies
	Electrical distribution system engineering	Electrical distribution system engineering	Industrial management technology
	Information system engineering		
	Internship		
	Extracurricular activities		

Source: Prepared by the Study Team based upon the websites[75]

[75] The following websites were referred to: http://www2.iwate-ed.jp/mot-h/gaiyo/syllabus.html）
(http://www.tochigi-edu.ed.jp/utsunomiyakogyo/nc2/?page_id=24)
(http://www.kanagawa-th.pen-kanagawa.ed.jp/ducation_content/student_council_activities_index.html)
(http://www.toyota.co.jp/company/gakuen/course_high/unit.html)
(http://shiroishi-kougyou.myswan.ne.jp/course/course_facility.html)
(http://www.kuramaekogyo-h.metro.tokyo.jp/zen/zentop/setsubikougyou.pdf)
(http://www2.hakodate-ct.ac.jp/subject/syllabus)(http://syllabus.kosen-k.go.jp/Pages/PublicDepartments?school_id=09) (https://xythos.tokyo-ct.ac.jp/web/syllabus/2015/syllabus_homepage/index.htm)
(https://www.nagaoka-ct.ac.jp/zaikou/syllabus/)

Table 9-17: Facility Plan of a GTHS (apprx. 300 Students Capacity)

Course	Electricity course	Mechanics course	Industrial engineering course
No. of students per grade	35	35	35
Years of programme	3 years	3 years	3 years
Total enrollment	105	105	105
	315		
Necessary No. of classrooms	3	3	3
Total No. of necessary classrooms	**9**		
Lab, Workshop, Library, etc.	Electrical workshop classroom + 2 attached rooms for preparation		
	Electronics workshop classroom + 2 attached rooms for preparation		
	Industrial engineering workshop classroom +2 attached rooms for preparation		
	2 ICT labouratories		
	2 Mechanics workshop classrooms		
	Music room		
	Art room		
	Home economics room		
	Library (with a sufficient study space) + language labouratory		
	Student toilet		
Hall	300 student capacity		
Sport field			
Cafeteria	With a kitchen		
Administration office	Director's room		
	Vice director's room		
	Office 1		
	Office 2		
	Meeting room (Large, middle and small)		
	Archive room		
	First aid room		
	Staff toilet		
	Teachers' room (Electricity course)	Teachers' room (Mechanics course)	Teachers' room (Industrial engineering course)
Staff dormitory			

Source: Prepared by the Study Team

Table 9-18: Facility Plan of a GTHS Satellite School in or around SEZs (300 Students Capacity)

Course	Electricity course	Mechanics course	Industrial engineering course
No. of students per grade	25	25	25
Years of programme	4	4	4
Total enrollment	100	100	100
	300		
Necessary No. of classrooms	4	4	4
Total No. of necessary classrooms	**12**		
Lab, Workshop, Library, etc.	Electrical workshop classroom + 2 attached rooms for preparation		
	Electronics workshop classroom + 1 attached room for preparation		
	Industrial engineering workshop classroom +2 attached rooms for preparation		
	1 ICT labouratory		
	1 Mechanics workshop classroom		
	Music room		
	Art room		
	Home economics room		
	Library (with a sufficient study space) +a language labouratory		
	Student toilet		
Hall	Not necessary. If needed, the hall of GTHS shall be used.		
Sport field			
Student dormitory	Male dormitory		
	Shower and toilet for male dormitory		
	Female dormitory		
	Shower and toilet for female dormitory		
Cafeteria	With a kitchen		
Administration office	Director's room		
	Vice director's room		
	Office 1 + Archive room		
	Meeting room (Large and small)		
	First aid room		
	Staff toilet		
	Professor's room (Electronics course)	Professor's room (Mechanics course)	Professor's room (Industrial engineering course)
Staff dormitory			

Source: Prepared by the Study Team

In order for the GTHSs to educate the assumed number of students, and to ensure that their programmes are on track, the following facility construction and equipment procurement plans need to be implemented.

(1) Chum Pu Voan GTHS (Phnom Penh)

Case: Establishing a GTHS with a 300 Student Capacity

As of March 2016 when the survey was conducted, there was no facility available for the school to start a technical programme in Chum Pu Voan high school. Accordingly, it is necessary to newly build all necessary facilities in order to open the programme, and, the Study Team, therefore, puts together the following facility plans.

As the available construction plot is not large enough to construct all the facilities assumed in Table 9-17, it should be noted that classrooms and special classrooms (with a library and a language labouratory) are planned in one building, while the remaining facilities are built separately.

a) Classrooms/Special classrooms: Rooms specified in Table 9-17 shall be planned in a 3-storied RC building. (The estimated total floor area: 3,000 sqm - 3,500 sqm.)
b) Administration Office: Rooms specified in Table 9-17 shall be planned in a 2-troied RC building. (The estimated total floor area: 800 sqm.)
c) Hall: A hall of 300 student capacity shall be planned in a 2-storied RC building. The ground floor shall be a piloti to allow natural ventilation for the surrounding. (The estimated floor area of the hall: 700 sqm.)
d) Cafeteria: A cafeteria with a kitchen specified in Table 9-17 shall be planned.

At a consultative meeting in May 2016, DVO directed Chum Pu Voan high school to secure 2 classrooms for workshop rooms in order to open the technical programme, and the school does so accordingly. Furthermore, MoEYS has started procuring and delivering equipment necessary for practicum for the technical programme. Given this move, if JICA is determined to assist Chum Pu Voan high school in opening the technical programme, it is necessary that JICA and MoEYS discuss in details. For example, it should be discussed whether or not JICA shall assist the school in constructing new facilities as proposed above or the high school continues using the temporary workshop rooms for the technical programme and JICA assists the school in constructing the remaining facilities.

Case: Establishing a Satellite GTHS with a 300 Student Capacity in or around SEZs

Presently, no construction plot is earmarked for a satellite GTHS, but a proposal for establishing a satellite GTHS in or around SEZ was favorably accepted at the consultative meeting. Thus, assuming that a construction plot shall be secured, the Study Team proposes the following facilities based upon Table 9-18.

a) Classrooms: Classrooms specified in Table 9-18 shall be planned in a 3-storied RC building. (The expected total floor area: 1,200 sqm.)
b) Lab and Workshop Bldg.: Rooms specified in Table 9-18 except for a library and a language labouratory, shall be planned in a 3-stroried RC building. (The expected total floor area: 1,440 sqm.)
c) Administration offices: Rooms specified in Table 9-18 and a library and a language labouratory shall be planned in a 3-storied RC building. (The expected total floor area: 1,440 sqm.)
d) Hall: No hall is planned for the satellite school. The hall of the main GHTS shall be used, whenever necessary.

e) Cafeteria: A cafeteria with a kitchen specified in Tale 9-18 shall be planned.
f) Student dormitory: A male and a female dormitories are planned separately, each of which is a 3-storied RC building with 170 capacity (150 students and 20 staff). (The expected total floor area: 1,080 sqm.)

(2) Bavet High School (Bavet GTHS)

Case: Establishing a GTHS with 300 Student Capacity

As is the case with Chum Pu Voan high school, there is no facility available for the school to start the technical programme. Accordingly, it is necessary to newly build all necessary facilities to open the programme and the Study Team puts together the following facility plans.

Concerning a plan to open a technical programme, Pouk GTHS in Siem Reap province goes one step ahead, but according to MoEYS, Bavet high school is also a candidate school to be assisted with facility construction and equipment procurement. Initially, KOICA had a plan to assist the school in building facilities for the technical programme, but due to the cancellation of the plan by the Korean organisation, the facility planning has been suspended. It is necessary for JICA to confirm as to how MoEYS proceeds with its plan to convert Bavet high school into a GTHS.

The Study Team proposes the following facility plan according to Table 9-17 on the assumption that a construction plot shown at the time of survey in March 2016 remains secured.

a) Classrooms: Rooms specified in Table 9-17 shall be planned in a 2-storied RC building. (The estimated total floor area: 960 sqm.)
b) Lab and Workshop Bldg.: Rooms specified in Table 9-17 except for a library and a language labouratory, shall be planned in 2 separate 2-stroried RC buildings. (The expected total floor area per building: 960 sqm.)
c) Administration Office: Rooms specified in Table 9-17 shall be planned in a 2-troied RC building. (The estimated total floor area: 800 sqm.)
d) Library: A stack with a reading space and a language labouratory shall be planned in a 2-stroied RC building. The estimated total floor area: 720 sqm.)
e) Hall: A hall of 300 student capacity specified in Table 9-17 shall be planned in a 2-storied RC building. The ground floor shall be planned as a piloti to allow natural ventilation for the surrounding. (The estimated floor area of the hall: 700 sqm.)
f) Cafeteria: A cafeteria with a kitchen specified in Tale 9-17 shall be planned.

Case: Establishing a Satellite GTHS with a 300 Student Capacity in or around SEZs

As is the case with Phnom Penh, there is no construction plot presently earmarked for a satellite GTHS, but a proposal for establishing a satellite GTHS in or around the SEZ was favorably accepted at the consultation meeting with MoEYS. Thus, assuming that a construction plot shall be secured, the Study Team proposes the following facilities based upon Table 9-18.

a) Classooms: Classrooms specified in Table 9-18 shall be planned in a 2-storied RC building. (The expected total floor area: 1,120 sqm.)
b) Lab and Workshop Bldg.: Rooms specified in Table 9-18 except for a library and a language labouratory shall be planned in 2 separate 2-stroried RC buildings. (The expected total floor area per building: 960 sqm.)
c) Administration Office: Rooms specified in Table 9-18 shall be planned in a 2-stroied RC building. (The estimated total floor area: 800 sqm.)
d) Library: A stack with a reading space and a language labouratory shall be planned in a 2-stroied RC building. (The estimated total floor area: 720 sqm.)

e) Hall: No hall is planned for the satellite school. The hall of the main GHTS shall be used, whenever necessary.
f) Cafeteria: A cafeteria with a kitchen specified in Tale 9-18 shall be planned.
g) Student dormitory: A male and a female dormitories are planned separately, each of which is a 3-storied RC building with 170 capacity (150 students and 20 staff). (The expected total floor area: 1,080 sqm.)

