VOCATIONAL EDUCATION AND TRAINING PLAN FOR ELECTRICAL AND ELECTRONICS INDUSTRY SECTOR

TERTIARY AND VOCATIONAL EDUCATION COMMISSION

State Ministry of Skills Development, Vocational Education, Research and Innovation

In collaboration with Sri Lanka Export Development Board (SLEDB) and Sri Lanka Electronic Manufacturers and Exporters Association (SLEMEA)

Vocational Education and Training Plan

For Electrical and Electronics Industry Sector

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Tertiary and Vocational Education Commission

Of

State Ministry of Skill Development, Vocational Training

And Research & Innovation

In Collaboration with

Sri Lanka Export Development Board

And

Sri Lanka Electronic Manufacturers and Exporters Association

Tertiary and Vocational Education Commission

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Preface

Responsiveness to labour market is the most essential feature in the TVET provision. TVEC in its role as a regulator, facilitator and standard setter needs most current and updated information for the purpose to provide strategic direction to TVET in the country such that the industry sectors continue to get competent work force in adequate numbers for growth and sustainability. In fulfilling its role, TVEC develops planning documents which detail the strategies, priority areas and specific initiatives for training of persons to meet the needs of industry. This updated VET plan is such a document. Based on this, TVET providers are expected to organize their training delivery.

This revised and updated VET Plan identified and analysed the skills gaps between demand for and supply of skills of the major occupations and emerging occupations with current technological trends. Thus, VET plan specifies quantitatively and qualitatively of any current shortages and with estimates or forecasts of human resources requirements for technical, craft and operational occupations at entry level for the next five years.

The Electrical and Electronics industry sector is very diverse industry and its product and services are used in all other industries. Therefore, electrical professionals and crafts persons are working in all industries. However, the industry especially the Electrical and Electronics component manufacturing has now grown into key industrial manufacturing sector serving both local and export markets contributing towards the country's economic growth. In this VET plan, greater focus has been placed on Electrical and Electronics Component Manufacturing sub-sector for Export Market and included as a separate Chapter (09), because of its increasing and decisive role as a merchandise export revenue earner for the country.

TVEC acknowledges with thanks the assistance extended by Sri Lanka Export Development Board to revise and update the VET plan for the Electrical and Electronics Sector. The revised VET Plan was jointly funded by TVEC and Sri Lanka Export Development Board. Sri Lanka Electronic Manufacturers and Exporters Association (SLEMEA) has also supported greatly in preparing this report.

TVEC extends heartiest thanks to industry representatives who participated in the survey, discussions and validation of this report. TVEC also appreciates the roles played by TVEC staff, SLEDB staff, Mr.Vajira Perera Former Director (Planning and Research)-(retired) of TVEC and Dr.K.A.C.Udayakumara Senior Lecturer, Open University who moderated the validation of the report. The study for preparing this VET plan was entrusted to a team of consultants lead by Mr.B.H.S. Suraweera and Mr. Gaminie Gunasinghe, who are highly regarded and experienced TVET experts in the country. TVEC acknowledges their expertise and the capacity by delivering a comprehensive report.

Janaka Jayalath

Director General (Acting)

Tertiary and Vocational Education Commission

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Abbreviations

A/C	Air Conditioning
AC /DC	Alternate Current / Direct Current
ADB	Asian Development Bank
AI	Artificial Intelligence
APAC	Asia Pacific region
ASI	Annual Survey of Industries
BBL	Barrel
BMS	Building Management System
BOI	Board of Investment
CAD	Computer Aided Design
CAGR	Compound Annual Growth Rate
CAM	Computer Aided Manufacturing
CBSL	Central Bank of Sri Lanka
CBT	Competency Based Training
CDM	Clean Development Mechanism
CEA	Central Environmental Authority
CEB	Ceylon Electricity Board
CER	Certified Emission Reduction
CFL	Compact Fluorescent Light
CNC	Computer Numerical Control.
CGTTI	Ceylon German Technical Training Institute, Moratuwa
COT	College of Technology
DCSSL	Department of Census and Statistics, Sri Lanka
DSM	Demand Side Management
DTET	Department of Technical Education and Training
EBT	Enterprise Based Training
EE	Electrical and Electronics
EEC	Electrical and Electronics components
ELV	Extra Low Voltage
EMS	Electronic Manufacturing Services
EPC	Engineering, Procurement, and Construction
ESCO	Energy Services Company
FDI	Foreign Direct Investment
FGD	Focus Group Discussion
GCE(A/L)	General Certificate of Examination (Advanced Level)
GCE(O/L)	General Certificate of Examination (Ordinary Level)
GDP	Gross Domestic Product
Gg	Giga Grams
HDR	High Dynamic Range
GHG	Green House Gases
IOT	Internet of Things
IPC and CIS	Institute of Printed Circuit and Certified IPC Specialist
IPP	Independent Power Providers
IPZ	Investment Promotion Zones

Abbreviations

IS-D	Information System Division
ISIC	International Standard Industrial Classification
KII	Key Informant Interview
KP	Kiyoto Protocol (KP)
kWh	Kilo Watt Hour
LECO	Lanka Electrical Company
LED	Light Emitting Diode
LKR	Lanka Rupees
LNG	Liquefied Natural Gas
LTGEP	Long Term Generation Expansion Plan
LV	Low Voltage
MCB	Miniature circuit breaker
MCCB	Molded Case Circuit breaker
MIG	Metal Inert Gas
MW	Mega Watts
NCRE	Non-Conventional Renewable Energy
NCS	National Competency Standard
NDC	Nationally Determined Contributions
NDES	National Diploma in Engineering Sciences
NAITA	National Apprentice and Industrial Training Authority
NITAC	National Industrial Training Advisory Committee
NYSC	National Youth Services Council
NVQ	National Vocational Qualification
OEM	Original Equipment Manufacturer
OJT	On the Job Training
OLED	Organic Light Emitting Diode
ORE	Other Renewable Energy
PCB	Printed Circuit Board
PPP	Private Power Providers –Chapter 2
PPP	Purchasing Power Parity – Chapter 9
PUCSL	Public Utility Commission of Sri Lanka
PV	Photo Voltaic
R & D	Research & Development
RCD	Residual Current Device
REMP	Renewable Energy Master Plan
ROHS	Restriction of Hazardous Substances
RPL	Recognition of Prior Learning
SLBFE	Sri Lanka Bureau of Foreign Employment
SLEDB	Sri Lanka Export Development Board
SLGTTI	Sri Lanka German Technical Training Institute, Kilinochchi
SLIOP	Sri Lanka Institute of Printing
SLSEA	Sri Lanka Sustainable Energy Authority
SLSIC	Sri Lanka Standard Industrial Classification
SLEMEA	Sri Lanka Electronic Manufacturers and Exporters Association

Abbreviations

SPP	Small Power Providers
SPSS	Statistical Package for the Social Sciences
TCF	Trillion Cubic Feet
TVE	Tertiary and Vocational Education
TVEC	Tertiary and Vocational Education Commission
TVET	Technical and Vocational Education and Training
UC	University College
UNFCCC	United Nations Framework Convention on Climate Change
UOVT	University of Vocational Technology
USD	United States Dollar
USJP	University of Sri Jayawardanapura
VTA	Vocational Training Authority
VET	Vocational Education and Training
WEEE	Waste Electrical and Electronics Equipment

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Executive Summary

Tertiary and Vocation al Education Commission (TVEC) has been developing Vocational Education and Training (VET) plans for key industry sectors of the economy of Sri Lanka since 1999. TVEC has developed a VET Plan for Electrical and Electronics Sector in 2012. With the invitation and assistance of Sri Lanka Export Development Board (SLEDB), the TVEC has updated the VET plan for the Electrical and Electronics Sector to address the skilled and semi-skilled employment gaps in the Electrical and Electronics manufacturing and export industry and to overcome it as stipulated in the National Export Strategy (NES). The revised VET Plan was jointly funded by TVEC and Sri Lanka Export Development Board (SLEDB). Sri Lanka Electronic Manufacturers and Exporters Association (SLEMEA) has also supported greatly in preparing this report.

The Sri Lankan Electrical and Electronics industry mainly caters for Automobiles, Telecommunication, Consumer Electronics, Power Generation, Transmission and Distribution, Industrial Automation and Medical Sector. Most of the companies are Original Equipment Manufacturers (OEMs) and Electronics Manufacturing Service (EMS) producers. At present the country has become a center of excellence for electronics design and development and moving towards the emerging technologies such as IoT, Robotics, Bio-medical, Analytics and to world known Research and Developments.

In the process of development of this VET Plan, in order to analyse demand for skills quantitatively and qualitatively, following analyses have been carried out.

i. Survey of a sample of 300 enterprises to identify demand for skills in occupations practiced in the industry.
ii. Key informant Interviews with 27 leading industrialists.
iii. Focused Group Discussions with nine industry sub-sector groups.
iv. Analyses of demands for Foreign Employment

In order to identify, skills supply side issues, following analyses were carried out.

i. Analyses of training performance of TVET institutions including NVQ Assessments.
ii. Tracer study to evaluate employability and to identify skills issues of passed outs trainees.

In addition, in order to identify issues on Economic environment of Electrical and Electronics Industry, Literature review was done and accordingly many useful information was found. In the analyses of industry survey, having worked out the distribution of enterprises by district and ownership, Table 3.4 lists the number of employees in respective occupations identified in the sample and these were projected to the population with 95 per cent confidence levels. Further, numbers of electricians in non- Electrical and Electronics Industry enterprises were worked out taking establishments listed in the Economic Census and Annual Survey of Industries. In addition to the numbers, survey has identified the positive and negative

attributes of TVET Passed outs. Findings of Key Informant Interviews with 27 industry representatives are summarized in the Chapter 4 and with many novel ideas, these industry experts added an innovative flavor to the VET Plan.

Focused Group Discussions were a brain storming exercise to give direction for skills development for Electrical and Electronics Industry Sector by TVET Institutions and they enlightened many skills issues. Analysis of demand for foreign employment shows that there are no takers for many vacancies and Pareto analyses identified the occupations that need special focus to increase departures. Tracer study was completed with 93 responses with 90 per cent statistical accuracy and the survey findings found that the Electrical and Electronics course completers have overall employability of 72.4 per cent with 55.3 per cent in wage employment and 17.1 per cent in self-employment.

Analyses of training supply have listed training delivery in 2019 with courses, institutions and district wise segregations and it summarized training by occupation in the Table 7.5. Chapter 9 analyses Electrical and Electronics Component Manufacturing for export including actions to be included in the training plan to address skills issues of the industry. The Table 10.1 which gives the comparison of demand for skills and supply of skills also shows that training supply is bit higher than the demand in and these could be matched within the confidence interval. Chapter 11 gives the training plans to address all skill issues and Chapter 12 proposes a mechanism for coordination and monitoring of the implementation and also gives the improvements done in the Revision and Updating of the VET plan.

Chapter 01: Introduction for Development of Vocational Education and Training Plan for Electrical and Electronics Industry Sector

1.1 Introduction

This chapter explains how the Vocational Education and Training (VET)Plan for the Electrical and Electronics Industry sector was developed, starting with its reference to the mandate of the Tertiary and Vocational Education Commission (TVEC) on development of VET Plans, the rationale for the development of the VET Plan and scope of the VET Plan. It also refers to the limitations of the study and explains how the report is structured with different Chapters with their titles.

1.2 TVEC Mandate for VET Plan

The three main objects of the Tertiary and Vocational Education Commission (TVEC), established by the Tertiary and Vocational Education (TVE) Act No 20 of 1990 are given below:

a. Policy development, planning, coordination and development of the tertiary education and vocational education at all levels in keeping with the human resource needs of the country.
b. Development of a nationally recognized system for granting of tertiary and vocational education awards including certificates and other academic distinctions and
c. Maintenance of academic and training standards in institutes, agencies and all other establishments providing tertiary and vocational education.

Further, Section 11 (1) of the (TVE) Act No. 20 of 1990 as given in the box below requires the TVEC to prepare plans for development of the Technical and Vocational Education and Training (TVET) Sector.

> Clause I of the Section 11 of the TVE Act No 20 of 1990
>
> The Commission shall, from time to time in according with the guidelines including criteria for eligibility or entry requirements issued by the Minister prepare a plan or plans as the case may be, for the development of tertiary education and vocational education in Sri Lanka. The Minister shall with his report thereon submit such plan or plans to the President for approval.

To ensure that the aforementioned requirement is fulfilled, the TVEC has been engaged in development of Vocational Education and Training (VET) plans for key industry sectors of the economy of Sri Lanka since 1999. Further, TVEC has started development of VET Plans for Provinces on the request of the Chief Minister of respective provinces since 2009.

VET plan outlines the strategies to bridge the gap between demand for and supply of skilled manpower. All its stakeholders i.e., industry sectors, TVET providers and the youth aspiring to undergo training benefit from such planning. VET plan will also recommend the mechanisms for effective coordination of relevant stakeholders during VET plan implementation. TVET institutions will thus, be able to utilize their resources to conduct demand driven programmes with a higher degree of rationalization.

1.3 Rationale of the study

The Electrical Industry in Sri Lanka is presently involved in power generation, transmission and distribution, manufacturing and servicing of electrical components, products and equipment and providing electrical services to other industry sectors including construction.

Electronics industry is one of the fastest evolving and most innovative industries, and also one of the most competitive. The electronics industry in the country constitutes of enterprises involved in the design and development, manufacture, assembly, and servicing of electronics components, products and equipment and providing services to other industry sectors as well. Although Electrical and Electronics industries initially existed as two distinctly different fields presently electrical and electronics industry sectors are converging to a single sector.

The Electrical and Electronics Industry in Sri Lanka has grown into key industrial manufacturing sector serving both local and export markets contributing towards the country's economic growth.

The industry contributed USD 381.17 Million to the Sri Lanka exports in 2019 and absorbs over 35,000 skilled workers in its multi-faceted activities. The workforce is drawn from a pool of skilled young men and women with basic academic and technical knowledge. There are over 85+ companies engaged in design, manufacture and export.

Electrical and Electronics Industry is striving to provide quality products and services to the customers in both local and foreign markets. The quality, productivity and expansion/ growth of electricity supply, electrical and electronics manufacturing and services in the Electrical and Electronics industry will all depend on the availability of trained, skilled and adaptive workforce in this industry. Therefore, training of craftsmen, technicians, supervisors, and other personnel in occupations and occupational areas in Electrical and Electronics industry has been a priority area and that is why it needs an updated VET Plan all the time.

1.4 Scope of the Study

The specific focus of the study was to capture information to identify the industry profile, human resource profile and training profile of the Electrical and Electronics industry in the country. Due consideration was given to understand the present and future socio, economic and environmental scenarios and interpret them in terms of human capital formation in the Electrical and Electronics industry.

a. Industry Profile of Electrical and Electronics enterprises provides a snapshot of Electrical and Electronics industry that includes Socio-economic scenario and current development trends and areas of growth. The industry profile will show the followings.

   i. Composition of industries by Scales

   ii. Geographical Distribution of industries – by district and province,

   iii. Technological level and changes envisaged in five years

   iv. Related government policy and other factors impacting on the sector

   v. Future trend analysis

b. Human Resource Profile

   Employment scenario with a mapping of occupations of the sector

   i. Current employment by occupation, age, sex, district, province

   ii. Demand for training and manpower requirements

c. Training profile

   i. Current supply of training

   ii. Gap analysis between demand for and supply of skills and a training plan with estimates/forecasts of human resource and skills requirements for next five years by occupation.

Therefore, this revised and updated VET Plan for Sri Lanka's Electrical & Electronics Industry will identify and analyse the skills gaps between demand for and supply of skills in the Electrical and Electronics Industry with any current shortages and with estimates or forecasts of human resources requirements for technical, craft and operational occupations at entry level for the next five years, in terms of both quantity and quality wise.

1.5 Methodology

1.5.1 Secondary Data Sources

a. Use of Secondary Data

A literature review done will assist to determine the Socio-economic environment with the Electrical and Electronics sector contribution to the economy of the country and the current development trends of the sector.

The literature review included:

National Policy framework 'Vistas of Prosperity and Splendor', government policy paper and the related initiatives to understand the Economic and Human capital Development trends based on the relevant subsectors of key policy areas, and accompanying strategies and activities envisaged.

Latest published reports of Department of Census and Statistics, Sri Lanka (DCSSL) on Economic Census, Annual Surveys of Industry (ASI), and quarterly and annual Labour Force Surveys.