(3) Building Codes, Permit and Standard for GTHSs

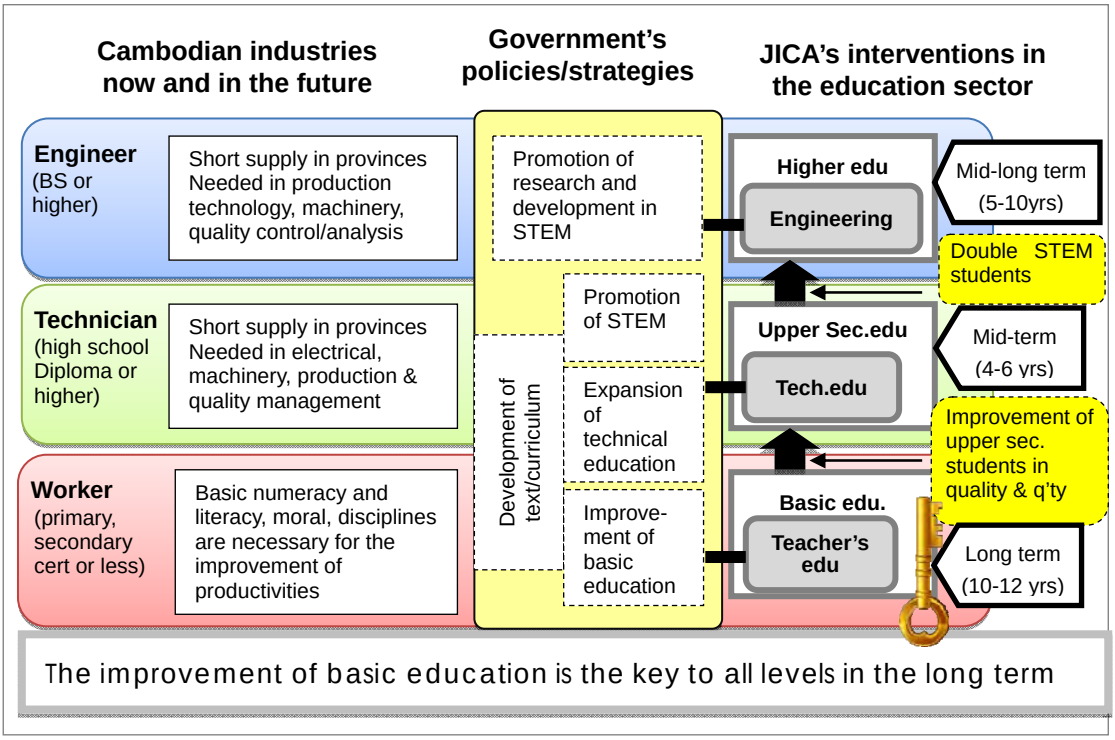
The building codes, permits, and standards required in the planning facilities for GHTSs and their satellite schools shall accord the codes and standard discussed in 9.1.8. Likewise, as for construction companies and material procurement, refer to 9.1.8.

10. Proposal of the New JICA Programmes

10.1 Summary of the Proposed JICA Programmes

Part 2 of this report observes that Cambodia has missed the opportunities to produce enough human resources required for the industrial sector. The overall access to basic education in Cambodia has dramatically improved; however, the quality of education still lags behind the rest of the region, resulting in a large number of dropouts, and workers of low productivity. Moreover, Cambodian students consistently achieve low grades in the fields of mathematics and science, which require a systematic understanding of basic concepts and theories. Consequently, the academic level among the upper secondary and higher education students in the STEM field remains unsatisfactory, as does the number of students choosing to enter the STEM field.

The below Figure 10-1 briefly summarises the discussions up to the previous chapter. As it indicates, the education sector may make a significant contribution to produce human resources required for the respective levels. For example, the improvement of basic education is effective for increasing the productivity of workers. In particular, the improvement of teachers' education, which MoEYS prioritises, is one of the long-term and crucial fields in which JICA can assist. Moreover, as for developing technicians needed in machinery and electrical operation, it is appropriate for JICA to start its assistance from strengthening technical high schools around SEZs. This is in line with the request from MoEYS. And, likewise, regarding an issue to develop engineers with a university degree or higher, it is reasonable that JICA provides its assistance to increase the number of students and improve the academic quality in engineering studies at universities, not only in Phnom Penh, but also in the provinces, thereby, assisting with forming the industrial clusters in the provinces stipulated in the IDP.



Source: Prepared by the Study Team

Figure 10-1: Proposed Cooperation Programmes in Educational Fields Aiming to Develop Human Resource Necessary for the Industrial Sector

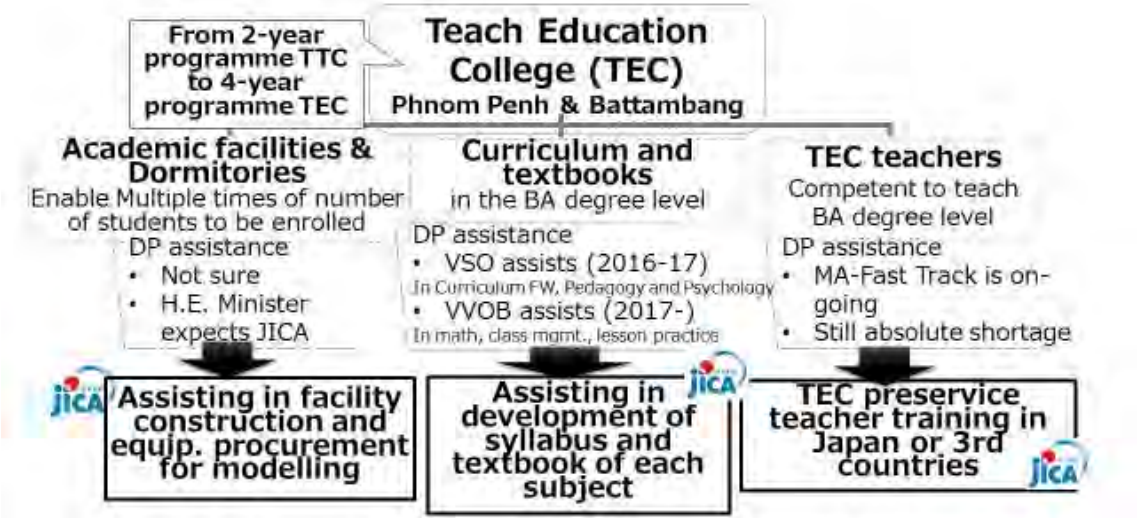
Ultimately, the improvement of basic education is the crucial key for human resource development. Therefore, providing good learning environment for primary and lower secondary students to acquire basic knowledge and skills leads not only to the improvement of the productivity of workers, but also to the improvement of access and educational quality of upper secondary education. With the increase of upper secondary students with a good academic achievement, it is expected that there will be more students pursuing engineering fields, and consequently there will be more trained engineers. Nevertheless, it should be noted that a large-scale promotion on the advantage of an engineering education (i.e. employability) by the government is necessary to increase the population interested in the field, by correcting a stereotyped image Cambodian people have on the engineering education as unsophisticated.

Against this backdrop, the Study Team prioritises the following three cooperation programmes in the order. This chapter discusses details.

1) Basic education: Assistance to establish TECs
2) Higher education: Assistance to promote engineering education
3) Upper secondary education: Assistance to establish GTHSs

10.2 Basic Education: Assistance for Teacher Education Colleges (TECs)

Teacher Education Colleges (TEC) will be first opened in Phnom Penh and Battambang province in 2018. In establishing the TECs, the Cambodian side needs assistance in three areas: 1) curriculum and textbook development, 2) capacity development of TEC teachers/professors, and 3) construction and renovation of facilities and procurement of equipment. Assuming that JICA starts its assistance in 2017 and on-going and planned assistance of other development partners remain unchanged, the following map (Figure 10-2) is provided to identify the effective areas for intervention.

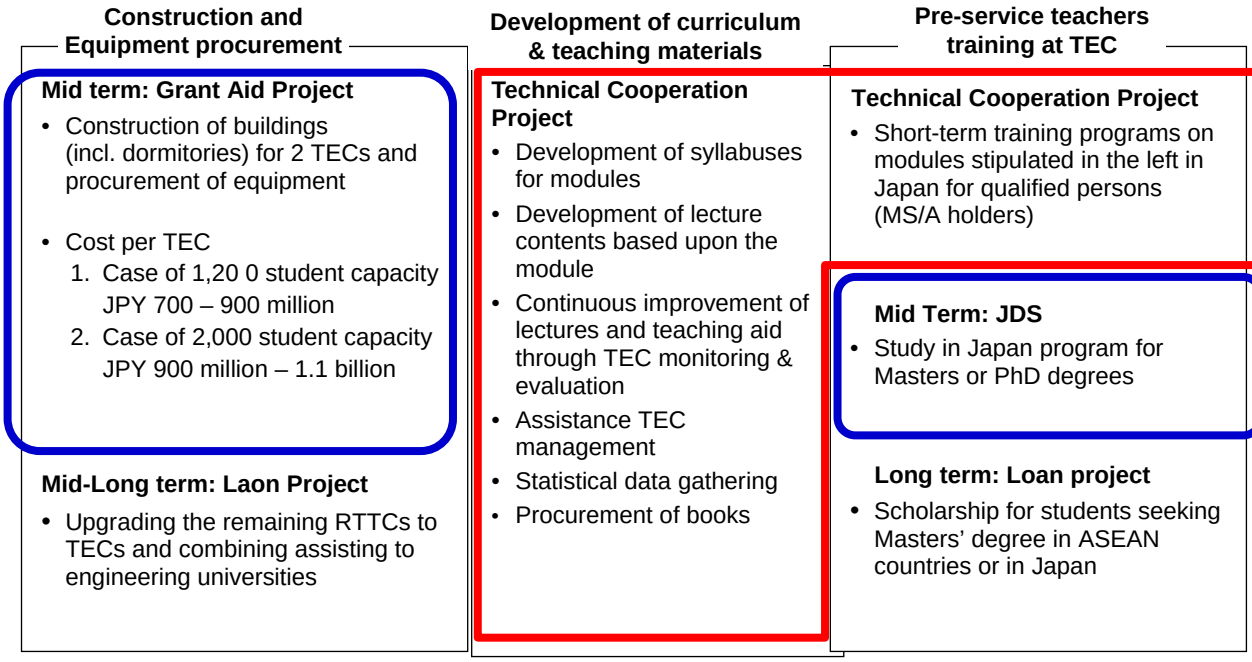


Source: Prepared by the Study Team

Figure 10-2: On-going Efforts to Establish TECs and JICA's Possible Intervention Areas

For JICA to successfully implement assistance programmes in these areas, it is necessary to use appropriate cooperation schemes (i.e. Grant aid projects, loans, and technical cooperations) depending on the size, purpose, and timing of a project. Figure 10-3 indicates as to which

schemes are suitable for the respective areas. The following sections discuss details of possible interventions in the three areas, based upon Figure 10-3. Among them, concerning the development of curriculum and teaching aid, JICA needs to align its assistance with the curriculum framework to be established by the end of 2016 with VSO's intervention and to coordinate with VSO and VVOB to determine which subjects JICA shall assist.



Source: Made by the Study Team

Figure 10-3: Areas to Assist in Establishing TECs and Details of Assistance

10.2.1 Technical Cooperation Project: Project for Development of Teacher Education

The Study Team proposes a technical cooperation project to assist in establishing TECs. Details are summarised in the below table. The project assumes that the first two TECs will be opened in October 2018 to produce its first group of graduates in September 2022. Thus, setting the project period from January 2017 to December 2022 is appropriate, as the project will handle pre-opening tasks (ex. the development of syllabi and teaching/learning materials and teachers/professors and directors' trainings) and monitor the placement of the first batch graduates. The target areas are Phnom Penh and Battambang province, however, students outside of the said two provinces are expected to enroll, thus, actual beneficiaries are beyond the two provinces. On top of that, it should be noted that the expected enrollment per grade of 400 is a temporary figure, as MoEYS has not established its standard yet over the enrollment capacity of each TEC.

Table 10-1: Technical Cooperation Project to Assist Establishing TECs (Preliminary)

Project period	January 2017 – December 2022 (6 years)	
Implementing Agencies	TTD, MoEYS (In the future, a teacher education council may be formed, to which implementing agency will transfer.)	
Super goal	Completion rate of basic education will increase	
Overall objective	Capacity of pre-service teachers of primary and lower secondary teachers will be enhanced all over Cambodia	
Project objective	Capacity of pre-service teachers of primary and lower secondary teachers will be enhanced in the target areas	
Expected Outcomes	1. Syllabi and teaching/learning materials of the respective subjects taught at TEC shall be developed. 2. Capacity of TEC teachers/professors will be enhanced 3. System and method to evaluate TEC students shall be established. 4. TEC lecture improvement cycle shall be established.	
Target areas	Phnom Penh and Battambang province	
Beneficiaries	・ 3,200 students of TEC (400 students/grade x 4 grades x 2 TECs) or 2,000 students of TEC (250 students/grade x 4 grades x 2TECs) ・ 100 professors at TEC (50 professors/TEC x 2 TECs)	
Inputs	【Japanese side】 ●Technical cooperation project budget 1. Dispatching Japanese experts 2. Provision of equipment (office equipment) 3. Workshops in Japan or third countries 4. Workshops in Cambodia/ Training fee 5. Other expenses ●Other project budget ・ Construction of school facilities and procurement of equipment with Grant Air or Loan ・ Training for TEC teachers/professors using JDS, etc.	【Cambodian side】 1. Assigning staff 2. Providing project offices at the respective TECs and TTD. And providing spaces for various workshops. 3. Providing utility costs for the Project office.

Source: Prepared by the Study Team

The project assumes the following activities.

(1) Gathering base data on teachers
(2) Developing syllabi for respective modules
(3) Developing the contents of lectures for the above modules
(4) Procuring necessary books, reference books, etc.
(5) Continuous improvement in lectures, courses and teaching/learning materials through monitoring and evaluating lectures at TECs
(6) Assisting in school management of TEC

First, the project gathers basic statistical data on teachers, such as the level of the schools that they teach at, age, and subjects-in-charge, to determine the number of enrollments per grade. Second, the project carries out short-term trainings and workshops in Japan between 2017 and 2018, before opening the TECs. By doing so, the preparation for academic programmes (ex. establishing evaluation standard for each subject module, and for students' academic achievement, etc.) may be performed simultaneously.

The project assumes the following inputs for the first half and the latter half of the project respectively.

- Main tasks in the first half phase (2017-2019): Gathering teachers' basic data, developing syllabi and teaching/learning materials, preparation for lectures, training for teachers/professors, and procuring books and textbooks.
- Main tasks in the latter half phase (2020-2022): Managing TEC and improving lectures and courses.

Needless to say, an input on TEC management in the first half phase is important, and likewise, developing the academic contents, training for professors, and procuring books are necessary in the latter half phase. However, as the main tasks shift during the life of a phase, the project aims to establish a system of self-improvement like PDCA cycle.

The project assumes that the Director of a TEC will play a crucial role. Presently, the lesson improvement is at each professor's discretion in RTTCs. In addition, it is not implemented according to technical group meetings and feedbacks from students, and on top of that, its process is not monitored at all. As the previous chapter states, for a TEC, the Director as an expert both in academic and management fields, is needed, who can oversee students' learning from the educational viewpoint and guide the teachers/professors, and who can simultaneously secure a necessary budget and procure necessary facilities and equipment. In order to have such TEC Directors, the project shall provide a training opportunity not only for teachers/professors but also for Directors to be exposed to the school management in Japan or third countries. This training programmeme is crucial for TECs to establish its management standard.

10.2.2 Grant Aid Project: Assistance for Facilities and Equipment of TECs

As of the end of April 2016, the MoEYS hasn't been able to determine the capacity estimate of the first two TECs.[76] As indicated in Table 10-2, suppose the number of TECs in total would be six, where both PTTC and RTTC exist, and assuming the total annual number of trainees for pre-primary, primary and lower secondary levels would be 4,000, just like the average prior to 2014, the number of students each year at each of the 6 TECs should be about 670 students; 4,000 divided by 6. As each TEC has 4 year-long programmes, the total number of students assumed for each TEC should be about 2,700 students; 670 times 4, which would be the expected capacity of one TEC. In addition, each TEC is supposed to deliver a B.Ed Fast Track Programme for In-service primary and lower secondary teachers, and thus the capacity of 3,000 student facilities is in fact required for each TEC. Presently, a set of PTTC＋RTTC can accept only 500-600 students maximum. Accordingly, 6 sets of PTTC+RTTC require a large scale of expansion of their facilities, which may be a challenging need.

By expanding and upgrading more than 6 PTTCs, we would, therefore, reduce the burden over each of the 6 sets of PTTC+RTTC, meaning increasing the number of TEC up to 10, the number of annual admission per TEC can be reduced to 400. And thus, the capacity of each TEC can be reduced to less than 2,000 students; 400 times 4 years + B.Ed Fast Track students. Alternatively, if the admission of each of the 10 TEC limits to 250 students annually, the capacity of each TEC can be limited to 1,200 students; 250 times 4 years + B.Ed FT students. These two scenarios[77] of a 2,000 student capacity TEC and 1,200 student capacity TEC are referenced in the following Table 10-2.

[76] As referenced earlier, since the MoEYS/Cambodian government doesn't own any statistical data of teacher demands, subject by subject, the number of enrollment in each TEC cannot be determined. Accordingly, the capacity of TEC has not been decisively identified yet.

[77] Essential statistical data which allows the Study Team to calculate and estimate the number of the in-service teachers was unable to be found in MoEYS.

Table 10-2: Estimates of Number of TEC Student

Number of TEC	# of admission, assuming 4,000 graduates annually	Total # of students per TEC (4-year programme)
6 TEC (*Suppose only 6 P/RTTC are upgraded)	670 students	2,700 students
10 TEC (*In case of additionally 4 PTTC are upgraded)	400 students	1,600 students

Source: Study Team prepared.

(1) Equipment

Referring to the equipment standard of primary and lower secondary schools in Japan, and assuming the number of students per class is 25, the cost of equipment required for a TEC is estimated at about 93 million Japanese Yen (≒ US$850,000), as indicated in Table 10-3 (also see Appendix for details). It should be noted that some of the items indicated in the list may not be necessary, depending on the curriculum and the syllabi to be developed, therefore the amount can be reduced. On the other hand, no purchasing cost of books is included in the Library estimate in the list.

Table 10-3: TEC Equipment Estimate (for 1 TEC)

Category	Amount in JP¥
Primary Science Lab	12,982,000
Primary Math	1,258,000
Primary Social Study	150,000
Lower Second. Sci. Lab	28,384,000
Lower Second. Math	2,459,000
Lower Second. Social S.	150,000
Music Lecture room	3,683,000
Art Workshop	2,180,000
Tech. Art Workshop	4,182,000
Clothing Workshop	3,608,000
Cooking room	6,252,000
Computer Lab	11,340,000
Library	4,410,000
Meeting hall	8,000,000
Sport Ground	2,172,000
Dispensary	1,474,000
Conference room	520,000
TOTAL	**93,204,000**

Source: Study Team prepared.

(2) TEC Phnom Penh Facility

With reference to the student dormitory, each of the RTTC and the PTTC in Phnom Penh is equipped with one building. In addition, ADB is building another dormitory building for the RTTC. Accordingly, construction of another dormitory is not considered in the JICA cooperation plan.

Meanwhile, the meeting hall and the library are decrepit, and accordingly they will be demolished and replaced with a new one for each.

Furthermore, the renovation of the existing 5 lecture room buildings is also necessary.

Table 10-4 and Table 10-5 show the estimated budget required for the 2,000 capacity renovation and expansion, and for the 1,200 capacity. The 2,000 capacity TEC; 400 students per year, requires more lecture rooms, thus an extra 3-Story building is proposed to be constructed. The estimated cost of the 2,000 capacity would be about JP¥1.03 billion (approx. US$9.4 million), while the 1,200 capacity renovation and upgrade would require JP¥730 million (approx. US$6.6 million).

(3) TEC Battambang Facility

With reference to student dormitory, total 4 buildings for female students and 3 buildings for male students (and some teachers) in PTTC/RTTC Battambang. Accordingly, only one additional male dormitory has been requested to be built.

The existing buildings for administration, faculty members, and lecture rooms are substantially old, and accordingly they will be demolished and newly re-constructed. The administration building includes a library; therefore, a new library will be secured in a re-constructed building. Table 10-6 and 10-7 shows the 2,000 capacity and the 1,200 capacity estimate. The estimated cost of the 2,000 capacity would be about JPY 1.11 billion (approx. US$10 million), while the 1,200 capacity renovation and upgrade would require JP¥920 million (approx. US$8.4 million).

The reason why the estimated cost of TEC Battambang is higher than that of Phnom Penh is because the buildings in Battambang require more demolishment and new construction/ re-construction.