Also, Annual reports of the Central Bank of Sri Lanka, Ceylon Electricity Board (CEB), Lanka Electricity Company (Pvt) Limited and relevant TVEC publications etc. and other available reports relevant to Electrical and Electronics industry.

Manpower demand in foreign labour market and supply from Sri Lanka was also studied based on secondary data from Sri Lanka Bureau of Foreign Employment made available by Information System Division of TVEC. This data was listed in terms of job orders and departure figures for various occupations in the Electrical and Electronics sector at different manpower levels.

1.5.2 Use of Primary Data

Main objectives of the collection of primary data were to determine

i. Industry profile
ii. Human resource profile and
iii. Training profile

Industry Survey, Key Informant Interviews, Focus Group Discussions and Tracer study of TVET pass-outs were the methods used for collecting Primary Data required for the analyses.

The information captured enabled to study the current employment scenario with a mapping of occupations of the sector by occupation, age, sex, district and province to determine/forecast the demand for training and manpower requirements for next five years.

a. Industry Survey Methodology and Sample Frame

Skills demand in Electrical and Electronics sector in the local labor market was studied based on Primary data collection done by survey research method.

As any Survey study needs a data base to decide on the sampling frame. This database of enterprises in both formal and informal sector was made available, with the courtesy DCSSL officials. This was the basis of the sample design and sample frame.

Also list of names of establishments in the sector available in the database of the National Apprentice and Industrial Training Authority too obtained for this survey.

The survey was carried out with the sample of 300 enterprises selected district wise based on the stratified random sampling technique. However, as scale of enterprises was not known before the survey, a set of large-scale enterprises was included in to the sample as well.

Questionnaire for data collections was prepared collectively and field tested with the Key Informant interviews. Data collection became challengeable due to COVID-19 situations and, it became difficult to fill the questionnaires by enumerators. Most enterprises have taken the questionnaires to be filled by themselves and enumerators collected them on a later date. Though they have filled the questionnaires to give strong heart- felt messages, some missing fields were also found.

Collected data was entered in a database and SPSS and Excel packages were used for data tabulation.

b. Key Informant Interviews (KIIs)

Interviews were held with key individuals selected from 28 leading companies in Electrical and Electronics sector in the country. The purpose was to gather qualitative and quantitative information on workforce and also economic and technology trends in the industry. There was a key informant each from Public Utility Commission, Sri Lanka and Sri Lanka Sustainable Energy Authority two regulatory and policy making bodies in energy sector.

c. Focus Group Discussions (FGDs)

Focus group discussions were used as a qualitative approach to gain an in-depth understanding of sector specific skills issues. The method aimed to obtain opinions and ideas from a purposely selected group of relevant individuals from different types of enterprises in the Electrical and Electronics sector. Therefore, the purpose was to assess the skills gaps and how to bridge such gaps in present and future workforce and the envisaged growth potential of the sector and technology changes and innovations in next few years.

In the process of development of this VET Plan, nine Focused Groups Discussions were held with following specials groups.

i. Electrical Installation in High-rise Building
ii. Solar Panel Service Companies
iii. House wiring Electricians
iv. Customer Electronics Repair Technicians
v. Electric Panel Making Companies
vi. Electric Parts sales Shops
vii. Electrical and Electronics Equipment Service Companies
viii. Electrical and Electronics Industries, FTZ, Katunayake
ix. Electrical and Electronics Trainers / Instructors

All issues and gaps identified through KIIs and FGDs was presented at the FGD with the trainers/instructors and reasons and remedial actions were explored which were used to prepare the training plan.

d. **Tracer Study**

The purpose of the tracer study was to determine the employability of the NVQ certified trainees passing out from the vocational training institutes in the country in Electrical and Electronics related occupations and obtain their feedback on the institutional training they have undergone and suggestions for any course improvements.

Though Terms of Reference of the study expected to trace 200 NVQ course completers, it was decided to have a sample size of 300 for this study as it was planned to be postal survey. To make the sampling more representative, based on the total number of NVQ certificates issued in occupations in Electrical and Electronics sector by district, by various training providers and by occupations (thus inclusive of both clustering and stratification of samples), proportionate numbers to be traced in each cluster were determined. The names and the addresses of the persons to be contacted for the survey were randomly picked from TVEC certificate data base.

However, only 93 persons have responded to the postal survey, a rate of response is a little more than 46 per cent, this figure could be considered fairly appropriate to serve the purpose of the study.

e. Data on Supply Side of Skills

TVEC annually collects training data from individual training centres in all public, private and NGO sectors. As TVEC usually verifies and filters those data from training providers, it was considered that TVEC databases were more accurate primary data than data collected by enumerators/ consultants themselves.

Therefore, data on annual enrolment in pre-employment training courses conducted by TVET institutions, apprenticeship, and enterprise-based training, course completion and details of NVQ certifications by occupations in the Electrical, Electronics inclusive of Mechatronics industry related occupations and occupational areas and TVET institutions were collected

from TVEC databases. This information is basically primary data received from TVEC databases.

In addition, information/data on the available National Competency Standards (NCS) and the availability of Assessors in relevant occupations in the sector were also collected.

Further, relevant data was taken from secondary data sources such as the Labour Market Bulletin and TVET Guide publication of TVEC.

1.6 Skills Gaps and Training Plan

The training plan presented here reports the skills needs/ skills gap that was calculated based on the difference in demand and supply of skills in the sector, both to fill current vacancies, and to meet the needs of a growing industry. This plan was validated with the participation of Industry personnel and training providers.

VET Plan offers proposals to meet these needs through training, apprenticeships, and also by promoting the industry as one that offers secure, rewarding employment opportunities.

1.7 Limitations to the Scope of the Study

The Electrical and Electronics industry sector is very diverse industry and its product and services are used in all other industries. Therefore, electrical and electronics professionals and crafts persons are working in all industries.

It was not practicable to cover all industry sectors in the Industry enterprise survey and therefore, it was limited to Electrical and Electronics industry and number of electricians working in other industry sectors were estimated based on number and size/scale of enterprises in other industry sectors.

Data collection became a challenge due to COVID-19 situations as stated earlier and, it became difficult to fill the questionnaires by enumerators. It was difficult to organise and getting participation of industry representatives in FGDs too.

Planned visits to enterprises involved in Katunayaake and Biyagama Investment promotion Zones for KIIs with CEOs/HR managers too was hampered due to travel and meeting restrictions imposed due to COVID-19.

Further, it was not possible to capture skills gaps in all occupations in the sector as enterprises outsource some activities fully or partially, like motor winding and erection and maintenance of electrical power lines. Those requirements were assessed based on views expressed by relevant professionals.

1.8 Structure of the Report

Chapter 01 includes a brief description of the rationale of this study with an Introduction on Development of VET Plan for Electrical and Electronics Industry Sector. It also indicates the methodology of this study and its scope. Chapter 02 is a compilation of secondary data on Socio-Economic Characteristics done mainly by Literature Review. Chapter 03 describes the Demand for Skills in Electrical and Electronics industry sector, based on the findings from Industry enterprise survey, it also estimates the manpower requirements for the next five year as well. Chapter 04 is on training needs identified through Key Informant Interviews. Chapter 05 reports findings emerged from Focused Group Discussions. Chapter 06 covers Demand for Electrical and Electronics Industry related Skilled Persons for Foreign Employment. Chapter 07 deals with the Skills Supply Side Analysis in the Electrical and Electronics occupations.

Chapter 08 of the report is on the detailed description of the findings of the Tracer Study and Chapter 09 separately analyses skills needs in the Electrical and Electronics Component Manufacturing Sector for Export Market**,** because of its increasing and decisive role in the economy. Chapter 10 covers the Skill Gaps forecast and training needs Identified followed with the Chapter 11 which basically presents the Training Plan to bridge the skill gaps and training needs in the Electrical and Electronics Industry Sector and recommendations for the training. Chapter 12 outlines the suggested mechanism for coordinating and monitoring of the implementation of the VET plan and concludes with a section indicating the new areas covered and improvements made in this revised and updated VET Plan (2020) in comparison to the VET plan published in 2012.

1.9 Conclusion

This is just an introduction on how VET plan was developed and what activities and contents are included in the VET Plan. Details study of those activities and materials included are presented in subsequent chapters.

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Chapter 02: Economic Environment of Electrical and Electronics Industry

2.1 Introduction

This chapter is compiled with the information and data collected by literature review done to determine the socio-economic environment of the electrical and electronics industry sector. Based on this study, the profile of the industry was identified and illustrated in a flow diagram. Electricity supply with power generation, transmission and distribution, Electrical and Electronics Manufacturing and Services are the sub sectors of the industry. The contribution by economic divisions under each sub sector to the economy is also included in this chapter. Technological level and changes envisaged in next five years, environmental impacts and also the roles of a few of associated institutions are described. Any stated or implied long-term vision and objectives for the industry identified in this study are given in the last section in the Chapter.

2.2 Industry Profile

Electrical engineering happens to be one of the oldest and core branches of engineering. It is an engineering profession concerned with the study, design and application of equipment, devices and systems which use electricity, electronics, and electromagnetism.

The electrical and electronics both are interrelated with each other. The **electricity** is the **flow of electrons,** and the **electronics** is the technique of **controlling** the flow of **electrons** for doing the particular work. However, the difference between Electrical and Electronics circuits is that electrical circuits have no decision making (processing) capability, whilst electronics circuits do. An electric circuit simply powers machines with electricity and that the **electrical devices convert** the **electrical energy** into the **other form of energy** like work, heat, light, sound, etc. whereas the **electronics device controls** the **flow of electrons** for performing the particular task.

The Electrical Industry in Sri Lanka is presently involved in power generation, transmission and distribution, manufacturing of electrical components/products and equipment for local consumer market and export and providing electrical services to consumers in general and to other industry sectors including construction.

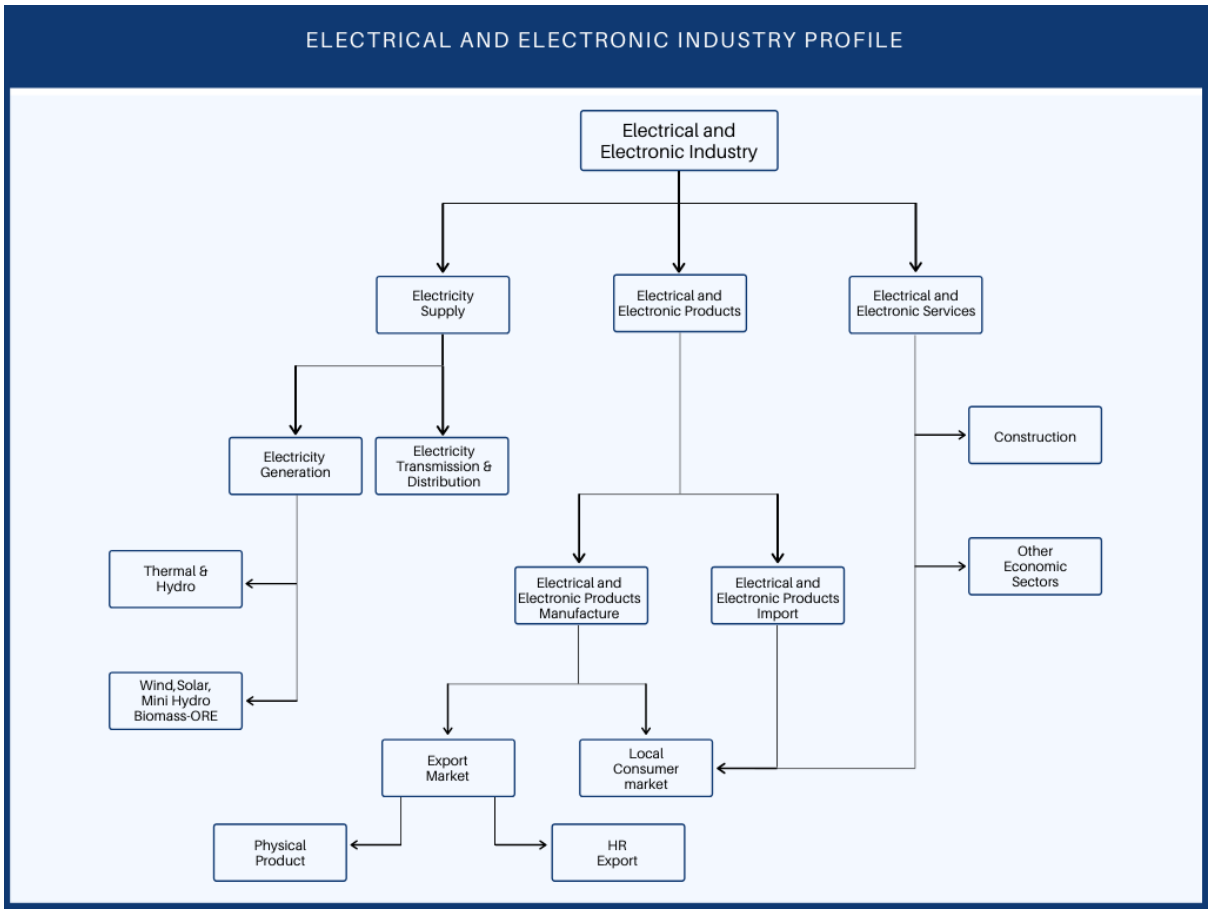
The Electronics Industry emerged in the 20th century and is today one of the largest global industries. The electronics industry in the country is composed of organizations involved in the design, development and manufacture of components or products for local market and export and servicing of electronics equipment and components for the consumers and to other economic sectors.

Although Electrical and Electronics industries initially existed as two distinctly different fields just like Electrical and Electronics engineering disciplines in the academic fields, now these two disciplines are converging as Electrical and Electronics Engineering

qualification. Here in this study too, it is intended to consider Electrical and Electronics industry sectors as a single sector to avoid repetitions in our analyses.

Electrical and Electronics Industry profile as depicted in the Figure 2.1 identifies the sub-sectors of the industry.

Figure. 2.1 Electrical and Electronics Industry profile in the Country



2.3 Electricity Supply

Sri Lanka's power sector has made some progress in several areas in the last ten years. Some of its achievements include near 100 per cent electrification, low transmission & distribution losses and meeting increased electricity demand with new power generation. The country has also been able to stimulate the growth of Other Renewable Energy (ORE) including rooftop solar projects with financing from domestic banks and investors.

The per capita electricity demand has progressively increased from141 kWh in 1990 through 602 kWh in 2016 to 670 kWh in 2019 reflecting both rising incomes and greater access to the national grid. The country's national electrification ratio was at 99.3 per cent

in 2016, 99.7 per cent by October 2017, and by the end of 2017 had reached 100 per cent electricity accessibility. *(ADB, 2019, Sri Lanka Energy Sector Assessment, Strategy, and Road Map)*

2.3.1 Generation

Electricity generation in Sri Lanka was almost 100 per cent from hydropower until mid-1995. However, with the rapid growth in electricity demand during the last 20 years and the limited potential to develop new large hydropower facilities, the power generation mix in the country has shifted to a mixed hydrothermal system. Initially, the state-owned Ceylon Electricity Board (CEB) was the only entity allowed to engage in power generation, transmission, and distribution activities. After 1996, Sri Lanka allowed the private sector to participate in its Small Power Providers (SPP) program to develop renewable energy-based power plants to sell electricity to CEB. Also, the private sector could invest in large generation projects as Independent Power Providers (IPP). *(ADB, 2019, Sri Lanka Energy Sector Assessment, Strategy, and Road Map)*

Table 2.1: Number of Power Stations (CEB and Private Power Providers PPP) and Installed Capacity at the end of Year 2019

Ownership & Type of Power Generation	Number of Power Stations	Installed Capacity (MW)	Generation (GWh)	% of Total Generation
C.E.B-Total	**28**	**2,953**	**11,286.5**	**70.9**
Hydro	17	1,399	3,784	23.8
Thermal (oil)	10	654	2,137	13.4
Thermal (Coal)	01	900	5,361	33.7
ORE (Wind)*	01	103	-	0.0
Small islands	N/A		4.5	
IPP/Private Power Providers-Total	**254**	**1,264**	**4,636**	**29.1**
ORE (mini hydro)	206	410	1,011	6.3
Thermal (Oil)	06	628	2,875	18.1
ORE (Wind)	15	128	348	2.2

Ownership & Type of Power Generation	Number of Power Stations	Installed Capacity (MW)	Generation (GWh)	% of Total Generation
ORE (Solar, Dendro/Biomass)	27	97	220	1.4
Roof Top Solar			182	1.1
Total	**282**	**4,217**	**15,922.5**	**100**

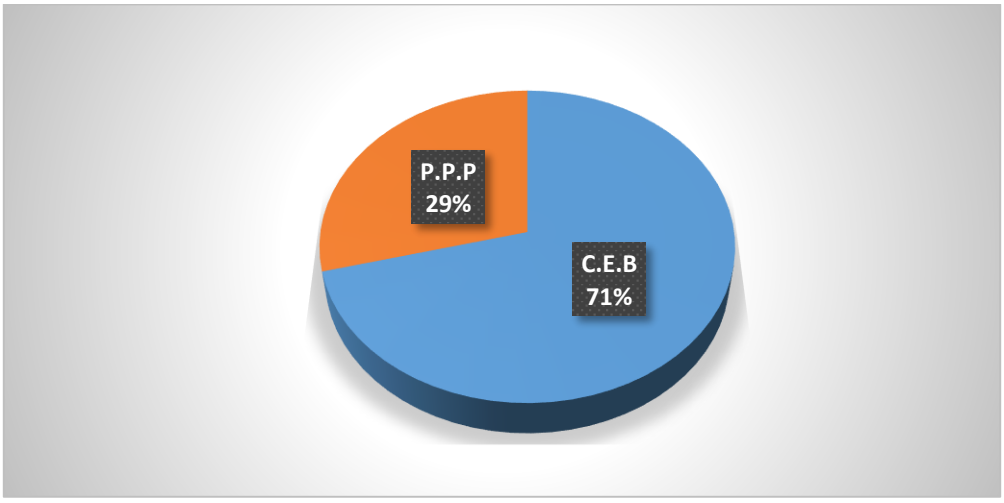
Source: CEB Statistical Digest 2019

Table 2.1 shows the capacity mix in generation by technology and also the diversity of fuel mix in electricity generation.

By the end of 2019, the total installed capacity was 4,217 MW including non-dispatchable power plants (small hydro and wind,) of capacity 538 MW owned by the private sector and 97 MW of (Solar, Dendro/Biomass). Out of the total installed capacity of 4,217 MW, 42.9 per cent (1,809 MW) was from hydro (both large hydro and small hydro); 51.7 per cent (2,182MW) from thermal; and 5.3 per cent (225 MW) from other renewable sources such as wind, solar, and biomass.

Figure 2.2 shows that by the end of 2019, 70.0 per cent of the total installed capacity in the country is owned by CEB, while Independent Power Providers and Small Power Providers own the rest.

Figure 2.2: Generation of Electricity by Ownership-2019

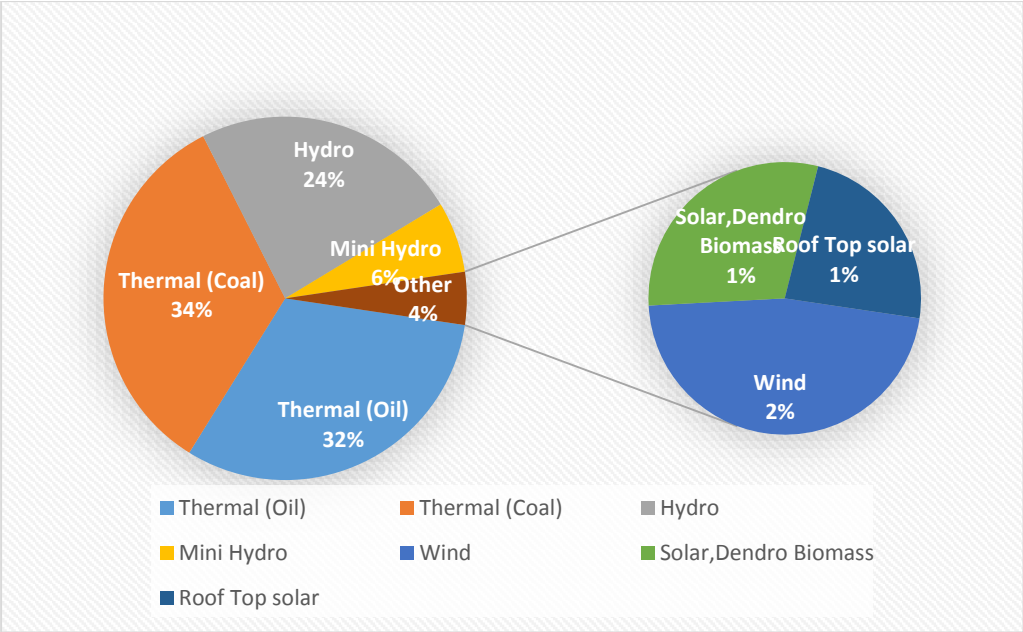


Source: CEB Statistical Digest 2019

2.3.2 Generation of Electricity from Renewable Sources

By the end of 2019, 11.0 per cent of the generation was from Other Renewable Energy (ORE) and this included small hydro, biomass, wind, and solar. Contribution of each renewable source to generation is shown in Figure 2.3 below. By entering into small power purchase agreements (less than ten MW), the private sector contributes to renewable energy development in the country. Sri Lanka has developed almost all the small hydropower resource sites through this initiative and by the end of 2019, the total installed capacity of small hydropower plants was 410 MW.

Figure 2.3: Generation by Source in year 2019



Source: CEB Statistical Digest 2019

2.3.3 Electricity Generation and Sale

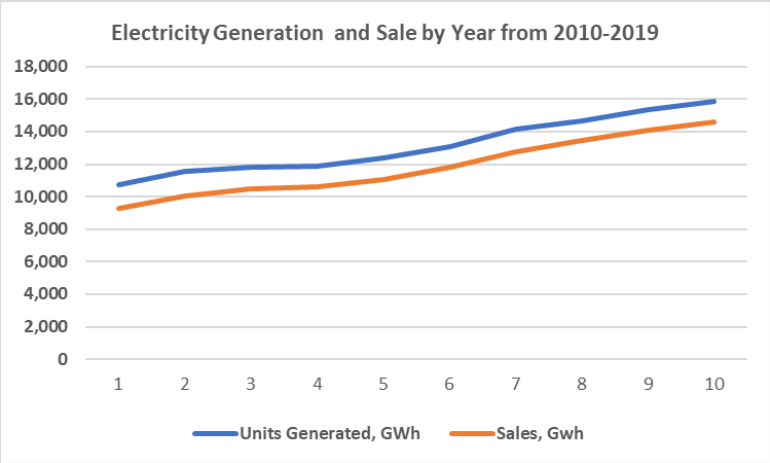
The Electricity Market in Sri Lanka is dominated by the household and industrial sectors, while demand in the commercial sector has been increasing rapidly over the years. In 2019, the highest energy consumption was by the consumers in the category 'Domestic and Religious Purpose' accounting for about 32.9 per cent of the total consumption. This was followed by the industrial sector which accounted for 30.4 per cent of the total consumption. The electricity consumption by consumers in the general-purpose category was however only 20.9 per cent of the total consumption indicating an annual growth of 6 per cent.

Table 2.2: Electricity Generation and Sale by Year

Units Generated, GWh									
2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
10,714	11,528	11,801	11,898	12,357	13,090	14,149	14,671	15,374	15,879
Sales, GWh									
9,268	10,024	10,475	10,621	11,063	11,786	12,785	13,430	14,091	14,612

Source: CBSL, Economic and Social Statistics of Sri Lanka-2020

Figure 2.4: Electricity Generation and Sale by Year



Source: CBSL, Economic and Social Statistics of Sri Lanka-2020

2.3.4 Electricity Transmission and Distribution

Transmission of Electricity is exclusively by the Ceylon Electricity Board (CEB). It operates 220kV and 132kV grids, embracing all power stations and dispatches all electricity supplied to the grid through its System Control Centre. The System Control Centre plans and carries out the operation of generation and transmission system in order to achieve reliability, quality and operational economy.

CEB serves about 4.5 Million customers across four distribution regions and its distribution licensee has around 92 per cent share in Sri Lankan market. Total Employed in C.E.B(as at 2019 year-end) is 20,512.

Lanka Electricity Company (LECO), a state-owned distribution company, is the only player in the distribution sector, other than CEB. LECO holds around eight per cent market in the distribution segment, and purchases power in bulk from the CEB Transmission Licensee. LECO serves around 588,000 consumers in the western and coastal belt townships between Negombo and Galle. Total Employed in LECO (as at 2019 year-end) was 1,544 (*CEB, 2019, Statistical Digest and LECO, 2019 Statistical Digest).*

2.4 Electrical and Electronics Products and Equipment

2.4.1 The Economic Groups in Electrical Products Manufacturing

The subsector of Manufacturing includes the establishments engaged in manufacture of electronics, equipment and components.

There are six major classifications of economic activities in the manufacture of electrical equipment, made according to the variety of electrical products or equipment made.

i. Manufacture of electric motors, generators, transformers and electricity distribution & control apparatus.
ii. Manufacture of batteries and accumulators
iii. Manufacture of wiring and wiring devices
iv. Manufacture of electric lighting equipment
v. Manufacture of domestic appliance.
vi. Manufacture of other electrical equipment

These manufacturing subsectors in Sri Lanka are also assisted by foreign investments as well. Of course, there are many establishments like Associated Cables Limited, Orient Holdings limited Electrical Accessories, Associated Battery Manufacturers Ceylon Ltd; Sierra Cables and LTL Transformers (Pvt) Ltd that are fully Sri Lankan owned and Contribute to the manufacturing industry.

2.4.2 Economic Groups in Electronics Manufacturing

The subsector of Electronics Manufacturing includes the establishments engaged in manufacture of electronics, equipment and components. In this economics group, there are manufacturers of printed circuits, switches, boards and panels, electronics circuits, transistors, valves, cathode tubes etc., telephone sets, audio/video equipment and parts, and other electronics products.

2.4.3 The Electrical and Electronics Manufacturing Sector for Export Market

The Electrical and Electronics Manufacturing Sector for Export Market has contributed USD 381.17 Million to Sri Lanka's exports earnings in 2019 and employed over 35,000 skilled workers in its various activities. The workforce is drawn from a pool of skilled young

men and women with basic general education and technical knowledge. There are over 85 companies engaged in design, manufacturing and export.

A detailed analysis of the Electrical and Electronics Manufacturing Sectors for Export Market is included as a separate Chapter (09), because of its increasing and decisive role as a merchandise export revenue earner for the country.

2.4.4 Electrical and Electronics Consumer Markets

There is a huge local consumer market for import and retailing of Electrical and Electronics related equipment and accessories in the country with a large number of establishments representing global brands of such equipment and accessories. In this market segment, these firms/establishment import the complete products or their parts and components and then assemble in to consumer electrical or electronics products and sold. Some of the well-known establishments have a large number of retail shops across the country, selling multiple brands, product portfolio and offering multiple financing options. In addition, there are a large number of establishments and persons engaged in whole sale and retail sale of Electrical and Electronics consumer goods and other equipment and accessories island wide in both formal and informal enterprises.

A total of 5,223 establishments with 17,657 persons are engaged in the whole sale and retail sale of electrical goods, while the respective numbers in electronics market are 1,363 and 6,685. *(DCSSL, 2013/14, Listing of Economic Census)*

2.4.5 Global Industry Trends- Electric Household Appliances Market

Market size surpassed USD 350 Billion in 2016 and is poised to witness over eight per cent Compound Annual Growth Rate (CAGR) till 2024. The global industry shipments were over 600 Million units and are set to cross 1 Billion units by 2024.

"CAGR: A business and investing specific term for the geometric progression ratio that provides a constant rate of return over the time period. CAGR is not an accounting term, but it is often used to describe some element of the business, for example revenue, units delivered, registered users, etc. CAGR dampens the effect of volatility of periodic returns that can render arithmetic means irrelevant. It is particularly useful to compare growth rates from various data sets of common domains such as revenue growth of companies in the same industry or sector"

The market demand is driven by growth of organized retail sector coupled with need for modernized appliances across Asia Pacific (APAC) region. The increasing demand for air conditioners, refrigerators, and washing machines, can be attributed to improving living standards. Steady growth is predicted in the developing markets while rural regions are set to outdo the trends due to improving lifestyles and rising purchasing power.

(www.gminsights.com/industry-analysis/electric-household-appliances-market)

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2.6.1 Global Industry Trends- **Consumer Electronics Market**

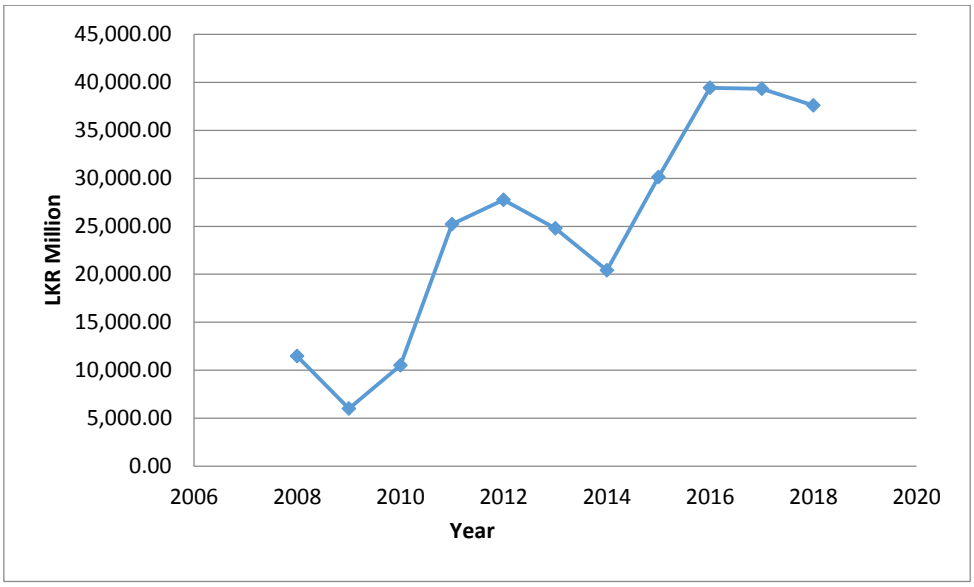
Market size valued at USD 1,100 Billion and is expected to register over three per cent growth between 2017 and 2024. Increasing penetration of smart phones across the globe is expected to drive the market growth.

The number of vendors offering advanced technologies like 4K and OLED are on the rise across the globe with players such as LG Electronics, Sony Corporation, and Samsung Electronics in the market place resulting in rising competition. Market share is expected to rise with the growing popularity of OLED and 4K televisions with the declining prices of these devices is providing impetus to the market share. With the falling prices of such devices coupled with growing replacement rate of traditional televisions with newer ones is expected to drive the market revenue of consumer electronics. *(www.gminsights.com/industry-analysis/consumer-electronics-market)*

The following Figure 2.5 indicates the cost of imports of home appliances both electrical and electronics to Sri Lanka during the period 2008 to 2018. In the three yr. period from 2016 to 2018 the costs of imports were around LKR 38,000 Million which is a threefold increase to the values in 2008 to 2010. As suggested in above sections, this Figure 2.5 confirms the steady growth predicted in the developing markets and rural regions outdoing the trends due to their improving lifestyles and rising purchasing power.

(www.cbsl.gov.lk)

Figure 2.5: Import Expenditure of Home Appliances



Source:(www.cbsl.gov.lk)

2.7 Electrical / Electronics Services Industry

Repair and maintenance of machinery, domestic and industrial wiring and also provision of consultancy services constitute the electrical/electronic services activities. Established firms, small and medium enterprises, home business owners and self-employed craftsmen offer these services.

2.7.1 Services for Consumer Products:

All the well-known establishments selling multiple brands of home appliances and household equipment having a large number of retail shops across the country, offer after sales services through their service centres. Few of the examples are ABANS, Samsung, and Singer.

Electronics services, are mainly trouble shooting and repairing of electronics appliances such as TV, Video set and computers. Here too small and medium enterprises, home business owners and self-employed craftsmen offer these services.

2.7.2 Electrical Services in Construction Industry

Contractors providing Electrical Services is one of the largest specialist groups in the construction industry. The industry provides essential services for a range of downstream construction and industrial markets. Electrical contractors install and maintain basic electrical circuitry on buildings and industrial equipment, and also install electric lights, power facilities and instrumentation. Over the past decades, electrical contractors have benefited from solid demand growth in the housing and non-residential building markets. However, the industry's performance can be negatively affected by any decline in demand from the non-building infrastructure and industrial markets, largely stemming from the decreased investment in infrastructure.