Table 10-4: Facility Rehabilitation, Renovation and Re-construction for TEC Phnom Penh (2,000 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction and Re-construction work		1	LS		686,000,000	
A-1	Meeting hall	2-Story RC made, Ground floor: Piloti	1	LS	150,000,000	150,000,000	
		Piloti: 1,000 m^2 x JP¥50,000/m^2=50,000,000.- + Hall: 1,000m^2 x JP¥100,000/m^2=100,000,000.-					
A-2	Library	2-Story RC made, Bookshelves; reading rooms; Language Lab.	600	m^2	80,000	48,000,000	
A-3	Administration Bloc	2-Story RC made, Director's room; Vice Directors' room, Admin Offices, etc.	1,200	m^2	80,000	96,000,000	
A-4	Lecture rooms and Sci. Labs	3-Story RC made, Lecture rooms + Lab, workshops, etc.	1,500	m^2	80,000	120,000,000	
A-5	Canteen	1-Story RC made, kitchen + Open dining, etc.	400	m^2	80,000	32,000,000	
A-6	Lecture room Building	3-Story RC made x 2 buildings for 30 lecture rooms	3,000	m^2	80,000	240,000,000	
B	Demolishing work		1	LS		37,950,000	
B-1	Meeting hall		815	m^2	30,000	24,450,000	
B-2	Library		450	m^2	30,000	13,500,000	
C	Renovation work		1	LS		100,000,000	
C-1	5 Lecture room Buildings	Interior; Exterior; doors/windows; roofing, etc.	5	LS	20,000,000	100,000,000	
	Sub-total					823,950,000	
	Direct Cost					823,950,000	
	Temporary work cost		1	LS		41,197,500	Direct Cost x 5 %
	Work supervision cost		1	LS		82,395,000	Direct Cost x 10 %
	Management cost		1	LS		82,395,000	Direct Cost x 10 %
	Total Indirect Cost					205,987,500	
	Grand TOTAL					**1,029,937,500**	**Total floor area=8,700m^2**
							(JP¥118,383/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Source: Study Team prepared.

Table 10-5: Facility Rehabilitation, Renovation and Re-construction for TEC Phnom Penh (1,200 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction and Re-construction work		1	LS		446,000,000	
A-1	Meeting hall	2-Story RC made, Ground floor: Piloti	1	LS	150,000,000	150,000,000	
		Piloti: 1,000 m^2 x JP¥50,000/m^2=50,000,000.- + Hall: 1,000m^2 x JP¥100,000/m^2=100,000,000.-					
A-2	Library	2-Story RC made, Bookshelves; reading rooms; Language Lab.	600	m^2	80,000	48,000,000	
A-3	Administration Bloc	2-Story RC made, Director's room; Vice Directors' room, Admin Offices, etc.	1,200	m^2	80,000	96,000,000	
A-4	Lecture rooms and Sci. Lab	3-Story RC made, Lecture rooms + Lab, workshops, etc.	1,500	m^2	80,000	120,000,000	
A-5	Canteen	1-Story RC made, kitchen + Open dining, etc.	400	m^2	80,000	32,000,000	
B	Demolishing work		1	LS		37,950,000	
B-1	Meeting hall		815	m^2	30,000	24,450,000	
B-2	Library		450	m^2	30,000	13,500,000	
C	Renovation work		1	LS		100,000,000	
C-1	5 Lecture room Buildings	Interior; Exterior; doors/windows; roofing, etc.	5	LS	20,000,000	100,000,000	
	Sub-total					583,950,000	
	Direct Cost					583,950,000	
	Temporary work cost		1	LS		29,197,500	Direct Cost x 5 %
	Work supervision cost		1	LS		58,395,000	Direct Cost x 10 %
	Management cost		1	LS		58,395,000	Direct Cost x 10 %
	Total Indirect Cost					145,987,500	
	Grand TOTAL					729,937,500	Total floor area =5,700m^2
							(JP¥128,059/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Source: Study Team prepared.

Table 10-6: Facility Rehabilitation, Renovation and Re-construction for TEC Battambang (2,000 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction and Re-construction work		1	LS		764,240,000	
	New Construction work						
A-1	Meeting hall	2-Story RC made, Ground floor: Piloti	1	LS	150,000,000	150,000,000	
		Piloti: 1,000 m^2 x JP¥50,000/m^2=50,000,000.- + Hall: 1,000m^2 x JP¥100,000/m^2=100,000,000.-					
A-2	Canteen	1-Story RC made, kitchen + Open dining, etc.	400	m^2	80,000	32,000,000	
A-3	Dormitory for male	2-Story RC made	720	m^2	80,000	57,600,000	
A-4	Lecture room Building	3-Story RC made for 24 lecture rooms	1,944	m^2	80,000	155,520,000	
	Re-construction work						
A-5	Administration, Lab & Workshop	3-Story RC made, Director's and Vice Directors' rooms, music room and art workshops, IT Lab, etc.	1,440	m^2	80,000	115,200,000	
A-6	Administration & Library	3-Story RC made, Admin offices, bookshelves and reading room, language Lab, etc.	1,230	m^2	80,000	98,400,000	
A-7	Lecture room Building	3-Story RC made =24 lecture rooms	1,944	m^2	80,000	155,520,000	
B	Demolishing work		1	LS		127,260,000	
B-1	Administration Bldg.	4-Story RC made	1,716	m^2	30,000	51,480,000	
B-2	Administration Bldg.	2-Story RC made	690	m^2	30,000	20,700,000	
B-3	Lecture room Building	3-Story RC + wooden made	1,836	m^2	30,000	55,080,000	
	Sub-total					891,500,000	
	Direct Cost					891,500,000	
	Temporary work cost		1	LS		44,575,000	Direct Cost x 5 %
	Work supervision cost		1	LS		89,150,000	Direct Cost x 10 %
	Management cost		1	LS		89,150,000	Direct Cost x 10 %
	Total Indirect Cost					222,875,000	
	Grand TOTAL					**1,114,375,000**	**Total floor area =9,678m^2**
							(JP¥115,383/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Source: Study Team prepared.

Table 10-7: Facility Rehabilitation, Renovation and Re-construction for TEC Battambang (1,200 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction and Re-construction work					608,720,000	
	New Construction work						
A-1	Meeting hall	2-Story RC made, Ground floor: Piloti	1	LS	150,000,000	150,000,000	
		Piloti: 1,000 m^2 x JP¥50,000/m^2=50,000,000.- + Hall: 1,000m^2 x JP¥100,000/m^2=100,000,000.-					
A-2	Canteen	1-Story RC made, kitchen + Open dining, etc.	400	m^2	80,000	32,000,000	
A-3	Dormitory for male	2-Story RC made	720	m^2	80,000	57,600,000	
	Re-construction work						
A-4	Administration, Lab & Workshop	3-Story RC made, Director's and Vice Directors' rooms, music room and art workshops, IT Lab, etc.	1,440	m^2	80,000	115,200,000	
A-5	Administration & Library	3-Story RC made, Admin offices, bookshelves and reading room, language Lab, etc.	1,230	m^2	80,000	98,400,000	
A-6	Lecture room Building	3-Story RC made for 24 lecture rooms	1,944	m^2	80,000	155,520,000	
B	Demolishing work					127,260,000	
B-1	Administration Bloc	4-Story RC made	1,716	m^2	30,000	51,480,000	
B-2	Administration Bloc	2-Story RC made	690	m^2	30,000	20,700,000	
B-3	Lecture room Building	3-Story RC + wooden made	1,836	m^2	30,000	55,080,000	
	Sub-total					735,980,000	
	Direct Cost					735,980,000	
	Temporary work cost					36,799,000	Direct Cost x 5 %
	Work supervision cost					73,598,000	Direct Cost x 10 %
	Management cost					73,598,000	Direct Cost x 10 %
	Total Indirect Cost					183,995,000	
	Grand TOTAL					**919,975,000**	**Total floor area =7,734m^2**
							(JP¥118,952/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Source: Study Team prepared.

(4) Time Schedule

With reference to the timing of JICA Grant Assistance for the TEC establishment, considering the capacity of the existing facilities of PTTC/RTTC, it can wait for 1) one School Year in case of admitting 400 students per year; or 2) two School Years in case of 250 students annually. Accordingly, in the case of #1), the construction and the renovation works are expected to be completed by August 2019; while in the case of #2), the works can last until August 2020. And, the equipment is expected to be procured and installed by October -November 2019 or 2020, respectively.

In the meantime, as indicated in Table 10-8, suppose the preparatory survey will begin in January 2017, the study will last for 9 months, then additional 2-3 months are required for Cabinet approval and Exchange of Notes (E/N). Subsequently, the detailed design study requires 6 months, and the process for tender of bidding requires an additional 3 months. Then, the construction works will require 15-16 months, therefore, the earliest that all of the work can be completed is by February 2019. As the works include the renovation works of the existing facilities as well as the demolition and the re-construction works, the number of available lecture rooms will be reduced during the works. Accordingly, the number of admission in the first and the second years of TEC should restrain up to about 200 students per year, while from the third year the number can increase.

It should be noted that this time table doesn't include the necessary time for let the MoEYS conduct an assessment of teacher demand and the projection of the number of future admission.

Meanwhile, it should also be noted that the procurement of equipment can be parallelly or simultaneously carried out while the construction works proceed.

Table 10-8: Predicted Time Table for TEC Facility Construction Works and Equipment Procurement with JICA Grant Assistance

Japanese Fiscal Year	2016			2017				2018				2019				2020		
Quarter	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Preparatory Survey			■	■	■													
Cabinet approval・E/N						■												
Detailed Design Study							■	■										
Tender of bidding									■									
Construction works										■	■	■	■	■	■			
TEC establishment schedule	Preparation and transition to TEC									TEC 1st Year				TEC 2nd Year				

Source: Study Team prepared.

(5) Financial Arrangement

The Cambodian government has requested DP, principally JICA, for the construction, renovation and rehabilitation of the initial two TECs in Phnom Penh and in Battambang, so as to make them the models for any additional construction and renovation. For the additional TEC, while the Cambodian government is making an effort to prepare its own budget, a Yen loan

assistance could be also an option. So far, there is no other DP who shows the interest in the assistance for facility construction and renovation of the TEC establishment.

10.2.3 Grant Aid Project: Scholarship Programme for TECs (JDS)

In the mid to long term, TEC teachers training through strategical application of JDS could contribute to the assurance of TEC education quality. The core members of the Educatoin Research Council (ERC) graduated from Japanese universities with doctoral degrees and are the driving force behind the minister's education reform. If these liberal groups would increase their number, Cambodia would change for the better. In the education sector, each TEC would need local expert groups with majors in subject education, educational philosophy, education history, educational law, pedagogical phycology, and educational finance and administration. One of the assistance choices for TEC teacher training is that TEC teachers would study abroad under the JICA grant aid scheme, which will be discussed later in 10.5.

10.3 Higher Technical Education: Assistance for Higher Technical Education Development and Networking

10.3.1 Technical Cooperation Project: Project for Networking Engineering Faculties of Higher Education

The following table shows the summary of a proposed technical cooperation project for engineering education at HEIs. The project aims to develop a Labouratory-based Education and Research (LBE) model and a Project-based Learning (PBL) model at ITC and RUPP respectively. These two models will be transferred to provincial HEIs such as UBB and SRU by post-graduate students at ITC and RUPP who are from the respective provinces. It is very important to develop incentive mechanisms for the post-graduate students in serving to introduce LBE and PBL at provincial HEIs. In addition, the study team also suggests forming a network of engineering-related faculties and departments in Cambodia for sharing their resources. The team also recommends improving students' employability by building capacity of industry-university liaison offices and student career offices of the related HEIs.