The industry consists of contractors that install electrical wiring or fittings in buildings and other construction projects. Industry operators also repair and maintain existing electrical equipment and fixtures.

A. INDUSTRY PRODUCTS AND SERVICES

Electrical circuitry installation

Electrical circuitry upgrade and renovation

Maintenance and repair services

Project Management and Consultancy Services

B. ELECTRICAL SERVICES IN CONSTRUCTION INDUSTRY

Electrical wiring repair or maintenance

Electrical wiring installation

Closed-circuit video surveillance system installation

Exhaust fans installation

Electric lights and power fittings installation

Electrical and communication cabling and switching systems installation

Illuminated signs installation

Safety switches installation

Specialist industry-specific equipment installation

There was a total of 1,143 enterprises engaging 4,027 persons in the electrical and electronics installation works in construction of commercial and residential buildings in both formal and Informal sectors.

(DCSSL, 2013/14, Listing of Economic Census)

2.8 Contribution to Economy

2.8.1 Contribution to Economy by the Electrical and Electronics related Economic Divisions

Table 2.3 below shows the contribution to the economy by each economic division considered in this study of the Electrical and Electronics industry sector. The Table 2.3 lists, salaries and wages paid in formal units, value of output and value added (which is the value of output minus the value of intermediate consumption) in both formal and informal establishments in the economic divisions.

The highest value of output to economy is from economic division related to Electricity supply. with LKR 364.8 Billion followed by Manufacture of electrical equipment with LKR 78.5. Billion Manufacture of Electronics equipment division is the lowest with LKR 6.5 Billion; Construction installation division contributes LKR 12.3 Billion and Repair of consumer and household Electrical and Electronics items contributes LKR 13.0 Billion.

Table 2.3: Contribution to Economy by Economic Divisions in Electrical and Electronics Industry Sector by both Formal and Informal Units in 2017.

Economic Division	Sector	Salaries and Wages LKR	Value of Output LKR	Value of Intermediate Consumption LKR	Value Added LKR
26 Manufacture of computers, electronics and optical products	Formal	935,055,387	6,453,417,436	3,228,793,733	3,224,623,703
	Informal		248,180,658	114,790,161	133,390,497
Total			6,701,598,094	3,343,583,894	3,358,014,200
27.Manufacture of Electrical Equipment-	Formal	7,284,082,102	77,875,984,771	46,668,149,703	31,207,835,068
	Informal		672,429,041	264,216,007	408,213,034
Total			78,548,413,812	46,932,365,710	31,616,048,102
35 Electricity, gas, steam and air conditioning supply	Formal	20,364,115,554	364,295,766,106	272,397,652,394	91,898,113,712
	Informal		483,332,740	189,692,600	293,640,140
Total			364,779,098,846	272,587,344,994	84,846,724,253

Economic Division	Sector	Salaries and Wages LKR	Value of Output LKR	Value of Intermediate Consumption LKR	Value Added LKR
95.Repair of computers and personal and household goods	Formal	173,381,335	1,177,237,962	315,493,232	861,744,730
	Informal		11,871,535,740	3,370,399,069	8,501,136,671
Total			13,048,773,702	3,685,892,301	9,362,881,401
432. Electrical, Plumbing and other Construction installation activities	Formal	1,516,885,587	10,606,277,706	5,251,624,906	5,354,652,800
	Informal		1,678,510,524	461,014,710	1,217,495,814
Total			12,284,788,230	5,712,639,616	6,572,148,614

Source: DCSSL, 2018-ASI Report & 2013/14 - Economic Census Report. The number preceding the name of the economic division in the first column is the SLSIC 2-digit code used by DCSSL for relevant divisions.

{Formal industrial establishments refer to economic units which have documented accounts or incorporated. Informal units as small and unorganized establishments which are engaged in a range of economic activities and are unregistered or small engaging less than 10 persons by definition. A large number of these enterprises carry economic activities in homes, small workshops without a fixed location and mostly operated by an individual working either alone or with the help of unpaid family members. -DCSSL}.

Table 2.4: Key economic indicators of the establishments by Economic Division in Electrical and Electronics Industry - 2017

Economic division	Output per person engaged LKR Mn	Value added per person engaged LKR Mn	Annual Salary per Person engaged in formal units LKR
26 Manufacture of computers, electronics and optical products	2.1	1.1	325,463
27 Manufacture of Electrical Equipment	4.8	1.95	473,361
35 Electricity, gas, steam and air conditioning supply	13.5	3.2	763,759

Economic division	Output per person engaged LKR Mn	Value added per person engaged LKR Mn	Annual Salary per Person engaged in formal units LKR
95.Repair of computers and personal and household goods	0.52	0.37	321,672
432. Electrical, Plumbing and other Construction installation activities	2.1	1.1	509,193

Source: ASI-2018 of DCS &DCL report on Economic Census in 2013/14; The number preceding the name of the economic division in the first column is the SLSIC 2-digit code used by DCSSL for relevant divisions.

In terms of Value addition to the economy, Electricity supply division contributes LKR 84.8 Billion, Electrical manufacturing LKR 31.6 Billion, Repair services LKR 9.4 Billion, Electrical Installation LKR 6.6 Billion and Electronics manufacturing lowest with LKR 3.4 Billion.

Annual output per person engaged is an indicator which reveals the labour productivity of an establishment. Table 2.4 above depicts that the activities in Electricity, gas, steam and air conditioning supply economic division are having the highest output per person engaged out of all the other divisions related to Electrical and Electronics Sector with LKR. 13.5 Million; Next to it are activities in Manufacture of Electrical Equipment with LKR 4.8. Million while Repair of Household Electrical and Electronics Goods with LKR 0.52 Million is the lowest.

Value added per person engaged is an indicator which suggests the productivity of the industry. Table 2.4 also shows the value added per persons engaged by economic section. Electricity, gas, steam and air conditioning supply activities are reported to be in the top when ranking this indicator. The value added per person engaged in this activity is LKR 3.2 Million. Next to it are activities in Manufacture of Electrical Equipment with LKR 1.95 Million. Economic activities in both Manufacture of Computers, Electronics and Optical Products and Electrical, Plumbing and other Construction Installation are with LKR 1.1 Million.

Annual salary per person engaged is an indicator which reveals the labour market status and DCSSL suggests that it is very important in the education and vocational training policies of the country. Table 2.4 above also shows the annual salary per person engaged in economic activities broadly. Annual Salary per person engaged in Electricity, gas, steam

and air conditioning supply activities is highest with LKR. 763,759. Next is Electrical, Plumbing and other Construction installation with LKR. 509,193**.** The lowest is in Repair of computers and personal and household goods with LKR. 321,672.

2.8.2 Contribution to the Economy by Export Earnings from Electrical and Electronics Industry Sector

Details of the share of the Electrical and Electronics exports of the total export earnings of the country and the earnings from disaggregate Electrical and Electronics export products during the period from 2009 to 2019 are given in Chapter 09 on Electrical and Electronics Component Manufacturing export Market.

2.9 Technological level and Changes envisaged in next 5 years

2.9.1 Electricity Supply-Generation

Hydro and coal and liquid fuel thermal power plants dominate the Power sector in the country. When hydropower generation becomes lower than average, Sri Lanka is likely to continue to use diesel and fuel oil to augment power generation during peak periods, to bridge the generation gap.

However, the government of Sri Lanka, through the envisaged renewable energy targets and projected generation planning, has been pursuing a shift toward clean generation, including both Non-Conventional / Other Renewable Energy [NCRE] (Solar, Wind, Biomass, Mini-Hydro, etc.) and Liquefied Natural Gas (LNG) based generation.

There are eight small-scale solar power plants with a total installed capacity of 51.36 MW developed under the country's SPP program. It is estimated that the technical potential for the use of solar energy for electricity generation is about 6,000 MW.

Rooftop solar PV systems became increasingly popular with the introduction of the net-metering system in 2010 and the government-initiated "Battle for Solar Energy" program in 2016. There had been 182 GWh power generation in 2019 from rooftop solar PV systems connected to the national grid by end 2019.

The country has good wind energy resources that are concentrated in the north western coastal area and in the central highlands. By end 2019, Sri Lanka had a total installed wind power generation capacity of 128 MW. It is estimated that the country can gain a utilizable wind power potential of 5,600 MW.

Under the Sri Lanka Renewable Energy Master Plan 2014 (REMP) study, it was identified that Mannar has a potential of 375 MW for wind power development out of which CEB has already developed and commissioned 103 MW plant in Nov. 2020, financed by the Asian Development Bank (ADB).

Sri Lanka almost completed the development of the country's small hydropower potential. The introduction of the small power producer program helped to mobilize the private sector in investing in small hydropower plants.

Majority of the potential of hydropower has by now been exploited for major hydropower plants and currently, (i) the CEB is building medium-scale hydropower plants: About 247 MW of capacity will be added by 2022 with the ongoing construction of Broadlands (35 MW), Moragolla (30.2 MW), Uma Oya (122 MW), and the planned power plants: Gin Ganga (20 MW), Thalpitigala (15 MW), and Moragahakanda (25 MW); and (ii) smaller grid-connected hydropower plants continue to be developed by the private sector.

Power Generation -Liquefied Natural Gas

First natural gas discovery was made in the Mannar Basin off North Western coast in 2011. So far, exploratory drillings have made two discoveries from the same block with estimated reservoir capacities in excess of one Trillion Cubic Feet (TCF) of natural gas and 10 Million BBL (barrels) of condensate. These discoveries have propelled further explorations in the Mannar Basin, both in onshore and offshore regions.

The National Policy on Natural Gas envisages achieving the following goals

• The share of natural gas reaches at least 1/3 of the mix of total fossil fuel consumption by 2030 • Dependency on imported fossil fuels reduced to at least half of the present level in terms of physical quantity by 2030 • Progressive penetration of natural gas in all sectors maintaining minimum 30 per cent of the total energy mix. • Profitable avenue of foreign exchange earnings established through exportation, exploitation and bunkering of indigenous gas resources • Emission of greenhouse gasses minimized so that emission targets set by Sri Lanka's Nationally Determined Contributions (NDC) to Paris Agreement on Climate Change can be achieved • Level of other harmful gasses that contribute to local air pollution minimized so that ambient air quality standards specified by the CEA can be reached • Robust framework of legal, regulatory and institutional arrangements to bring about effective behavioral responses of producers, suppliers and consumers of natural gas in place by 2020 • Progressive growth of skilled employment and business opportunities with high local value content generated through steady stream of foreign and local investments on natural gas. (*Petroleum Resources Development Section, Ministry of Highways, Road Development and Petroleum Resources Development- 2019, National Policy on Natural Gas-Public Consultation Document)*

2.9.2 Transmission & Distribution

The power system in Sri Lanka is managed by the System Control Centre—a function of the CEB transmission licensee. In 2016, energy loss in the transmission network was at 1.7 per cent, whereas in 2014 it was 2.7 per cent. Transmission development studies are regularly carried out by the transmission licensee, and the transmission development plan

is updated every 2 years for a 10-year period. The recently available transmission development plan has identified several transmission projects including the augmentation of existing grid substations, construction of new grid substations, installation of reactive power compensation equipment, and construction of new transmission lines. Implementation of these projects would ensure capacity adequacy and reliability of the transmission network to cope with the demand growth. (*Asian Development Bank, 2019 – Sri Lanka Energy Sector Assessment, Strategy and Road Map).*

However, sustaining these achievements and keeping pace with demand from a growing economy while meeting the envisaged power sector development needs, will require large sums of new investment. They include large investments in renewables and LNG/gas-based generation. These investments apparently are not forthcoming, it means Sri Lanka's reliance on imported (oil and coal) based power will need to be continued to meet its future energy requirements.

In March 2015, the Sri Lanka Energy Sector Development Plan for a Knowledge based Economy 2015–2025 established a series of thrust areas and targets. In 2016, the government made announcements about the choice of fuel for bulk power generation (coal versus LNG) and an accelerated program to increase electricity generation from solar PV.

The country's specific nationally determined contributions for the energy sector include: (i) establishment of large scale wind power plants of 514 MW; (ii) establishment of 115 MW of solar power plants; (iii) establishment of 105 MW of biomass power plants; (iv) establishment of 176 MW of mini hydropower plants; (v) introduction of demand-side management (DSM) activities; (vi) strengthening sustainable energy related policies with a view to increasing the share of renewable energy from the existing 50 per cent , to 60 per cent in 2020, until further developments in renewable energy technology allow for increased share of electricity generation from renewable energy sources); and (vii) converting existing fuel oil based power plants to liquefied natural gas (LNG) .

(Ministry of Power and Energy, 2015, *Sri Lanka Energy Sector development plan for a knowledge-based economy 2015-2025)*

Investment Needs in the Power Sector by 2026

To meet the projected demand for electricity in 2026, Sri Lanka will need to mobilize capital investments of about USD 5.0 Billion in generation, USD 1.1 Billion in transmission, USD 229 Million in distribution, and USD 512 Million in planned Demand Side Management (DSM) programs. Including contingencies of about USD 102 Million, it is estimated that total cumulative funds of about USD 7 Billion will be needed up to 2026. The funds will have to come from both the government, commercial banks, and the private sector, and tap both domestic and foreign sources of capital.

(World Bank, 2019-Sri Lanka Energy Infrastructure Sector Assessment Program; Executive Summary)

2.9.3 Technological level and Changes envisaged in next 5 years in Electrical and Electronics Manufacturing

Electrical software and Electronics manufacturing trends are said to be linked closely with the combined and hardware sectors resulting emerging disruptive technologies to serve many new areas. Such identified applications will be in new areas with varying degrees of automation and digitization. The discussion on such future trends is included in Chapter 09 on Electrical and Electronics Component Manufacturing for Export Market.

2.9.4 Consumer Electronics.

The demand for televisions with larger screen sizes integrated with new technologies such as 4K and Organic Light Emitting Diodes (OLED) is on the rise across the globe. The number of vendors offering such advanced technologies is increasing with players such as LG Electronics, Sony Corporation, and Samsung Electronics in the marketplace resulting in rising competition and decreasing prices. Traditional televisions are now being replaced with newer ones with increasing rate, driving up the market revenue of consumer electronics.

The portable solar cells, coloured light source and smartphone displays, application in curved HD TVs dominate the global organic electronics market. Potential applications of organic electronics are in a broad range of fields including national security, environmental health, biomedical research and IT.

Organic electronics *is a field of materials science concerning the design, synthesis, characterization, and application of organic small molecules or polymers that show desirable electronics properties such as conductivity. Unlike conventional inorganic conductors and semiconductors, organic electronics materials are constructed from organic (carbon-based) small molecules or polymers using synthetic strategies developed in the context of organic and polymer chemistry. One of the promised benefits of organic electronics is their potential low cost compared to traditional inorganic electronics.*

Attractive properties of polymeric conductors include their electrical conductivity that can be varied by the concentrations of dopants. Relative to metals, they have mechanical flexibility. Some have high thermal stability. (:en.wikipedia.org/wiki/Organic_LED)

OLED-(Organic Light Emitting Diodes) is a flat light emitting technology, made by placing a series of organic thin films between two conductors. When electrical current is applied, a bright light is emitted. OLEDs are emissive displays that do not require a backlight and so are thinner and more efficient than LCD displays (which do require a white backlight)] OLED displays are not just thin and efficient - they provide the best image quality ever and they can also be made transparent, flexible, foldable, rollable and even wearable and stretchable in the future. Transparent OLEDs embedded in windows or car windshields are also possible. (www.oled-info.com/oled-introduction)

2.10 Government Policy and Other Factors that may impact the Industry

In the Policy framework- 'the Vistas of Prosperity and Splendour ', among the ten key policies aimed at achieving the fourfold outcome of a productive citizenry, a contented family, a disciplined and just society and a prosperous nation; the two policies related to this study here, are on the People Centric Economic Development and Technology Based Society.

In the Macroeconomic Policy framework, following policies could be highlighted *(Ministry of Finance, Sri Lanka)*

a. Reducing the trade deficit; promoting domestic resources-based exports, import substitution and expanding the export economy via increasing valued-added industries.
b. Reducing import taxes on raw materials and intermediate goods to promote domestic production.
c. Making free of import tariff on machinery and technical equipment to develop internationally competitive industries

In the subsector of Business / Enterprise Development, the sectoral policy component of creating a conducive business environment for the business community to build up domestic industry the following strategies are identified.

a. Facilitate entrepreneurship development
b. Protect, safeguard and strengthen domestic entrepreneurs
c. Encourage value addition.

The activities stipulated cover many aspects relevant to commencement and sustainability of any industry.

The following specific activities identified and listed below will have direct bearing on the Electrical and Electronics industry related manufacturing and services subsectors.

a. Setting up industrial cities/ investment promotion zones, free ports covering all Provinces in economic corridors
b. Bring an Act to the parliament to clearly specify what should and should not happen in investment promotion zones and industrial towns
c. Setting up a single unified machinery to facilitate export import processes and to eliminate the waste of time in this process
d. Providing facilities for international business giants to set up their offices in Colombo and in the Port City
e. Carrying out international publicity campaign with the assistance of the private sector to attract foreign private investments into the country
f. Developing programs to get higher prices for those through value addition before export.
g. Providing facilities to large-scale businesses to commence production of various high technology products
h. Protecting, safeguarding and strengthening domestic entrepreneurs with special focus.

In addition, Government is expected to provide facilities to new entrepreneurs to secure needed land, credit facilities, business consultancy, technological and infrastructure facilities. Actions to be taken to deliver programs to develop entrepreneurship skills among youth even from school days.

In the sub sector of Technology and Innovations, sectoral policy component of establishing a Technology Based Society (Smart Nation) entails the following strategies and expected activities thereof to be carried out.

a. Establish Sri Lanka as a Global Innovation Hub

Maximize the use of innovative measures in

i. Internet of Things (IoT),

ii. Artificial Intelligence (AI),
iii. Biotechnology, Robotics, Augmented Reality,
iv. Cloud Computing, Nanotechnology, 3D printing

b. Set up a Citizen Centric Digital Government for the convenience of citizens

i. Establish nine Citizen Service Centres to adopt new technologies for public service delivery (ID cards, passports, driving license etc.)
ii. Introduce a digital & electronics payment system to pay traffic fines Establish an e-procurement system to eliminate bribery & corruption

c. Establish Digitally Inclusive Sri Lanka

i. Establish a country wide high speed optical data transmission system and a high speed 5G Mobile Broadband System to facilitate data transmission
ii. Establish digital cities with digital administration & monitoring
iii. Introduce a mobile & digital payment system to handle all financial transactions
iv. Place a cross border e-commerce and International e-payment system
v. Introduce new legislation to ensure data protection, cyber security and Intellectual Property Rights

Overall, these sub-sectoral policy components and activities will have a great impact on Electronics and ICT sectors in the country opening up opportunities for research & development and economic growth in manufacturing for local and export markets and EE services.

In addition, the achievement of the sectoral policy objectives requires human capital formation. In such human capital formation TVET sector invariably has a role to play in skills development of the citizenry of the country.

2.11 Environmental Impacts

2.11.1 Air Pollution

The main environmental indicators are: (i) CO_2 emissions per capita and (ii) CO_2 emissions per unit of GDP. As the country has moved to a generating system that is more fossil fuel-based, there has been a gradual increase in CO_2 emissions per capita. This rise became particularly noticeable after 1996, the year the oil-fired IPPs began operating. As of 2011, the CO2 emission per capita specifically attributable to electricity generation was 262 kg, a level that, while not high by global standards, is nevertheless a very substantial 60 per cent increase from the level of 164 kg per person in 2000. Sri Lanka's current energy policy emphasizes the need to resort to sustainable energy, but it remains to be seen how successful this will be in reversing this rising trend in emissions.

Measures to mitigate environmental impact

Regarding the energy sector, the government has aimed for a 20 per cent greenhouse gas emission reduction target which amounts to 39,383 Giga grams (Gg) of their total GHG emissions, estimated at 196,915 Gg for the period 2020–2030.

Government has actively participated in the global efforts to minimize GHG emissions within the framework of sustainable development and principles enshrined in the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol (KP). One of the key measures that Government has initiated towards this endeavor is the Clean Development Mechanism (CDM).

The Clean Development Mechanism (CDM) helps Sri Lanka to meet its emission reduction targets, by allowing the trade of Certified Emission Reduction (CER) credits earned by developing countries. The energy sector has been identified as having the highest potential to take up emission reduction projects. (http://www.energy.gov.lk/en/energy-management/what-we-do)

Sri Lanka currently has 20 registered renewable power CDM projects, totally 183 MW in potential capacity. Only one of these, Broadlands Hydropower, is a large-scale hydropower project, the others are all small-scale hydropower or other renewable energy technologies. Twelve of these projects have been issued with Certified Emission Reduction (CER) credits and so are definitely operational, but many of the other eight may not have been commissioned.

2.11.2 E-waste or electronics waste

E-waste is created when an electronics product is discarded after the end of its useful life. Used electronics which are destined for refurbishment, reuse, resale, salvage recycling through material recovery, or disposal are also considered e-waste. The rapid expansion of technology and the consumption driven society results in the creation of a very large amount of e-waste in every minute.

An estimated 50 Million tons of E-waste are produced globally each year. The USA discards 30 Million computers each year and 100 Million phones are disposed of in Europe each year. The US Environmental Protection Agency estimates that only 15–20 per cent of e-waste is recycled; the rest of these electronics go directly into landfills and incinerators

(https://en.wikipedia.org/wiki/Electronics_waste)

2.11.3 Electronics Waste Management in Sri Lanka

In 2016, Central Environmental Authority has declared a National week on elimination of Electronics waste, plastic and polythene to draw public attention to management of electronics waste and to facilitate collecting Electronics waste stagnated in the house hold level.

It is reported that nearly 427 tons of electronics waste and around 80,000 units of Compact Fluorescent Light Bulbs (CFL) were collected in drop off events during this National week. By implementing this event, it was able to channel the collected Electronics waste and CFLs to an environmentally sound management mechanism. Directing 80,000 units of CFL to the recycling facility was also a great achievement as these contain 2-5 mg of mercury per bulb.

In 2020 also CEA collaborated with the Postal Department to collect e waste during a national week in October, 2020. Although the amount collected is not known yet.

a) Streamlining informal Sector E waste collectors-

When considering the electronics waste management system in the country, the system operates through formal and informal sector collectors. A significant amount of e-waste continues to be collected and dismantled through informal sector. As these processes are rudimentary in nature, there is a very big potential to create health and environmental impacts. Having understood this situation, Waste management Unit of the Central Environmental Authority has taken initiatives to streamline the informal sector engaged in electronics waste collection. As the initial step, these informal sector establishments were registered and awareness was given to the people engaged in informal sector in workshops on waste management.

At present Sri Lanka, does not have a comprehensive updated database for the generation and lifecycle management of electronics and electrical waste (e-waste) except the national implementation plan done in 2008. Hence the magnitude and flow of e-waste generation is not well known in the country. Only a few studies exist, which contain a rough estimate made years back.

Unavailability of a database and reliable information on the magnitude and flow of e-waste generation is a major drawback that has negative effect on the planning processes of e-waste management systems and also for the setting up of electronics and electrical waste management facilities. Moreover, inadequate information on the existing practices and strategies on e-waste management is a concern to all interested parties in the country.

According to a study done by, EML Consultants (Pvt) Ltd undertaken for CEA in 2016 annual E- Waste release is expected to increase by more than 4-fold from 10,000MT per

year in 2010 to 43,000 MT per year in 2030 and computer e- waste releases show a gradual increase and eventually becoming the dominant waste component (6,067 MT) in 2030, while TV shows a decreasing growth due to already saturated Sri Lankan market generating 5,732 MT in 2030. *(Central Environmental Authority 2016- Annual Report)*

Further, about 85 Sri Lankan exporters in Electronics / Electrical Industry are reported to be ISO certified, observe ROHS and WEEE regulations and are committed towards protecting the environment and also comply with the ILO requirements of decent labour.

The Restriction of Hazardous Substances Directive 2002/95/EC, (RoHS),regulation short for Directive on the restriction of the use of certain hazardous substances in Electrical and Electronics equipment, was adopted in February 2003 by the European Union. The RoHS Directive set restrictions upon European manufacturers as to the material content of new electronics equipment placed on the market

The WEEE regulation (Waste Electrical and Electronics Equipment) Directive is the European Community Directive 2012/19/EU on waste from Electrical and Electronics equipment (WEEE) which, together with the RoHS Directive 2011/65/EU, became European Law in February 2003.

The WEEE Directive set collection, recycling and recovery targets for all types of electrical goods, with a minimum rate of 4 kilograms per head of population per annum recovered for recycling by 2009.

b) Hazardous Waste have been defined as the Scheduled Waste and prescribed under the Gazette Extra Ordinary 1534/18 Dated 01.02.2008.

As per the regulations stipulated under the Part II of the National Environmental (Protection & Quality) Regulations No 01 of 2008 all persons involved in the handling of (Generate, Collect, Transport, Store, Recover or Recycle and Disposal of waste or establish any site or facility for the disposal) Scheduled Waste specified in the Schedule VIII of the regulation should obtain a license from the Central Environmental Authority

Under above regulations, there are 14 Licensed E-Waste Collectors & Exporters in Sri Lanka as per the list Updated, on 06 March, 2020 by Waste Management Division of CEA.

Source: Central Environmental authority website.

2.12 Roles of Associated Institutions and Organizations in Electrical and Electronics Sector

a) The vision of the electrical and electronics industry in the country is to achieve a status of a global hub for its export. Co-ordination Secretariat for Science Technology and Innovation (COSTI) which functioned under the purview of Ministry of Scientific Affairs was reported to had assisted through related institutions for the industry to formulate R & D initiatives. Industry is assisted to collaborate with the Universities and Academic

Institutions. Reports show that Sri Lanka Electronics Manufactures and Exporters Association (SLEMEA) was established to empower industry to meet its challenges.

b) Sri Lanka Electronic Manufacturers and Exporters Association (SLEMEA)

The Sri Lanka Electronic Manufacturers and Exporters Association (SLEMEA) mostly represent the major manufacturing companies in the sector operating in the BOI investment promotion zones and is said to be had contributed considerably to the growth of the Electrical and Electronics sector. Promotion of R & D culture in the sector, initially in 17 recognized companies engaged in R & D is given prominence

SLEMEA highlighting its achievement in 2018 reports of its role in the shaping of the national policy; in particular in getting a reduction of Port and Airport Levy (PAL) from 7 per cent to 2.5 per cent anticipating a 17 per cent export growth. SLEMEA is expected to continue its facilitating role to iron out sector wise obstacles and assist the sector to perform efficiently and grow.

2.13 Long Term Vision and Objectives of Electrical and Electronics Industry

Any stated or implied long-term vision and objectives for the industry identified in this study are given below.

2.13.1 Energy Supply- Generation, Transmission and Distribution

Vision of the electricity supply sub sector is to assure the energy security and provide quality, reliable, sustainable and affordable energy for economic prosperity of the Nation. The government's National Policy Framework - Vistas of Prosperity and Splendour- has a subsector on Power and Energy, where the sectoral policy of 'Assuring availability of low-cost energy which is needed for accelerating economic growth' has been clearly stated.

In the policy document following two strategies or thrust areas have been specified to accomplish the said vision.

a. Improving existing energy mix
b. Transforming the country's energy mix towards renewable energy

The document has also identified the exact targets/activities to be implemented in the future. These are listed as below.

a. Improving existing energy mix
b. Enhance the contribution of hydro and renewable energy to 80 percent of the overall energy mix by 2030
c. Assurance of energy security and self-sufficiency
d. Expedite exploration of natural gas

Transforming the country's energy mix towards renewable energy

a. Add 100MW of wind energy in Mannar by 2021 and add 800MW of solar energy by executing wind and solar projects in Mannar, Poonareyn and Monaragala
b. Encourage rooftop solar systems to ensure availability of low-cost energy for households and small business
c. Encourage private sector and entrepreneurs to setup renewable energy projects
d. Encourage efficient energy generation programme by utilizing industrial wastes

2.13.2 Electrical and Electronics Manufacturing

a) Electrical and Electronics Manufacture in Sri Lanka is mainly supported by Foreign investments. To provide flexibility and support to those existing enterprises to continue their growth, the future vision is to create an attractive and conducive atmosphere for more foreign investments to arrive in the country and simultaneously promote local entrepreneurs to set up businesses.

Targeting sectors for Investment and Export Promotion in Sri Lanka" by the "Sector Targeting Team", is an attempt for proactive investment and export promotion by BOI and EDB to attract new investors in new sectors and to bring in their FDI and Technology to the country. The strategies identified and used are as follows.

i. Promotion of existing and emerging exporters and to see whether the sector has existing players that can expand their production facilities and/or engage in joint ventures.
ii. Targeting of investment and know-how from abroad.
iii. Improve required hard and soft assets.

Sri Lanka needs to improve its required assets (such as the costs of electricity and wastewater treatment etc) while promoting investments to Electrical and Electronics manufacturing sector.

b) **Electrical and Electronics Component Manufacturing**

Vision of the industry is to achieve the status of a global hub and the industry players have now formulated R & D initiatives through state agencies to work in close liaison with Universities and Academic Institutions. Sri Lanka Electronics Manufactures and Exporters Association (SLEMEA) was formed with the intention of empowering and meeting challenges faced by the industry.

Three main approaches were identified to make the Electrical and Electronics Components Manufacturing sector successful in the next five years;

i. Leverage the country's existing capacity in Electronics Manufacturing Services (EMS) while increasing production of electrical parts and products.
ii. Work to become a component manufacturing base for large multinational brands by linking with the software industry, helping Sri Lankan producers to move up the value chain.
iii. Leverage innovative ideas available in academia and industry to focus on a few high-tech products such as robotics and Internet of Things devices (IoT), among other growth opportunities.

c) **Electrical and Electronics Consumer Market**

Local Consumer market is mainly import based industry where the complete product is imported or parts are imported and then assembled in to a consumer product. Future growth of this industry subsector could be viewed as;

i. Industry which continues to expand and employ more of skilled workers to assemble parts and components to a product
ii. Growing local manufacturing industry which can substitute currently imported products, which need more competent high-tech workers

The strategy suggested by the sector is to explore the possibility of technology transfer mechanisms such as joint ventures to make the locally manufactured product that can penetrate both local as well as other growing markets in other countries. Such strategy of course needs the backing of the state to succeed.

d) **Electrical and Electronics Services**

Repair and maintenance of machinery, domestic and industrial wiring and also provision of consultancy services constituent the electrical/ electronics service activities. Established firms, small and medium enterprises, home business owners and self-employed craftsmen offer these services.

Repairing and maintenance of Electrical and Electronics equipment, is being predominantly home and/ or small business sector, there are special needs that to be addressed for future growth of this industry subsector. These are mainly;

i. While enhancing the technical knowledge and skills levels of the persons engaged, there is the need for giving entrepreneurial skills to run the businesses efficiently.

ii. Upgrading of the standards of practices at work such as safety and occupational health and other regulatory measures such as licensing and non-regulatory methods such as awareness on improvements of market operation are identified.

e) **Electrical and Electronics Services in Construction Industry**

This is a sub sector that will grow with the construction of high rise and residential building and accompanying technology applications such as Building Management Systems. Skills upgrading of the workforce should be the objective relevant to TVET provision. Such needs were identified at Focus Group Discussion with the industry representatives from this specific sector as listed in the VET Plan.

2.14. Conclusion

For long term sustainability of the Electrical and Electronics industry sector, the most important factors to address are the stability of economic growth, political environment, government policies and fiscal and tax incentives for investors and local businesses. In addition, support in getting the capital and market access is also essential. Lastly, the most important factor for the growth and sustainability of this industry sector is the availability of skilled and competent workforce.

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Chapter 03: Demand for Skills identified thorough Analyses of Industry Enterprise Survey

3.1 Introduction

This chapter presents the analyses of Industry enterprise survey which include analyses of number of enterprises and number of employees. It starts with methodology on how the sample frame was selected and how survey was implemented. Thereafter, it gives distributions of enterprises by scales, ownership and scope of operations of the enterprises surveyed. By analyzing the number of employees in Electrical and Electronics occupations in the sample, it estimates the number of employees in respective occupations in the populations with confidence interval. Further, this chapter presents how the number of electricians in non- electrical establishments was estimated.

Having analyzed responses of enterprises, it forecasts the number of employees required in Electrical and Electronics industry sector in next five years.

3.2 Analyses of the sample survey of Enterprises

Skills demand in Electrical and Electronics sector in the local labor market was studied based on primary data collection done by survey research method. Such Survey study needs a data base to decide on the sampling frame on the geographical distribution of total population of Electrical and Electronics sector enterprises. This database of enterprises in both formal and informal sector was made available, with the courtesy of the Department of Census and Statistics, Sri Lanka (DCSSL). This was the basis of the sample design and sample frame.