Table 10-9: Proposed TCP for Engineering Education at HEIs

Cooperation period	2017 to 2022 (5 years)
Implementing Agency	DGHE, MoEYS ITC, RUPP FoE, UBB, SRU
Super Goal	Engineers with practical skills, which reflect the particular needs of SEZs, will be produced.
Overall Goal	Capacity of four universities for practical engineering education and research will be enhanced.
Project Purpose	Labouratory-based Education and Research (LBE) and Project-based Learning (PBL) will be developed in ITC and RUPP and introduced to UBB and SRU.
Output	1. LBE model is developed 2. PBL model is developed 3. A pilot model where fulltime master students contribute in provincial universities in introducing LBE and PBL, while they are studying in ITC (or RUPP) is developed 4. Incentive mechanisms are developed for promoting the above three components 5. A network of engineering HIEs is developed for sharing the resources 6. Capacity of industry-university liaison office and student career office is enhanced in order to improve students' employability

Project Area	Phnom Penh, Battambang, and Svay Rieng	
Beneficiary	・ 4740 students（ITC 3800, RUPP 520, UBB 180, and SRU 240） ・ Approx.300 lecturers	
Input	[Japan] TCP 1. Expert from Japan and ASEAN 2. Equipment (LBE/PBL implementation 3. Training (international) 4. Training/workshop/seminar (local) 5. Others Outside the TCP ・ Capacity development of lecturers through AUN/SEED-Net, JDS, etc.	[Cambodia] 1. Staffing 2. D 3. To develop legal system for encouraging young scholars to serve in provincial HEIs after obtaining higher degrees 4. To secure necessary budget for the incentive mechanisms for promoting LBE and PBL, especially in provincial HEIs

10.3.2 Grant Aid Project: Facilities and Equipment for Engineering Faculties of Higher Education

As referenced in 9.2.3, assuming 150 student admissions annually each at UBB and SRU and the requirement to strengthen the quality of education in STEM subjects, the Study Team proposes construction of a STEM building as indicated in Table 10-10 and Table 10-11. The ground floor serves for labouratories for the foundation course works in Physics and in Chemistry, while the 2nd through the 4th floor accommodate labouratories and research and development rooms connected to professors' rooms, so that the LBE and/or PBL can be properly conducted.

Table 10-10: Proposed STEM Building for Faculty of Science and Technology of UBB (600 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost (JP¥)	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction		1	LS		192,000,000	
A-1	STEM Building	4-Story RC made	1,920	m2	100,000	192,000,000	
	Sub-total					192,000,000	
	Direct Cost					192,000,000	
	Temporary work cost		1	LS		9,600,000	Direct Cost x 5 %
	Work supervision cost		1	LS		19,200,000	Direct Cost x 10 %
	Management cost		1	LS		19,200,000	Direct Cost x 10 %
	Total Indirect cost					48,000,000	
	Grand TOTAL					**240,000,000**	**Total floor area=1,920 ㎡**
							JP¥125,000/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Table 10-11: Proposed STEM Building for Faculty of Science and Technology of SRU (600 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost (JP¥)	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction		1	LS		192,000,000	
A-1	STEM Building	4-Story RC made	1,920	m^2	100,000	192,000,000	
	Sub-total					192,000,000	
	Direct Cost					192,000,000	
	Temporary work cost		1	LS		9,600,000	Direct Cost x 5 %
	Work supervision cost		1	LS		19,200,000	Direct Cost x 10 %
	Management cost		1	LS		19,200,000	Direct Cost x 10 %
	Total Indirect cost					48,000,000	
	Grand TOTAL					**240,000,000**	**Total floor area=1,920 ㎡**
							JP¥125,000/m^2)

RC: Reinforced Concrete, LS: Lump Sum

(1) Equipment for Engineering Education

As also mentioned in 9.2.3, the equipment required for the engineering department is:

① At this stage, it is uncertain what equipment ITC and RUPP procure on their own and how much assistance by development partners is required. Along with the necessary equipment in view of strengthening the STEM education in provinces, the details should be determined in due course.

② When a STEM building is constructed at each of UBB and SRU, as indicated in Table 10-10 and Table 10-11, the procurement of equipment as indicated below should also be considered (also see Appendix for details):

Equipment for Foundation Course Work in Chemistry: JP¥31,350,000;
Equipment for Foundation Course Work in Physics: JP¥22,980,000;
Equipment for Basic Engineering 1: JP¥52,980,000;
Equipment for Basic Engineering 2: JP¥53,970,000; and
Total: JP¥161,280,000.

Accordingly,

1. UBB: JP¥161,280,000;
2. SRU: JP¥161,280,000; therefore

TOTAL: JP¥322,560,000.

(2) Time Schedule

In view of strengthening the Engineering Education in Cambodia, the capacity development of UBB and SRU is essential. In this view, as mentioned in the proposed Technical Cooperation project framework at 10.3.1, it has to be initiated with the in-country study or study abroad of existing and future candidates of Provincial university lecturers and instructors. In the meantime, when they return to their own university or institute in a Province, the facility must accommodate their needs so that they can demonstrate what they learned through the practice of the LBE or the PBL. And thus, while the dispatching programme of existing and future lecturers and istructors to a university in Phnom Penh or overseas starts in 2016, it is truly desirable if the STEM Building construction work at UBB and SRU could start as soon as possible. If a request for the STEM Building construction is made within this year, if the request is approved, a preparatory survey can start in 2017 and the start of construction work can begin in 2018. Meanwhile, if another request for implementing the proposed Technical Cooperation project is also made and approved in the Japanese fiscal year 2016, the project can train the existing or future lecturers during the fist half of the project during the STEM building construction. Also, through the training of the existing and future lecturers from the provinces, ITC and RUPP can practice their LBE and PBL and strengthen their practical education capacity during the first half of the project between the JPFY 2017 and 2020. When ITC and RUPP practice the LBE and the PBL, they should connect to the universities in the provinces with fiber-optic cables and deliver on-line lectures from the central universities to the provincial universities, which can also enhance the capacity of ITC and RUPP. During the time, the project can assist with the process of the facility construction and the equipment procurement for the provincial universities. Then, in the latter part of the project between the JPFY 2020 and 2022, the project can assist with the LBE and/or PBL practice of the returnd lecturers and instructors. Those LBE and PBL practices in provinces can be also shared with the central universities and universities abroad including ones in Japan on line. These series of process can be the Cambodian version of the AUN/SEED-Net.

(3) Financial Arrangement

As mentioned in Chapter 7, Part II, the Cambodian government is constructing a STEM building in ITC, to be completed by 2019. RUPP has a plan of the STEM building construction. Therefore, the two central universities will be accommodated for the practice of the LBE and the PBL.

With reference to ITC, a Research Innovation Center; whose total floor area is 1,314 m^2 was constructed with the Japanese Grant Aid assistance and opened in 2015, where necessary equipment was also procured with the Japanese Cultural Grant Aid assistance. Furthermore, ITC has received various assistance and contributions from other DPs, therefore its infrastructure is relatively well established. Nevertheless, if the ITC, as well as RUPP, will be substantially involved in the support for the capacity development of provincial universities in science and engineering education, it would be required to further equip basic measuring equipment and analysing equipment to be shared with provincial universities.

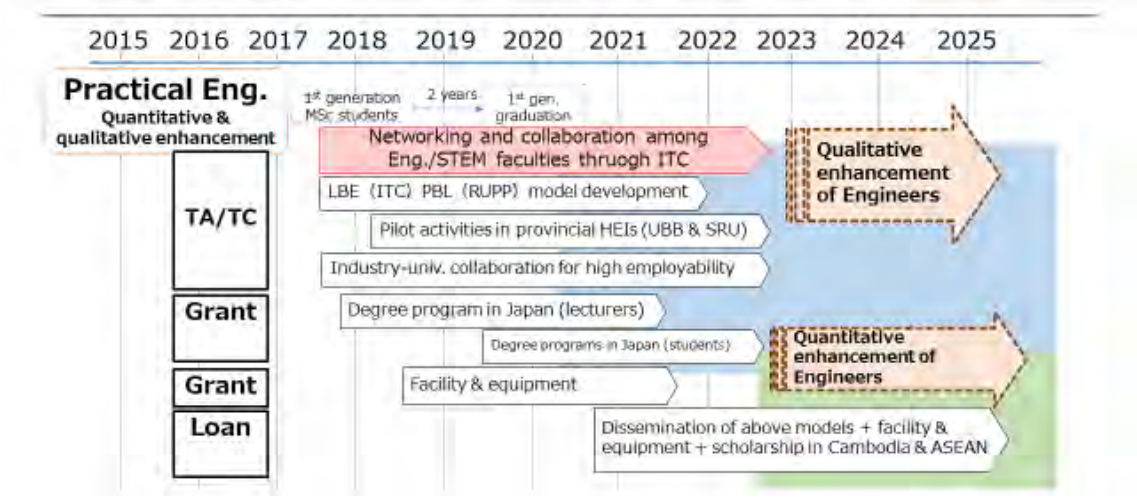
In terms of RUPP, as mentioned, the allocation of national budget for their procurement of necessary equipment for the projected new STEM Building has not yet been realised.

Concerning UBB and SRU in the provinces, it is recommended to encourage their ownership and self-helping efforts toward the construction of a STEM Building.

10.3.3 Prospects of Engineering Education for Next 10 Years

The next 10-year perspective for Engineering Education is presented in Figure 10-4.

ITC, whose capacity has been steadily developed with various assistances from JICA, has finally entered into the stage of practicing the LBE. The enhanced capacity of ITC must not be only utilised internally, but be also spread nation-wide. ITC is also fully aware of their role and responsibility, and accordingly the assistance for the bottom up of Engineering Education nation-wide through the capacity development of provincial universities, in collabouration with RUPP, is highly expected, and that is the Cambodian prospect for the next 10 years. In proportion to the development of STEM education from the basic education level, it is expected that the STEM Departments of the provincial universities accept the assistance and the engineering human resources produced will then increase. Subsequently, it is expected that FDI, demanding STEM HR, will increase, and, therefore Cambodia will achieve the required industrial diversification and advancement as a country. In addition, inter-sub-sectoral cooperation can be also realised through which a certain number of Engineering Department graduates becomes GTHS teachers.