Further, list of names of establishments in the Electrical and Electronics industry sector available in the employer database of the National Apprentice and Industrial Training Authority was obtained for this survey. The survey was carried out with the sample of 300 enterprises selected district wise, based on the stratified random sampling technique. However, as scale of enterprises was not known before the survey, a set of large-scale enterprises was included in to the sample as well.

Questionnaire for data collection was prepared collectively and field tested with the Key Informant interviews. Data collection became challengeable due to COVID-19 situations and, it became difficult to fill the questionnaires by enumerators. Most enterprises have taken the questionnaires to be filled by themselves and enumerators collected them on a later date. Though they have filled the questionnaires to give strong heart- felt messages, some missing fields were also found. Thus, the survey has received responses from 293 enterprises.

Collected data was entered in a database and SPSS and Excel packages were used for data tabulation.

Table 3.1: The Sample Frame Used

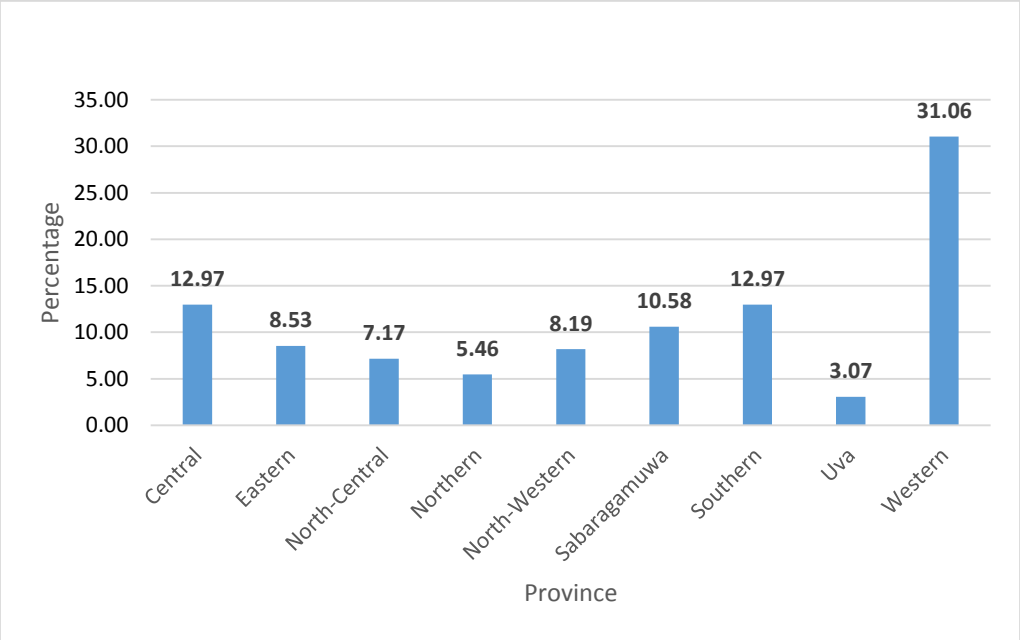
Economic Activity With ISIC Code	District																								
	Colombo	Gampaha	Kalutara	Kandy	Matale	Nuwara Eliya	Galle	Matara	Hambantota	Jaffna	Mannar	Vavuniya	Mullative	Killinochchi	Batticaloa	Ampara	Trincomalee	Kurunegala	Puttalum	Anuradhapura	Polonnaruwa	Badulla	Moneragala	Ratnapura	Kegalle	Total
26- Electronics Products Manufacturing	45	45	11	09	02	00	08	12	04	01	00	01	00	00	00	02	00	11	02	07	01	03	01	04	03	172
27- Electrical Products Manufacturing	22	138	55	34	11	04	25	40	17	01	00	00	00	01	01	04	00	33	08	11	08	03	01	20	18	555
35. Electricity Gene and Distribution	17	08	06	13	03	26	11	10	00	00	00	00	01	02	00	01	00	00	07	01	01	19	05	71	41	243
43. Installation of EE & wiring etc	182	191	54	78	23	06	42	29	15	104	07	11	03	04	54	31	06	88	57	43	26	11	04	49	25	1143
95 Repair of household Equipment	182	178	767	603	208	175	604	464	271	272	24	71	27	31	190	246	109	800	482	358	212	219	120	408	391	1066 1
Total	**21**	**216**	**893**	**737**	**247**	**211**	**690**	**555**	**307**	**378**	**31**	**83**	**31**	**38**	**245**	**284**	**115**	**932**	**556**	**420**	**248**	**255**	**131**	**552**	**478**	**1277**
% of the Total	**17.2**	**16.9**	**6.99**	**5.8**	**1.93**	**1.65**	**5.4**	**4.34**	**2.4**	**2.96**	**0.24**	**0.65**	**0.2**	**0.3**	**1.92**	**2.22**	**0.9**	**7.29**	**4.35**	**3.29**	**1.94**	**2.0**	**1.03**	**4.32**	**3.74**	**99.8**
Group Total	**52**	**51**	**21**	**17**	**08**	**05**	**16**	**13**	**07**	**09**	**01**	**2**	**01**	**02**	**06**	**07**	**03**	**22**	**13**	**10**	**06**	**06**	**03**	**13**	**11**	**300**

Source: Department of Census and Statistics Sri Lanka,2013/2014 Listing of Economic Census

3.3 Distribution of Enterprises by Province

Distribution of enterprises of the sample among provinces and their percentages of distribution are given in the Figure 3.1. As per the Sample Frame, Majority of Enterprises are in the Western Province.

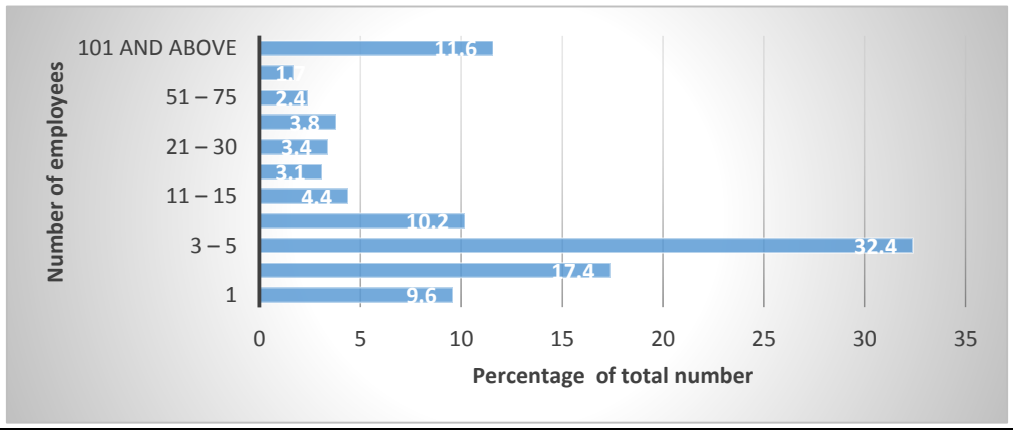
Figure 3.1: Distribution of Enterprises in Provinces



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Figure 3.2 give the distribution of enterprises based on number of employees. Accordingly, there are 208 enterprises (69.6 per cent) with 10 or less employees. 32.4 per cent enterprises are with 3 to 5 employees. There are 34 (11.6 per cent) enterprises with 101 & above employees. Numbers relevant to the graph are given in the Table A1-1 in the Appendix 1.

Figure 3.2: Distribution of Enterprises based on Number of Employees



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

There are 28 enterprises in the sample or 9.6 per cent enterprises are with only the owner. Many of these single owner- only enterprises are doing repairs of consumer electronics. When telephoned some of them and inquired why they are operating alone without taking an employee or a trainee, they stated that it is difficult to find trustworthy employees. Even at the Focused Group Discussion with Electronics equipment repairers, many participants explained the difficulties to find responsible people/ assistants to entrust expensive equipment handed over by customers. When telephoned an owner who does wiring and electrical installations to enquire why he does not take at least an employee or a trainee, he stated that they do not get work regularly and it is difficult to maintain an employee on permanent basis. He further explained that there is a group of owners without employees who work collectively. If a single owner's shop gets a job, others are invited to join on income sharing basis. It seems that collective work culture is being emerged to make single -owner only enterprises sustainable.

3.4 District Wise Distribution of Enterprises by Scale

Table 3.2 gives the District wise distribution of enterprises with percentages. Here the Department of Census and Statistics, Sri Lanka (DCSSL) classifies the size of enterprises based on the number of persons engaged under three scales (1 – 9), (10 – 99) and (100 and above) in their reports. This report uses the same scale with terms of small, medium and large scales for above three categories respectively.

According to the Sample Frame, it became necessary to survey an enterprise in the Mannar district. However, as it was not practicable to survey a single industry in a distance place within a short time after corona lockdown in July 2020, Mannar district was not surveyed and is not included in the Table 3.2.

Table 3.2: District wise Distribution of Enterprises by Scale

Province	District	Number of enterprises by number of employees					
		Less than 10 Small Scale		10 – 99 Medium Scale		100 and above Large Scale	
		Count	%	Count	%	Count	%
Central	Kandy	15	7.43	4	7.02	2	5.88
	Matale	10	4.95	1	1.75	0	0.00
	Nuwaraeliya	5	2.48	1	1.75	0	0.00
	Total	30	14.85	6	10.53	2	5.88
Eastern	Ampara	6	2.97	2	3.51	0	0.00
	Batticaloa	10	4.95	0	0.00	0	0.00
	Trincomalee	7	3.47	0	0.00	0	0.00
	Total	23	11.39	2	3.51	0	0.00
North-Central	Anuradhapura	11	5.45	0	0.00	0	0.00
	Polonnaruwa	8	3.96	2	3.51	0	0.00
	Total	19	9.41	2	3.51	0	0.00

Province	District	Number of enterprises by number of employees					
		Less than 10 Small Scale		10 – 99 Medium Scale		100 and above Large Scale	
		Count	%	Count	%	Count	%
Northern	Jaffna	10	4.95	0	0.00	0	0.00
	Kilinochchi	2	0.99	0	0.00	0	0.00
	Mullaitivu	1	0.50	0	0.00	0	0.00
	Vavuniya	3	1.49	0	0.00	0	0.00
	Total	16	7.92	0	0.00	0	0.00
North-Western	Kurunegala	14	6.93	4	7.02	2	5.88
	Puttalam	1	0.50	0	0.00	3	8.82
	Total	15	7.43	4	7.02	5	14.71
Sabaragamuwa	Kegalle	17	8.42	0	0.00	0	0.00
	Ratnapura	13	6.44	1	1.75	0	0.00
	Total	30	14.85	1	1.75	0	0.00
Southern	Galle	13	6.44	2	3.51	0	0.00
	Hambantota	5	2.48	2	3.51	0	0.00
	Matara	15	7.43	1	1.75	0	0.00
	Total	33	16.34	5	8.77	0	0.00
Uva	Badulla	3	1.49	1	1.75	0	0.00
	Monaragala	4	1.98	0	0.00	1	2.94
	Total	7	3.47	1	1.75	1	2.94
Western	Colombo	5	2.48	27	47.37	16	47.06
	Gampaha	5	2.48	4	7.02	10	29.41
	Kalutara	19	9.41	5	8.77	0	0.00
	Total	29	14.36	36	63.16	26	76.47
National		202	100.00	57	100.00	34	100.00

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

The same data was analyzed with horizontal percentages and given in the Table A1-2 in the Appendix 1.

Though there are no any establishments with 100 and more employees in Ampara, Hambantota, Jaffna, and Matale districts, four power stations were enumerated in these districts which are with high investment and high turnover.

Table 3.3: Mini Power Plants Enumerated in the Survey

District	Power Plant	Capacity
Ampara	Bio Energy Solution	2.5 MW
Jaffna	Ceylex Windpower	20 MW
Hambantota	Lafg Solar Power Plant	20 MW
Matale	Roswattha Mini Hydro Power Plant	5 MW

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

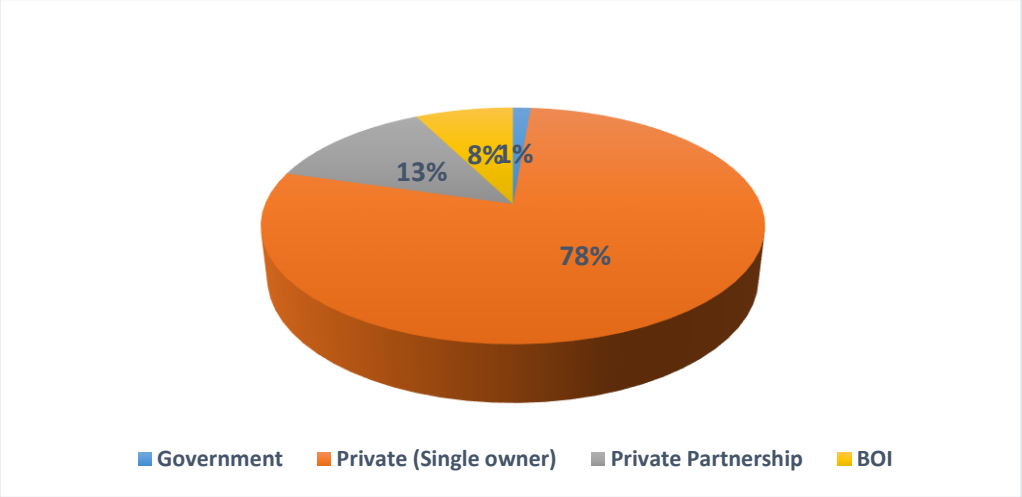
These enterprises are categorized under medium scale based on number of persons employed.

In addition, a Mini Hydro Power plant in Nuwara-eliya district was visited by an enumerator and that is listed under its company head office in Colombo which has about five power plants. Further, one more power plant in Monaragala district located in Sevanagala Sugar Factory too was visited and enumerated.

3.5 Ownership of the Enterprises Surveyed

Figure 3.3 shows the percentage distribution of the enterprises surveyed by the type of ownership. Accordingly, 22 enterprises are BOI industries which is eight per cent of the sample. Four enterprises are owned by the Government. About 78 per cent of enterprises are private industries.

Figure 3.3: Distribution of enterprises in the country by the type of ownership



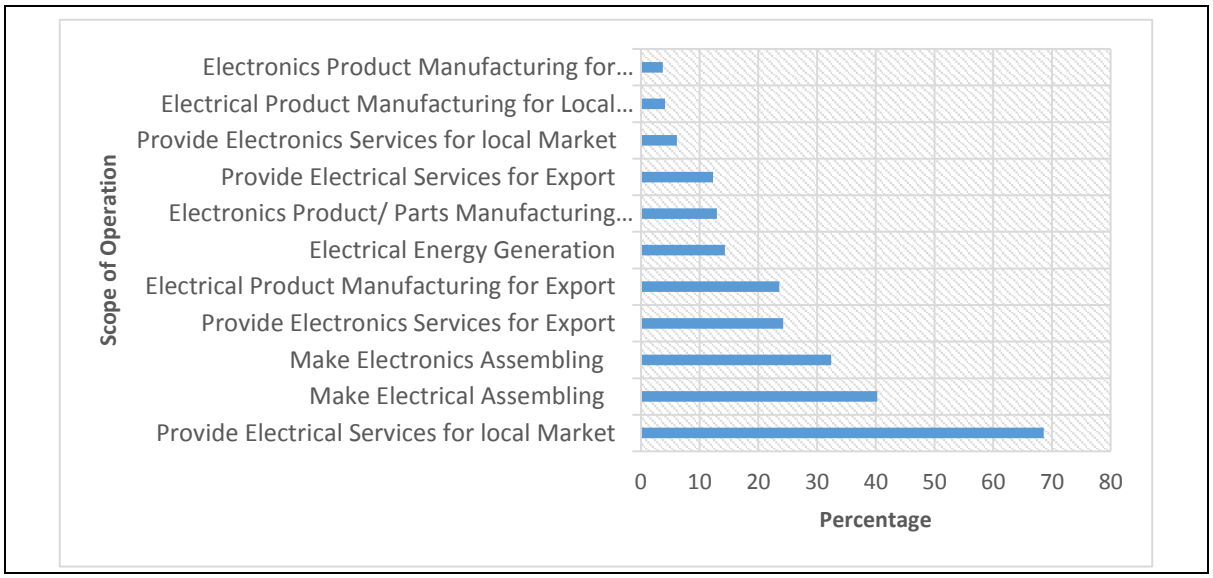
Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Province wise distribution of the enterprises by ownership is given in the TableA1- 3 in the Appendix 1.