Source: Prepared by the Study Team

Figure 10-4: Pre-view of Suggested Japanese Assistance to Engineering Education for Next 10 Years

10.4 General Technical High Schools (GTHSs): Assistance for GTHSs

This section discusses possible assistance from JICA to transform Cambodian high schools to GHTSs by opening a technical programme at secondary education level. In particular, this section discusses 4 high schools located near SEZs, based upon a request made by the Minister of Education, Youth and Sport to JICA. As mentioned before in part 2 and Chapter 9 of part 3 in this report, it is crucial to form an assistance programme which develops human resources required by foreign companies investing in and around SEZs, thereby the Cambodian economy transforms from its unskilled-labour centered-industry to more diverse and sophisticated one. Especially, developing human resources responding to the need of manufacturing industries is important. For this cause, the study team proposes:

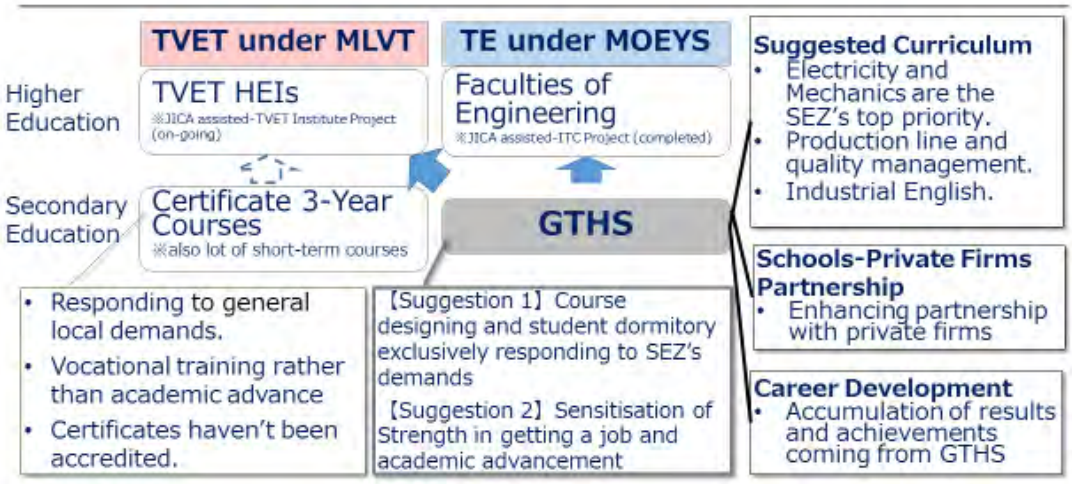
① To develop mechanics and electricians, both of whom are needed commonly among manufacturing industries;
② To develop middle class manager candidates capable of controlling the production process and quality management;
③ To equip students with English communication skills usable in foreign companies and soft social skills such as manner, discipline and moral;
④ To establish GTHSs and their satellite schools under close cooperation with private companies, thereby meeting the educational needs of the companies;
⑤ To establish/strengthen a career guidance system for technical students for successful job-seeking and advancing to higher education; and,
⑥ To rectify a misguided idea about technical education among the Cambodian society, by producing success stories of technical students in their academic and work career and by promoting technical education based upon such success stories.

In the meantime, the following concerning points need to be considered, when cooperative assistance is provided:

① As mentioned in the Chapter 8 of the Part 2, it is essential to clarify the different roles between the MoEYS and the MLVT in order to prevent the duplication of services and the unnecessary competition over the limited resources.

② At the same time, it is necessary to assure strong ownership and commitment of the MoEYS and its initiative on aid coordination among DP, so as not to be extremey dependent on Japanese cooperation.

③ Furthermore, it is important to make sure the capacity of the Cambodian side and to assist in strengthen their capacity in the course of work.



Source: Prepared by the Study Team

Figure 10-5: Possible Future Direction of Technical High Schools

10.4.1 Possible Cooperation Ideas for Enhancement of Administrative System for Establishing and Expanding GTHSs in SEZs

(1) Strengthening an Implementation System

Training courses in Japan or in Third Countries:

1) To organise training programmes and workshops for government officers to review the curriculum and put together syllabi and textbooks, and capacity development workshops for technical teachers shall be carried out in Japan or in the third countries.[78]

Issues to be considered, when a Technical Cooperation Project can be established:

2) To review the curriculum of technical high schools, the contents of which KOICA had originally assisted in putting together, and to revise it to develop human resources which meet the expectations of manufacturing companies investing in or around SEZs. When revising, inputs and advice from the private companies shall be sought.
3) To put together syllabi which shall be used in the GTHSs and their satellite schools, based upon the revised technical education curriculum.
4) To compile textbooks for the 2nd grade (Y2) and 3rd grade (Y3) of technical high schools based upon the revised curriculum. Textbooks for 1st grade (Y1) have already been available thanks to the Korean technical assistance, but revisions and teaching aids shall be made, as may be necessary.
5) To put together or revise rules on teaching requirements or Teacher Career Pathway (TPC) for technical teachers, if the existing rules and TPC are not appropriate.

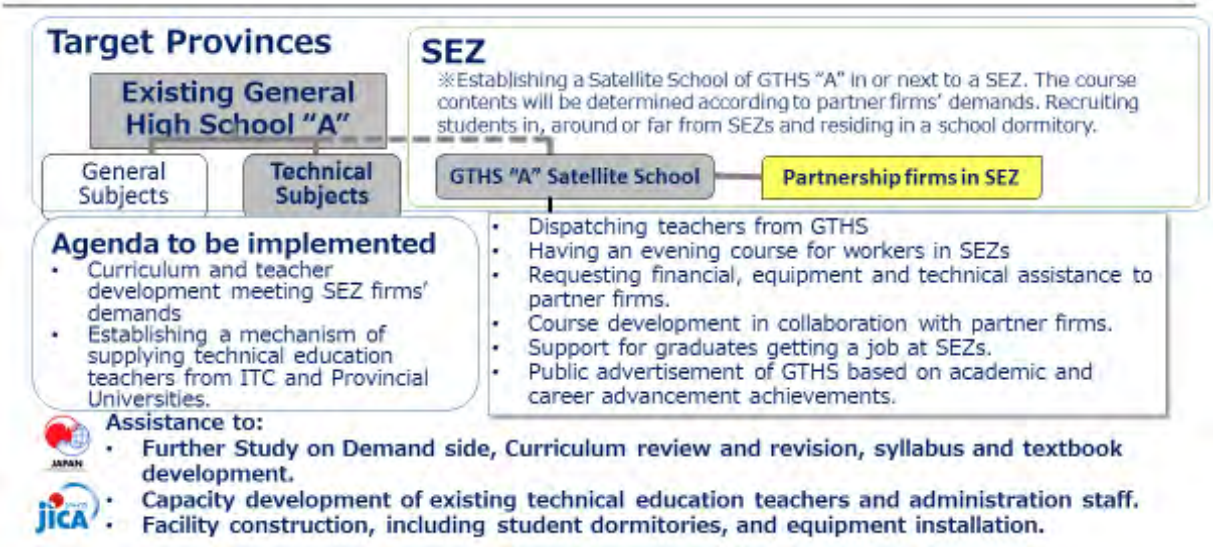
[78] References:(http://open_jicareport.jica.go.jp/600/600/600_118_11290780.html) (http://library.criced.tsukuba.ac.jp/event/pdf/090226/01-005.pdf)

Issues to be considered, when another Technical Cooperation Project can be established:

1) To seek cooperation from partner companies in assigning lecturers and renting equipment necessary for technical education.
2) To admit students, who are recommended by partner companies, to a satellite school and grant a scholarship.
3) To compile teaching guides for Y1, Y2, and Y3.
4) To facilitate GHTS students to advance to higher education in the technical fields, or to assist them in getting a position at companies investing in and around SEZs, and to assist GTHS satellite students in getting a position in investing in and around SEZs. And to keep a record on the number of students advancing to higher education institutions or getting employed by private companies.
5) Based upon the above-mentioned record, the programme shall promote technical education thereby rectifying a prejudice or mislead ideas on technical education among the Cambodian nationals. By doing so, students of academic excellence are lured to study technical programme and to be equipped with technical education – the programme aims to generate this good cycle.

(2) Training Pre-service Technical Teachers and Developing Capacities of In-service Teachers

1) To develop capacity among in-service teachers by using JICA's schemes such as Country-Focused Training and Group and Region-Focused Training[79]. Besides, to assist pre-service teachers in studying at university or technical colleges in Japan, using the Japanese Government (Monbukagakusho) Scholarship[80] may also be considered.
2) To establish the pre-service training system for sustainably train and produce Technical Education teachers in the country, possibly in collabouration with the Engineering Education Sub-programmeme.



Source: Prepared by the Study Team

Figure 10-6: Ideas on Japanese Assistance to GTHS to Meet the Needs of SEZs

[79] Reference: http://www.aichi-edu.ac.jp/topics/news/2009/671.html
[80] Reference: http://www.mext.go.jp/a_menu/koutou/ryugaku/boshu/1357035.htm

10.4.2 Possible Cooperation Ideas for Grant Aid Project: Facilities and Equipment Assistance for GTHSs and Satellite Schools

As summarised in the 2nd Part of this report, according to the survey conducted by the DVO/MoEYS at Bavet Secondary School in Svay Rieng Province, targeting of Grade 9 students in the lower secondary level, indicated that 44%; or, 60 out of 135 students showed an interest to be enrolled in a Technical Education course once they advance to the upper secondary level. Taking into account that students from other lower secondary schools nearby will also be enrolled, Bavet GTHS plans to accept 120 students for their Technical courses. Likewise, Chum Pu Voan GTHS in Phnom Penh will also accept 160 for the newly establishing Technical courses for the SY 2016/17.

As it is uncertain at present how much the MoEYS will construct or prepare GTHS facilities and equipment by themselves, the Study Team provisionally proposes the plans of 300 student capacity facilities and equipment for JICA cooperation. At the same time, the Study Team proposes the establishment of a Satellite School in or around an SEZ for each of the two GTHS in Phnom Penh and in Svay Rieng.

Table 10-12: Facility Proposal for Chum Pu Voan GTHS in Phnom Penh (300 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost (JP¥)	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction		1	LS		478,600,000	
A-1	Administration Bldg.	2-Story RC made	800	m^2	80,000	64,000,000	
A-2	General Classroom & Lab, Workshop Bldg.	3-Story RC made	3,360	m^2	80,000	268,800,000	
A-3	Meeting Hall	2-Story RC made, Ground floor: Piloti	1	LS	105,000,000	105,000,000	
A-4	Canteen	1-Story RC made, kitchen + Open dining, etc.	300	m^2	80,000	24,000,000	
A-5	Dormitory for male	3-Story RC made	-	m^2	80,000	0	
A-6	Dormitory for female	3-Story RC made	-	m^2	80,000	0	
A-7	Bathroom for male	1-Story RC made	105	m^2	80,000	8,400,000	
A-8	Bathroom for female	1-Story RC made	105	m^2	80,000	8,400,000	
	Sub-total					478,600,000	
	Direct Cost					478,600,000	
	Temporary work cost		1	LS		23,930,000	Direct Cost x 5 %
	Work supervision cost		1	LS		47,860,000	Direct Cost x 10 %
	Management cost		1	LS		47,860,000	Direct Cost x 10 %
	Total Indirect cost					119,650,000	
	Grand TOTAL					**598,250,000**	**Total floor area =6,070m^2**
							JP¥98,936/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Table 10-13: Facility Proposal for Chum Pu Voan GTHS Satellite Campus in Phnom Penh SEZ (300 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost (JP¥)	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction		1	LS		540,000,000	
A-1	Admin + Library Bldg.	3-Story RC made	1,440	m^2	80,000	115,200,000	
A-2	General Classroom Bldg.	2-Story RC made	1,200	m^2	80,000	96,000,000	
A-3	Lab & Workshop Bldg.	3-Story RC made	1,440	LS	80,000	115,200,000	
A-4	Canteen	1-Story RC made, kitchen + Open dining, etc.	300	m^2	80,000	24,000,000	
A-5	Dormitory for male	3-Story RC made	1,080	m^2	80,000	86,400,000	
A-6	Dormitory for female	3-Story RC made	1,080	m^2	80,000	86,400,000	
A-7	Bathroom for male	1-Story RC made	105	m^2	80,000	8,400,000	
A-8	Bathroom for female	1-Story RC made	105	m^2	80,000	8,400,000	
	Sub-total					540,000,000	
	Direct Cost					540,000,000	
	Temporary work cost		1	LS		27,000,000	Direct Cost x 5 %
	Work supervision cost		1	LS		54,000,000	Direct Cost x 10 %
	Management cost		1	LS		54,000,000	Direct Cost x 10 %
	Total Indirect cost					135,000,000	
	Grand TOTAL					675,000,000	Total floor area =6,750m^2
							JP¥100,000/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Table 10-14: Facility Proposal for Bavet GTHS in Svay Rieng (300 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost (JP¥)	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction		1	LS		497,800,000	
A-1	Administration Bldg.	2-Story RC made	800	m^2	80,000	64,000,000	
A-2	Meeting Hall	2-Story RC made, Ground floor: Piloti	1	LS	105,000,000	105,000,000	
		Piloti: 700 m2 x JP¥50,000/m2 = 35,000,000 + Meeting hall: 700 m^2 x JP¥100,000/m^2 = 70,000,000					
A-3	Library	2-Story RC made	720	m^2	80,000	57,600,000	
A-4	General Classroom Bldg.	2-Story RC made	960	m^2	80,000	76,800,000	
A-5	Lab & Workshop Bldg. (1)	2-Story RC made	960	m^2	80,000	76,800,000	
A-6	Lab & Workshop Bldg. (2)	2-Story RC made	960	m^2	80,000	76,800,000	
A-7	Canteen	1-Story RC made, kitchen + Open dining, etc.	300	m^2	80,000	24,000,000	
A-8	Dormitory for male	3-Story RC made	-	m^2	80,000	0	
A-9	Dormitory for female	3-Story RC made	-	m^2	80,000	0	
A-10	Bathroom for male	1-Story RC made	105	m^2	80,000	8,400,000	
A-11	Bathroom for female	1-Story RC made	105	m^2	80,000	8,400,000	
	Sub-total					497,800,000	
	Direct Cost					497,800,000	
	Temporary work cost		1	LS		24,890,000	Direct Cost x 5 %
	Work supervision cost		1	LS		49,780,000	Direct Cost x 10 %
	Management cost		1	LS		49,780,000	Direct Cost x 10 %
	Total Indirect cost					124,450,000	
	Grand TOTAL					**622,250,000**	**Total floor area =6,310m^2**
							JP¥98,966/m^2)

RC: Reinforced Concrete, LS: Lump Sum

Table 10-15: Facility Proposal for Bavet GTHS Satellite Campus in an SEZ in Svay Rieng Province (300 Students Capacity)

Item		Notes	Quantity	Unit	Unit Cost (JP¥)	Amount (JP¥)	Remarks
I	Facility Construction						
A	New Construction		1	LS		578,400,000	
A-1	Administration Bldg.	3-Story RC made	800	m^2	80,000	64,000,000	
A-2	Library	2-Story RC made	720	m^2	80,000	57,600,000	
A-3	General Classroom Bldg.	2-Story RC made	1,120	m^2	80,000	89,600,000	
A-4	Lab & Workshop Bldg. (1)	2-Story RC made	960	m^2	80,000	76,800,000	
A-5	Lab & Workshop Bldg. (2)	2-Story RC made	960	m^2	80,000	76,800,000	
A-6	Canteen	1-Story RC made, kitchen + Open dining, etc.	300	m^2	80,000	24,000,000	
A-7	Dormitory for male	3-Story RC made	1,080	m^2	80,000	86,400,000	
A-8	Dormitory for female	3-Story RC made	1,080	m^2	80,000	86,400,000	
A-9	Bathroom for male	1-Story RC made	105	m^2	80,000	8,400,000	
A-10	Bathroom for female	1-Story RC made	105	m^2	80,000	8,400,000	
	Sub-total					578,400,000	
	Direct Cost					578,400,000	
	Temporary work cost		1	LS		28,920,000	Direct Cost x 5 %
	Work supervision cost		1	LS		57,840,000	Direct Cost x 10 %
	Management cost		1	LS		57,840,000	Direct Cost x 10 %
	Total Indirect cost					144,600,000	
	Grand TOTAL					**723,000,000**	**Total floor area =7,230m2**
							JP¥100,000/m^2)

RC: Reinforced Concrete, LS: Lump Sum

(1) Equipment for GTHS

With reference to the equipment required for GTHS, based on the curriculum proposed in Table 9-16, the following amount is planned; also referring to technical high schools in Japan. The equipment procurement will be determined and delivered based on the existing equipment in the General High Schools and what the MoEYS procures by itself.

3. Euipment for General Subjects: JP¥103,963,000;
4. Equipment for Technical Courses: JP¥569,700,000;

Total: JP¥673,663,000.

(2) Time Schedule

As referenced earlier, the Japanese Grant Aid or Yen Loan Cooperation depends on how much the MoEYS implements by itself. If some room for cooperation is identified and the request for cooperation is made within 2016, for example, a Preparatory Survey can be conducted in the Japanese FY 2017, then the construction work can be launched in the FY 2018. In that case, the Technical Education construction can begin in FY2020, at the earliest, by utilizing the constructed and equipped facilities.

(3) Financial Arrangement

The Cambodian government is carrying out its policy for expanding and developing GTHS nation-wide. For this coming SY 2016/17, it aims to open the 3 GTHS, namely Chum Pu Voan in Phnom Penh, Bavet in Svay Rieng, and Pouk in Siem Reap, so allocating a budget and construction of facilities and procurement of equipment are proceeding. Nevertheless, as of May 2016, while the construction of the Technical Education building for Pouk GTHS in Siem Reap is on-going, Chum Pu Voan GTHS in Phnom Penh has just allocated one existing large room for the Technical Education to be divided into two workshops and to install some equipment. When it comes to Bavet GTHS in Svay Rieng, no realisation has been made therefore causing some doubt for starting the Technical Education courses at the beginning of SY 2016/17. Accordingly, along with fostering the self-efforts of the Cambodian government, some complimentary assistance for establishing GTHS, including Satellite campuses, is expected for development partners. So far, there is no DP other than JICA who is intending to assist the government's efforts for the GTHS development. One American NGO "D. K. Kim Cambodia Foundation" showed an interest for supporting it at the occasion of the 2nd Consultative meeting held in May 2016, but still not sure yet if any assistance will be realised in or not.

10.5 Possible Loan Projects

Concerning JICA's Yen Loan cooperation programmeme for the Cambodian education sector, the following options can be considered:

(1) Construction, renovation, and rehabilitation of the facilities, and procurement of the necessary equipment for the TECs other than those in Phnom Penh and in Battambang referenced earlier;
(2) Construction and expansion of the facilities, and procurement of necessary equipment for Faculties of Engineering and/or Science and Technologies of the higher education institutes;
(3) In-country or overseas (in Japan or in ASEAN countries) training programmemes for pre-service and in-service faculty members of the higher education institutes;

Furthermore, in case that the Technical Education in the secondary level, referenced earlier, is on track,

(4) Construction and expansion of the facilities, and procurement of necessary equipment for General and Technical High Schools (GTHS).

As the (1) - (3) can be put into together under a single "Assistance to Higher Education", (4) is regarded as exceptional.

These optional suggestions of the Yen Loan cooperation programmeme for the "Assistance for human resource development in Higher Education" is considered as the 2nd stage of the Suggestions of JICA Cooperation Programmeme, following after the 1st stage cooperation for the TEC establishment and the new programmemes for the higher education institutes have been implemented, as the approaches acquired through the 1st stage can be replicated or expanded. For example, referring to the TEC facility expansion other than in Phnom Penh and in Battambang, it can accelerate the teacher upgrading policy from the current 2-year programmeme to the B.A. degree mandatory. Besides, the TEC teacher upgrading programmemes through study in-country or abroad would be further promoted. By the time the 2nd phase expansion is realised, the TEC curriculum and pedagogical methods should have been established through the development of the 1st phase two TECs in Phnom Penh and in Battambang, accordingly they can be replicated. Concerning the Faculties of Engineering or Science and Technology of the higher education institutes, after University of Battambang (UBB) and Svay Rieng University (SRU) have adopted the approaches and the methods of Labouratory-based Education (LBE) from Institute of Technology of Cambodia (ITC) and Project-based Learning (PBL) of Royal University of Phnom Penh (RUPP), it would be appropriate to assist in the facility development and equipment procurement for the two Provincial universities through the Yen Loan Cooperation, so that UBB and SRU can practice LBE and/or PBL in their courses or programmemes. If this scenario is realised, the JICA Cooperation Programmeme can contribute to the establishment of "the system of which locally-trained human resources in the Provinces can productively engage in the local industries which have invested in the Provinces." In parallel, faculty members of the universities in Engineering and/or Science and Technology can be sustainably trained and produced in the long run.

With reference to the training programmemes for pre-service and in-service faculty members of the higher education institutes through the Yen Loan Cooperation, the options can be extended from In-country in Cambodia to overseas in Japan or in ASEAN countries. In the next 10 years, it is critical to train and produce faculty members in a variety of academic fields. Accordingly, it would be effective if the universities in Cambodia sign a MOU for collabouration with relevant universities in ASEAN countries.