3.6 Scope of Enterprises in Operations

Figure 3.4 gives the scope of enterprises in operation with multiple entries. Accordingly, 66 per cent of enterprises provide electrical services for local market, 39 per cent make electrical assemblies and 32 per cent make electronics assemblies.

Figure 3.4: Scope of Operations of Enterprises



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.7 Number of Employees in Electrical and Electronics Occupations

Table 3.4 shows the number of Electrical and Electronics Employees of Craft and Supervisory Levels occupations of the Sample of 293 Enterprises as Projected to population of 12,774 Enterprises and their monthly remuneration.

This survey has found about 204 small scale enterprises with less than 10 employees in the sample of 293 enterprises. Owners of these enterprises up to ten employees were considered as small-scale entrepreneurs and they are listed in the above table according to their field of operations. Remuneration column relevant to entrepreneurs were not filled as it was not practicable to collect such information.

Table 3.4: Number of Employees & their Monthly Remuneration in the Sample and Population

	Occupations	Number of Employees		Average Monthly Remuneration LKR)	Estimated Workforce in Population	A 95 % Confidence interval
		Male	Female			
Entrepreneurs	Small Scale Entrepreneurs in Electrical Works	117		-	5,101	(4,961-5,241)
	Small Scale Entrepreneurs in Electronics works	58		-	2,529	(2,430- 2,628)
	Small Scale Entrepreneurs in Solar works	5		-	218	(189 - 247)
	Small Scale Entrepreneurs in Motor Winding works	9		-	392	(353- 431)
Waged Employees	Electrical Supervisors	231	3	52,250	10,202	(10,004- 10,400)
	Electricians	839	5	31,000	36,796	(36,420- 37,172)
	Technicians (Electrical)	1,423	14	40,500	17,938	(17,675 -18,201)
	Technicians (Electronics)	145	9	40.500	2,454	(2,357- 2,551)
	Electrical Equipment Repairer	26	0	22,000	1,134	(1,068- 1,200)
	Electronics Equipment Repairer	172	3	29,600	7,630	(7,459 - 7, 801)
	Motor Winder	49	0	24,500	2,136	(2,045- 2,227)
	Solar Photovoltaic Installer	41	0	37,000	1,787	(1,704- 1,870)
	Electrical Draft Person	50	44	31,000	4,098	(3,973- 4,223)
	Operator / Electronics Line / Production Line [1]	1,800	2220	-	-	-
	Helper Electrical Works	62	2	21,500	2,790	(2,686- 2,894)
	Total	5,027	2,300	-	320,440	-
	Total of Male and Female	7,327		-		-

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Estimation of Workforce in respective occupation was done through projection of the number of employees in a respective occupation identified in the sample survey, to the population of the enterprises. It was done by dividing by sample size (293 number of questionnaires collected) and multiplying by population size (12,774). However, in the case of technician occupation, a very few enterprises, where large number of technicians are employed, were not considered for projection as it will give unrealistic

[1] This is not projected in this table and it is done in the Chapter 9.

numbers. Therefore, Projection was done without those large numbers and then they were added to the projected figures.

This survey has enumerated five Entrepreneurs in Solar works and its projection to population is 218. Total population of Solar companies given at the Focused Group discussion is 228 and it has 95 per cent accuracy. That is a reflection of the accuracy in this industry enterprise survey

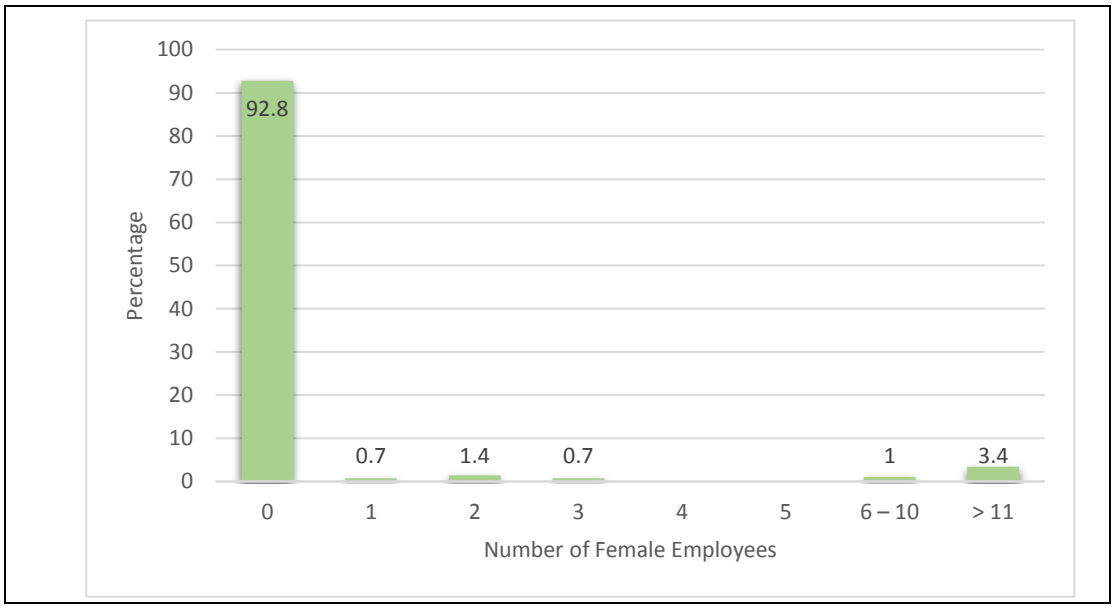
The Table 3.4 lists 844 electricians in the sample including five female electricians. The sample has 1,437 technicians (Electrical) including 14 females and 154 technicians (Electronics) including seven females. These technicians experienced and multi-skilled employees their salaries are higher than electricians and electronics craftsmen. Among 175 Electronics Equipment Repairers, Radio & TV Repairers are also included as it is difficult to differentiate Equipment Repairers from TV & Radio Repairers in many enterprises. The survey identified Electrical and Electronics Production Line Operators which sometimes may not be considered as electrical/electronics occupation. However, they have to identify the electronics/electrical components and do soldering and make electronics/electrical sub-assemblies. Many enterprises name the line operators with different designations such as component assemblers and production associates. Production line operators are mostly working in companies doing manufacturing of electronics components for export and therefore, its forecast in not given in the Table 3.4 and its forecast will be done in the Chapter 9 analyzing the exports.

Some of the occupations such as Electrical linesmen are not included in the Table 3.4 as they are not widely employed in formal industries.

3.8 Number of Females in Electrical and Electronics Occupations

survey had a focus to get number females in each craft and supervisory level electrical and electronics occupations. Figure 3.6 has presented the percentages of enterprises which employs female employees in electrical and electronics occupations and those percentages are very small. However, as the Table 3.4, shows 2,300 females are in employment and they are mainly employed as Production Line Operators/Production Associates and electrical draftspersons. When employers were questioned on how female employment could be promoted at the KIIs and FGDs, the answers they have given are incorporated in the training plan.

Figure 3.5 Percentage of Enterprises by Number of Female Employees



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.9 Monthly Remuneration of Craft and Supervisory Level Electrical and Electronics Occupations

The Survey inquired about monthly remuneration of each occupation and their averages are presented in the Table 3.4. Accordingly, average monthly remunerations of a Supervisor, Technician and Electrician are LKR 52,500, LKR 31,000 and LKR 40,500 respectively. These monthly remunerations are above the average wages prevailing in the labour market when compared to the monthly wages of the industry sector given in Labour Force Survey -2019.

However, Monthly remuneration of Electronics Equipment Repairer and Electrical Equipment Repairer are LKR 29,500 and LKR 22,000 respectively and that of Motor Winder is LKR 24,500. These are below the industry averages and that may be because these jobs are widely practiced in informal industries. Monthly remuneration of a Solar Photovoltaic Installer is LKR 37,000 and that could be the reason for many electricians to work in the Solar industry, as found in the Tracer study.

3.10 Estimation of Number of Electricians in Non- Electrical Establishments

The sample survey of enterprises is used to estimate the number of employees in sub sectors in Electrical and Electronics industry identified and shown in the flow chart in Figure 2.1. However, there are a large number of technical and related craftsmen engaged in electrical/electronics works in other sub sectors in manufacturing and services industry as well. The most common occupation in these economic divisions is the electrician. This occupation may sometime be designated as maintenance technician, but all their entry qualification is based on electrical skills.

These estimates are based on number of establishments in non-electrical sectors which were identified from the Reports on Economic Census 2013 / 14 Construction, Trade and Services and Annual Survey of Industries – 2018 which are the latest relevant publications of the Department of Census and Statistics.

Table 5.4- Economic Census 2013 / 14 Construction, Trade and Services (Formal Sector) has listed number of establishments under the categories based on number of employees of (35 – 99), (100 and above), (75 – 199) and 200 and above. Tables 5.8 & 5.10 of the report on Annual Survey of Industries – 2018 have listed number establishments in Mining & Quarrying, Manufacturing and Water, Sewerage and Waste management industries. Number of establishments identified from above information are listed in the Table A1- 6 and Table A1- 7 in Appendix 1.

Table 3.5: Estimation of Electricians in Non-Electrical and Electronics Establishments

Economic Sectors	Employee Range of Establishments	Number of Establishment	Number of Electrician in one Establishment - Experience based Judgment	Estimated number of Electricians
Economic sections of Construction, Trade and Services Activities	35 -99	725	1	725
	100 and above	171	2	342
	75 -199	533	2	1,066
	200 and Above	330	3	990
Industry Sectors of Manufacturing, mining etc.	40 -99	3067	2	6,134
	100 and Above	2119	3	6,357
Total Number of Electricians in non-Electrical and Electronics Sectors				**15,614**

Source: Worked out from the Table 5.4- Economic Census 2013 / 14 Construction, Trade and Services (Formal Sector) and Tables 5.8 & 5.10 -Annual Survey of Industries – 2018 Tables 5.8 & 5.10 -Annual Survey of Industries – 2018

Number of electricians in non- electrical establishments are estimated and listed in the Table 3.5, based on number of electricians in few non electrical and electronics establishments enumerated in the industry survey.

The electricians in non-Electrical and Electronics sectors are employed to attend to maintenance works and many enterprises designate them as Maintenance Technicians. There may be mechanical and civil based maintenance Technicians as well but here, only electricians or electrical based technicians are estimated and they are counted as electricians. Accordingly, number of Electricians / Electrical Technicians in non-electrical and electronics sector is estimated to be 15,614 as indicated in Table 3.5.

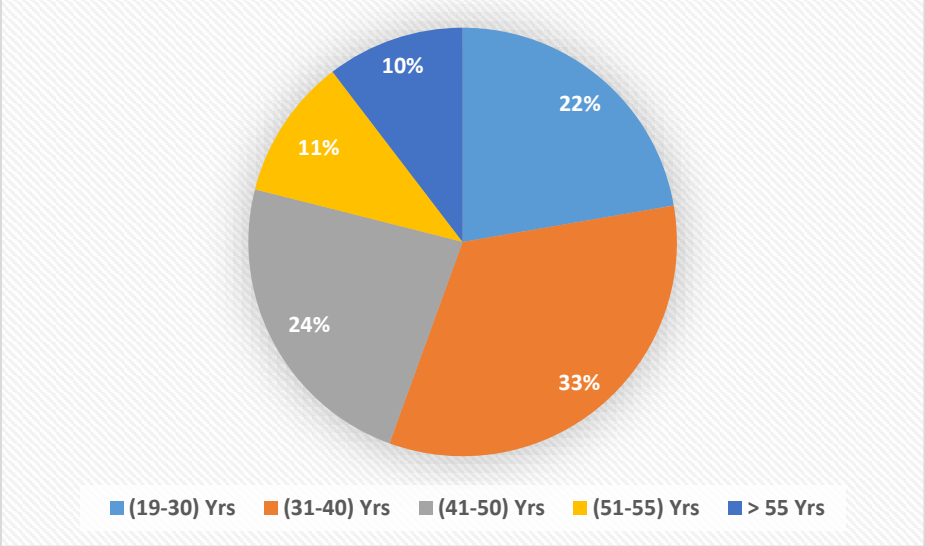
Further, there is a large number of community electricians who work as own account electricians or freelance electricians. That group is not included in the survey and the Public Utility Commission has collected the details of 22,403 community electricians for their electricians licensing programme. About 298 community electricians have already obtained the NVQ certificates and balance 22,105 community electricians need to be assessed for NVQ Level 4 for licensing purpose. The district wise list of community electricians is given in the Table A1-8 of Appendix 1.

At Key Informant Interviews, one respondent pointed out that electricians leave the jobs from waged employment to self-employment as daily wage is higher than monthly wages and therefore, community electricians have an increasing trend.

3.11 Provincial Distribution of Number of Employees by Age

Figure 3.6 and Figure 3.7 depict the numbers of technical employees in age categories at National Level and by provincial level respectively. Accordingly, 22 per cent of employees are in (19 - 30) years age category and 33 per cent are in (31 -40) years age category. These percentages are declining with increasing ages. Young age categories have higher percentages and that may be because industry is growing and employees leave the waged employment or leave the sector after gaining some experience.

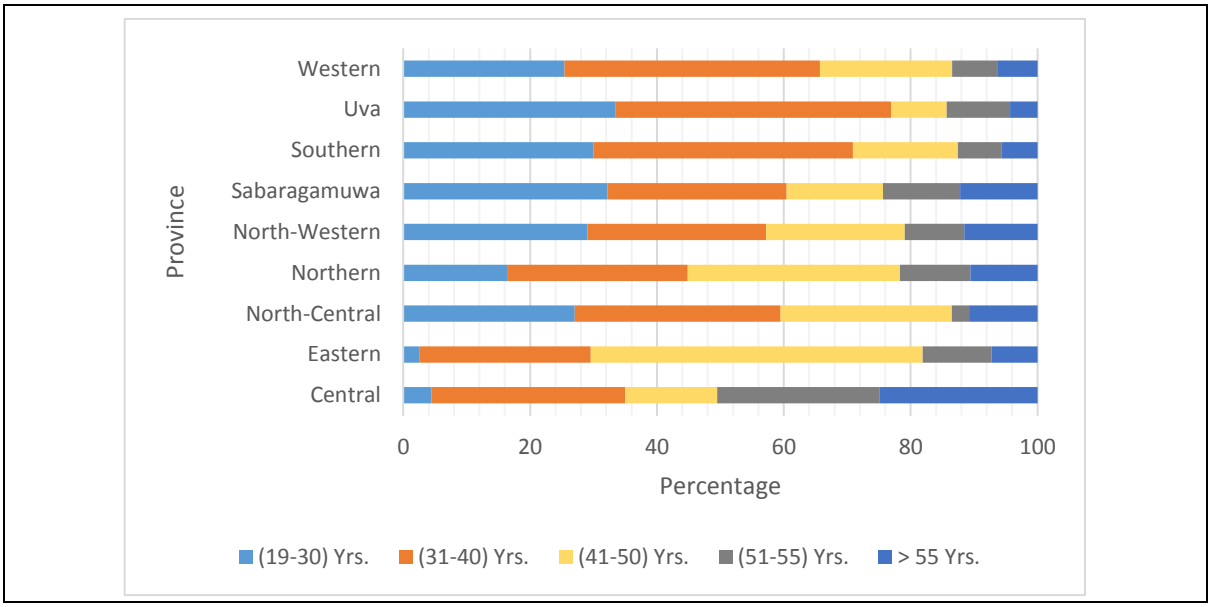
Figure 3.6 Percentage of Technical Employees in Age Categories at National Level



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Age wise distribution of employees at provincial level are presented in the Figure 3.7 and accordingly 19 - 30-years age category has small percentage in Central and Eastern province and the reasons for such low percentages were not found in the survey.

Figure 3.7: Percentage of Technical Employees in Age Categories by Province



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.12 Responses of Enterprises on Availability of Applicants for Vacancies

The survey Questionnaire had a question to evaluate the availability of applicants for vacancies and responses of industries to it are presented in the Table 3.6.

In overall, 65.5 per cent respondents have said that no shortage of applicants for vacancies in Electrical and Electronics occupations but 15.1 per cent has said that applications received are sufficient but applicants have no required skills. Still, in overall about 34.4 per cent of respondents have said that they are experiencing skills gaps of applicants to their vacancies.