10.6 Concerns for Implementation of JICA Technical Cooperation Projects

Finally, the three remaining issues to be resolved at the implementation of the above-suggested JICA Cooperation Programmemes are referenced below:

- Statistical data
- Aid coordination
- Ownership

As referenced in the TEC establishment section, due to the absence of the base data of in-service teachers, it is impossible to have a projection of the number of admissions for the new TECs. As it is a concern for the facility construction and renovation and the equipment procurement, it would be recommended to conduct a teacher base data collection survey, even if

it is included as a part of the proposed Technical Cooperation project at the early stage of the suggested JICA Cooperation Programmemes.
Besides, despite the fact that the MoEYS; the supplier of the education services, plans to establish 1 university and 1 GTHS at each Province, there is no available data which indicates "the future demand numbers of engineers and technicians." Meanwhile, according to the "JICA Preparatory Survey for Human Resources for Industrial Development Programmeme in Cambodia" conducted in 2011-12, the demanded numbers of engineers and technicians (equivalent to technical college graduates) in Cambodia estimated for the Year 2018 were 35,000 and 46,000, respectively.[81] However, the suggestions of the university expansions and the GTHS establishment of this Report are not proposed based on those estimates. In order to estimate the number of students of the Faculties of Engineering and/or Science and Technology and of the GTHS, it is necessary to conduct a specific demand-supply study and analysis, based on the present situation and status of Cambodia. In terms of the 3 existing GTHS, there is no data of alumni where they got a job.

With reference to the 2nd concern of Aid Coordination, VSO and VVOB as well as JICA have raised a hand for the assistance to the establishment of TEC so far. As each agency has its own interested areas and regulations in cooperation, in case that JICA has to take care the rest of all areas other than those areas to be assisted by VSO and VVOB from the pre-primary level through the lower secondary level, some concerns and warnings should be observed. It would be advisable for the MoEYS to continuously request and coordinate with the DP or funding programmemes, such as UNICEF for pre-primary, and CDPF and GPE for the overseas training for TEC pre- and in-service teachers. Towards the establishment and the development of TEC, the MoEYS is expected to strengthen its leadership and coordination for DP's sound collabouration.

The other expected issue is the development of Cambodian ownership. Through this Study, compared with H.E. the Minister Naron's decisive leadership and initiative, the Study Team perceived that the motivation and the committment varied from one relevant stakeholder to another in the Engineering Education and the Technical Education sub-sectors.

Suppose a Satellite GTHS would be established in SEZs as suggested earlier, the Cambodian government is required to prepare an open land and school environment in SEZs, while the MoEYS is supposed to administratively clarify the status of the Satellite GTHS, in addition to the curriculum review, the syllabus and textbook development, and the teacher training. In these views, further development of Cambodian ownership over the suggested programmemes would be highly appreciated.

[81] These estimated numbers were calculated with an assumption that the Cambodian industries follow the track of Thailand. The calculation was made under the hypothesis that the GDP of Cambodia in 2018 would be identical to that of Thailand in 1990.

11. Conclusion

This survey reviewed the national goals described in the latest national development policies (IDP 2015-2025) and analyzed the current status of the industrial sector, mainly manufacturers in the SEZs, at the request of the government of Cambodia. It then discussed the qualitative and quantitative shortages of industrial human resources in line with the issues of each level of basic education, upper secondary education, and higher education subsectors. An overall quality improvement in basic education will enhance the productivity of all workers, while it will also increase the number of youth who will continue to advance in the education system, i.e. upper secondary education and higher education, by decreasing the dropout rate in the primary and lower secondary education. Moreover, it will increase the number of technicians and engineers available in the workforce, where huge demands are expected in the near future. These improvements in the production of industrial human resources, based on a quality basic education, are requirements for the continued economic development in Cambodia, whose youth population has started to decrease, and, as some economists hae alerted, will end the population bonus by the year 2045.

This is the background for the current education reforms that MoEYS has implemented.

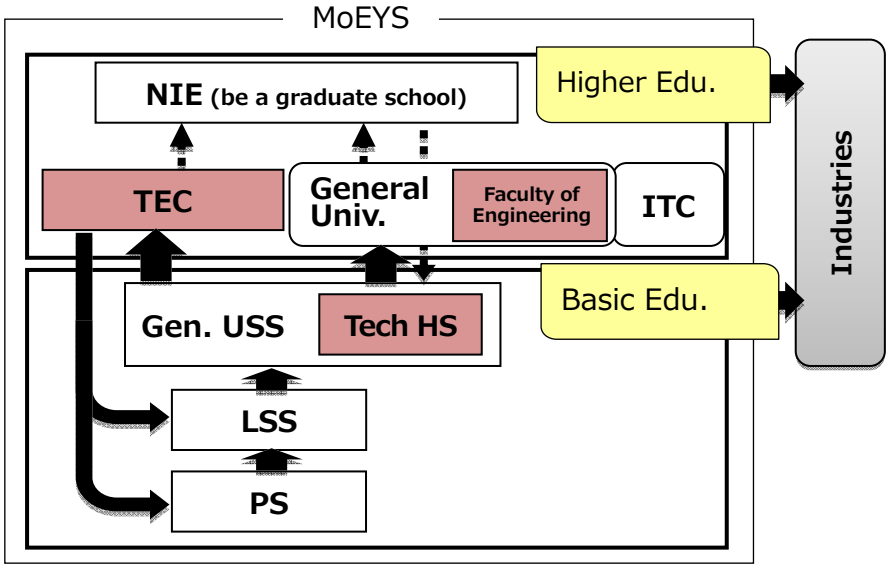
With the current basic education reform, MoEYS has made the implementation of TPAP a priority, particularly, making the diploma degree a requirement for obtaining a teachers' license. Currently teachers' licenses are provided to the graduates of an "upper secondary education plus 2 years training" (12+2). MoEYS has tried to increase the necessary education duration up to 12+4 inclusive of a diploma degree by 2020, in order to improve a teachers' capacity and teaching skills. During the preparation stage of TPAP implementation, development of TEPS and TCP are to be completed by the first half of 2015. One of the specific plans for making teachers' licenses as diploma level was the TEC establishment which MoEYS had requested to JICA for future assistance. In this regard, Chapter 9 and 10 proposed the possible assistance plans for JICA technical cooperation projects and grant assistance for TEC establishment in the near future. In the process, the Study Team discovered that MoEYS has lacked the fundamental administrative data, such as ages and majored subjects of current teachers in public education institutes at all levels. The lack of such basic data would affect MoEYS badly unable to analyze the necessary number of teachers required in the future and to finalize the volume of TEC accordingly. Therefore, JICA's assistance would be better to start from the assistance on this area by collecting basic data of current teachers. It is also necessary for MoEYS to set up the assistance structure not only with JICA but also with other DPs contributed to the basic education subsector as the necessary technical cooperation could be varied.

It is also inevitable that Cambodia improve the quality of engineering education in higher education sub-sector and scale up its quantity, for Cambodian industrial development, considering the recent trends of Cambodian manufacturers whose demands will be more diverse and sophisticated. IDP 2015-2025 aims at introducing industrial clusters in provinces where major higher education issues exist in enhancing provincial universities who should provide human resources and research. However, ITC is the only university who could provide engineering education and the Department of Engineering, RUPP, has produced no graduates so far after its opening two years ago. The provincial universities have neither provided engineering education even on typical course subjects such as electricity and machinery. Therefore, the Study Team proposed firstly to support strengthening LBE which upper grades of ITC currently provides and PBL which the Department of Engineering RUPP provide, and to support provincial universities to utilise the model developed by the two institutes. If this first step assistance would succeed, then JICA could assist teacher development of provincial

universities and improvement of facilities and equipment through loan assistance which will contribute to the aforementioned IDP 2015-2025 goals.

Finally, the development of technical education at the secondary level is emphasised in the IDP 2015-2025, whereas MoEYS' Master Plan for Technical Education at Upper Secondary Level addresses to increase from the existing 3 GTHS to 1 GTHS per Province. Following these policies, 3 GTHS and 2 GTHS are planned to be established in 2016 and in 2017, respectively. If it's realised, by the end of 2017, there will be total 8 GTHS to be established. H.E. Minister of Education has requested JICA to assist in the establishment of GTHS in the 4 SEZ regions, namely Phnom Penh Capital Municipality, Bavet in Svay Rieng Province, Poi Pet in Banteay Meanchay Province, and Sihanouk Ville Province. Among them, except Sihanouk Ville and Poi Pet, Phnom Penh and Bavet as well as another in Siem Reap Province are included in the above referenced government plan, therefore to be established by the end of 2017. In the meantime, the MLVT has been also expanding the TVET in the secondary level. Therefore, in order to avoid any duplication of efforts and clarify the differentiation, the Study Team has proposed the establishment of Satellite GHS, which focuses on the human resource development serving for SEZs, which can not only respond to the Minister's request but also un-overlap with MLVT's TVET services and take advantage of the upper secondary school system of the MoEYS. Nevertheless, it must be well noted that this suggestion requires governmental cooperation for acquiring necessary land in SEZ and awarding appropriate benefits or advantages to collabourating private firms.

The Cambodian education sector is entering into the challenge of establishing the ASEAN standard higher education institute for teacher education. Previously, since the basic education teacher qualification has been 12+2-year education, Teacher Training Centres have been separated from higher education. Now, basic education teachers are required to have a B.A. degree, and the teachers of TEC are required to have a M.A. degree just like the teachers of upper secondary schools, as determined in the TPAP. Accordingly, those who have graduated from TEC can advance to NIE, and then can be a teacher of an upper secondary school including GTHS. It indicates, as imaged in Figure 11-1, the role of higher education institutions will bring far larger impacts over basic education.



Source: Prepared by the Study Team

Figure 11-1: Future Human Resource Supply System for Industrial Development

The core members of the Education Research Council (ERC), which is an advisory committee of the Education Minister, have obtained a Ph.D degree in Japan. They are liberal in regards to human resources and are the driving force for realising the reforms proposed and led by the Minister. If these required forms of human resources increase to the necessary level, the country may change dramatically. Particularly in the domain of education, where groups of a variety of experts and specialists, in such fields as math and science, language and literature, educational philosophy, education history, educational psychology, and so on, are desperately needed in Cambodia. And needless to say, it requires decades for developing those kinds of human resources in higher education, stepping up from basic education, and thus in order to accelerate the educational reforms, it would be effective for all of the levels to let a certain number of M.A. and Ph.D candidates study abroad and enhance the HR capacity of the country. In case that Japan delivers a Yen Loan Cooperation programmeme in higher education in Cambodia, not only the assistance in the facility construction and equipment procurement, but, also, assistance in the area of HR development should be a priority.

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APPENDIX 1:

FACILITY PLAN AND ESTIMATE

APPENDIX 2:

LIST OF PROPOSED EQUIPMENT