Table 3.6: Responses of Enterprises on availability of Applicants for Vacancies in Electrical and Electronics Occupations at Crafts level

Occupations	More than sufficient applicants	Sufficient applicants	No sufficient applicants	Sufficient applicants but no required skills	Less applicants and they even do not have sufficient skills	Sufficient Applicants 2nd + 3rd + 5th columns	No sufficient Applicants 4th +6th Columns
All Occupations in general	13.6%	36.8%	23.6%	15.1%	10.9%	65.5%	34.5%
Electrician	12.1%	45.5%	19.2%	18.2%	5.1%	75.8%	24.2%
Electronics Technicians /Repairer	33.3%	0.0%	16.7%	0.0%	50.0%	33.3%	66.7%
Electrical Appliance Repairer	8.3%	19.4%	19.4%	27.8%	25.0%	55.6%	44.4%
Motor Winders	0.0%	40.0%	20.0%	10.0%	30.0%	50.0%	50.0%
Technician (Electricians in Maintenance)	21.6%	35.3%	23.5%	7.8%	11.8%	64.7%	35.3%

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

In key informant interviews with senior officials of enterprises, shortage of applicants was not presented as an issue though some gaps in skill levels were explained. For an example, one enterprise has received more than 100 applications with sufficient qualification for one vacancy of Electrical maintenance technician. The File of applications was shown to an interviewer and it had applications from NVQ 5 & 6 holders and an application from a graduate of a foreign university though they have advertised the vacancy for NVQ level 4. A representative another leading Enterprise stated that in electrical sector supply of and demand for human resources are balanced though skill gaps are found. It was explained that if 100 vacancies of electricians are advertised, usually 100 applications are received and therefore no choice for screening. It was further said that if 100 ICT vacancies are advertised, the trend is to receive 1000 applications.

3.13 Responses of Enterprises on Some Important Attributes of NVQ, TVET and Skills Development

Industry survey Questionnaire had questions to get following information from enterprises.

i. Awareness and Use of NVQ
    a. NVQ Awareness of Enterprises
    b. Enterprises considering NVQ for recruitment of staff and availability of NVQ holders in their staff
    c. Enterprises Recruiting TVET Passed Outs,
ii. Enterprises Providing Apprenticeship & OJT
iii. Enterprises with Skill Upgrading programmes for their staff
iv. Enterprises with Good Relationship with TVET Institutions

Responses of enterprises for above questions are analyzed at national level and at provincial level and presented in Figure 3.8 and Figure 3.9.

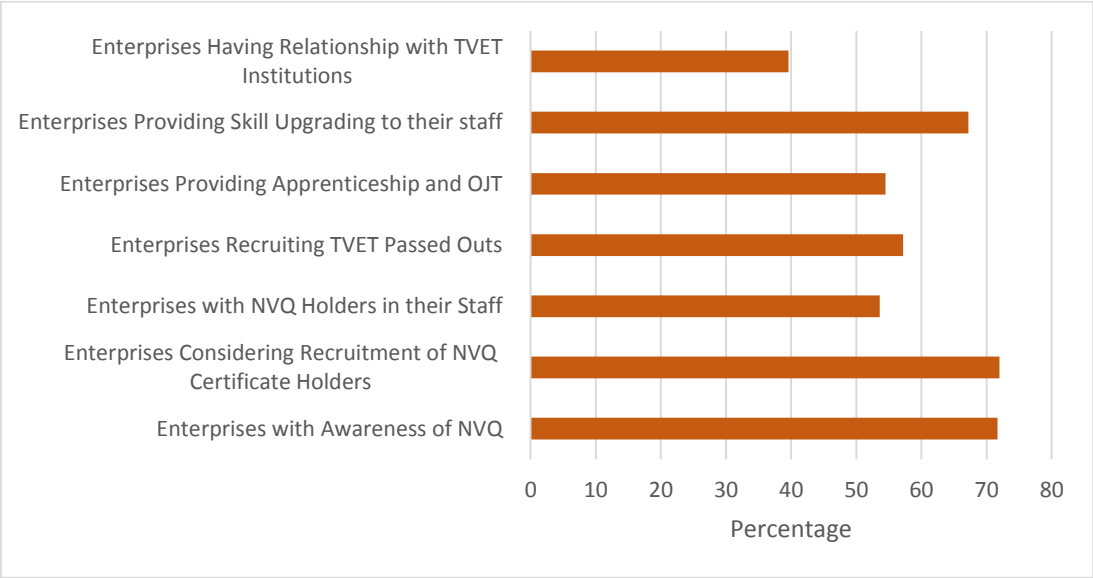
3.13.1 Awareness and Use of NVQ by Enterprises

According to the Figure 3.8, seventy-four per cent (74.1) of enterprises in the sample have reported that they are aware of the NVQ Framework. When NVQ awareness in provinces are considered as presented in the Figure 3.9, enterprises in the Western province have the highest 30.5 per cent on awareness and Central and Southern province have above 10.0 per cent awareness on NVQ. All other provinces have lesser awareness.

fifty-three per cent (53.4) enterprises have said that they have NVQ certificate holders in their staff and from which 42.0 per cent enterprises are in the Western province. Here also Southern and Central province performance in use of NVQ is better than other provinces. However, these analyses show that NVQ needs to be promoted among enterprises in outstations/ distant provinces.

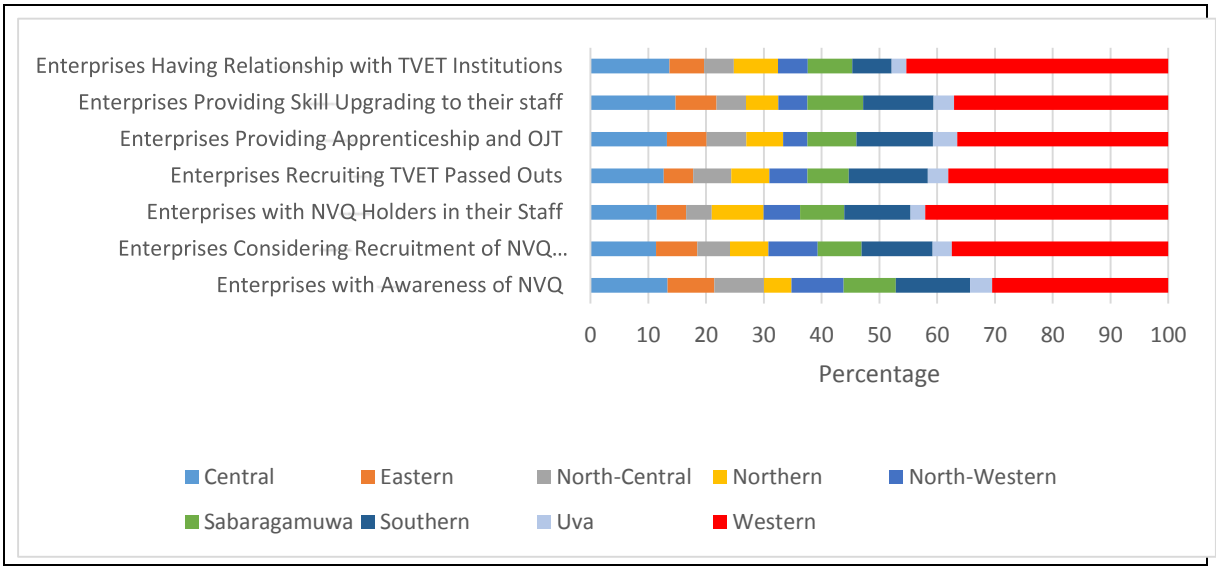
According to the Figure 3.9, seventy-two per cent (72.0) of enterprises consider NVQ Certificate holders for recruiting to their staff and among them, 37.4 per cent are from the Western Province. Among the enterprises considering NVQ Certificate holders for employment, more than 10.0 per cent are from Southern and Central Provinces. However, during survey, whether industries prefer NVQ to other qualification was not asked but according to Key informant interviews and the Focused Group Discussions, industries have institutional preferences such as Ceylon German Technical Training Institute (CGTTI) and Industrial Engineering Training Institute (Former Apprenticeship Training Institute of NAITA) over NVQ.

\Figure 3.8: National Level Presentation of Responses of Enterprises to the questions on NVQ Awareness, Consider Recruiting NVQ Holders, NVQ Holders in the staff, Recruit TVET Passed Outs, Provide Apprenticeship & OJT, Provide Skills Upgrading and Have Good Relationship with TVET Institutions



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Figure 3.9: Province wise Responses of Enterprises to the questions on NVQ Awareness, Consider Recruiting NVQ Holders, NVQ Holders in the staff, Recruit TVET Passed Outs, Provide Apprenticeship & OJT, Provide Skills Upgrading and Have Good Relationship with TVET Institutions



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.13.2 Enterprises Recruiting TVET Passed Outs

Industry Survey evaluated the number of enterprises in the sample who recruit TVET passed outs and found that 57.2 per cent are recruiting TVET passed outs. In the Western Province, above 35 per cent of institutions recruit TVET passed out and this percentage is lower because, sample of the industry survey had substantial number of informal sector industries.

3.13.3 Enterprises Providing Apprenticeship & OJT

According to Industry survey findings given in the Figure 3.8, there are 54.5 per cent enterprises providing apprenticeship and On the Job training for NAITA and TVET Trainees. As Figure 3.9 shows, here also Western Province leads with 37.6 per cent of its enterprises and Central and Southern provinces also have higher values than other provinces. This disparity in percentages may be due to larger proportions of small-scale enterprises operating in other provinces.

3.13.3 Enterprises providing skills upgrading to their staff

As shown in Figure 3.8, sixty-seven point two (67.2) per cent enterprises are providing skills upgrading opportunities for the staff. Their responses on types of training provided are listed in the Table 3.7.

Table 3.7: Responses on Skills Upgrading Programmes provided by Enterprises

Type of Programme	Responses
Advanced Technology in the Subjects	Almost all responded
Computer	Few, no significant number of responses
Quality Management	
Kaizen	
Trouble shooting in Electronics circuit	
PLC	
Multi Skilling	

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

The skills upgrading of staff would be further analyzed with the findings of the Key Informant Interviews and Focused Group Discussions.

3.13.5 Relationship between Electrical and Electronics Enterprises and TVET Institutions

Figure 3.8 and Figure 3.9 have presented the percentages of enterprises having good relationship with TVET institutions and accordingly 39.6 per cent of enterprises have

stated that they are having good relationship with TVET institutions. Further, TVET relationship with industries in the Western province is stronger than other provinces, and that need to be improved.

3.14 Positive and Negative Attributes of TVET Passed- outs as Commented by Employers

Table 3.8 has listed the positive and negative attributes of TVET passed out as commented by employers during the industry survey. Here 129 employers have commented on positive attributes and 120 have commented on negatives. A large number has not responded to this question too. Among negatives, low skills and poor attitudes are the most dominant. In this study, at Focused group discussions with industry groups, many commented on negative attributes of TVET passed outs. However, in the industry survey, many have given positive attributes which are quite opposites to those negatives. This may be due to different qualities and standards of pass outs and different management cultures of enterprises.

Table 3.8: Positive and Negative Attributes of TVET Passed out as Commented by Employers Recruiting TVET Passed outs

Positive Attributes	Number	%	Negative Attributes	Number	%
Come with Skills	29	22.5	low skills	17	14.2
Interest in learning	14	10.9	Poor Attitude	17	14.2
Commitment to work	11	8.5	Lack of Discipline	8	6.7
Good working habits	11	8.5	Not stay for long	6	5.0
Good in theory / knowledge	10	7.8	Expect high salary	9	7.5
Good Attitude	9	7.0	Leave problem	5	4.2
Knowledge about the field	6	4.7	Low knowledge	4	3.3
Good Attendance	5	3.9	Not regular	4	3.3
Some are fast learners	4	3.1	Poor work ethics	4	3.3
Good conduct	3	2.3	Priority for Salary	4	3.3
Good training	3	2.3	Not aware of the field of the job / training	3	2.5
know basics	3	2.3	Low interest in Learning	3	2.5
Other Positive comments	21	16.3	Low responsibility	2	1.7
-	-	-	Not committed	2	1.7
-	-	-	Not honest (Theft)	2	1.7
-	-	-	Not responsible	2	1.7
-	-	-	Poor phone ethics	2	1.7
-	-	-	Reluctant to do hard work	2	1.7
-	-	-	Other Negative Comments	24	20.0

Positive Attributes	Number	%	Negative Attributes	Number	%
Number Responded	129	100.0	Number Responded	120	100.0
No responses	164			173	
Number of Employers recruiting TVET Passed outs	293	-	-	293	-

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.15 Expansion of Enterprises and Policy Issues

Industry Survey questionnaire has following eight questions on expansion / downsizing and policy
issues.

i. What is your expectation of further development or downsizing of your operation in next five years?
ii. What are the new technologies expected in Electrical and Electronics industry in next five years?
iii. What are the new occupations that may be emerging in Electrical and Electronics industry in next five years?
iv. How do you dispose the E-waste of your company?
v. Do you consider employing disables?
vi. What are the effects of COVID-19 on your company?
vii. Are there any national policies that affect negatively on Electrical and Electronics industry?
viii. Any other comment not covered by above questions.

As these are open ended questions, they were coded and sorted out to produce tables which are analyzed below.

3.15.1 Expansion/Decline Expected in next five years

This question had 222 responses as presented in the Table 3.9. Accordingly, only three have stated that their businesses are declining. About 75 per cent enterprises have stated that businesses are expanding but expansions were not specified. About 2.7 per cent intend to have foreign relationship and 6.8 per cent expect to introduce new technologies.

Table 3.9: Expectation of further development/downsizing of Enterprises in the Next 5 Years

Expectations of Further Development	Responses	Valid Percent
Establish a new business	14	6.3
Expand the industry	167	75.2
Implement a new branch/ storage of the existing business	7	3.2
Develop Connections with foreign countries	6	2.7
Computer/ other repairs	6	2.7
Marketing the electronics components	1	0.5
New technology (audio development / solar/ CCTV)	15	6.8
Marketing using social media	3	1.4
Decline the business	3	1.4
Total Responses	**222**	**100.0**

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.15.2 Expectation of on new technologies for Electrical and Electronics Industry in next five years

There were 178 responses on expectation of new technologies and 40.5 per cent are expecting penetration of equipment with advanced technologies as presented in the Table 3.10.

Table 3.10: Expectation of new technologies for Electrical and Electronics Industry in next five years

Types of new technologies	Frequency	Valid Percent
System technology (computer program development)	56	31.5
High Technological Equipment	72	40.5
Solar Power	26	14.6
Nano technology	20	11.2
Improvements in Electrical & Electronics circuits	4	2.2
Total	**178**	100.0%

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

About 31.5 per cent are expecting computer progarmmes to improve the systems which means system automations and connectivity as explained in the Key Informants interviews. About 14.0 per cent and 11.0 per cent have stated the expansion of solar power use and application of nano technology respectively in next five years.

3.15.3 New occupations that may be emerging in electrical and electronics industry in next five years

Answers given to the question on emerging occupations in next five years in Electrical and Electronics sector are given in the Table 3.11. Some of those occupations are already emerged and most noteworthy answers are 'Multi skilled technician positions' and 'Convert repair sections with assembling sector'. These development trends were highlighted at the Key Informants interviews and Focused Group discussions too.

As most equipment and technical applications have both electrical and electronics combined with software, new occupations will be emerging which requires skills in all these technologies. At Key informant interviews, a name proposed for the occupation with integrated skills is the "System Integrator". Though TVET does not have integrated courses, many trainees following different courses but aspiring to acquire these integrated skills were found in the tracer study done for developing this VET Plan.

Other emerging trend is repairing to be converted to Replacements. As pointed out at Focused Group Discussion, parts replacing practice is emerging due to two reasons.

i. Most electronic components are soldered by automated soldering and it is difficult to maintain same soldering quality in hand soldering.
ii. Technicians get dominance with software skills than hand on technical skills

This has led to increase the costs of repairs and import of parts. Therefore, youth with technical aptitudes who have passions to enjoy hand on skills / manual dexterity should be chosen to follow electrical and electronics courses.

Table 3.11: New occupations that may be emerging in electrical and electronics industry in next five years

Responses on Emerging Occupations	Responses	Valid Per cent %
Multi technician positions	34	34.7
IT Developer	10	10.2
Programmer/ designer/ system manager	30	30.6
Convert Repair sectors to Assembling	7	7.1
Electronics Appliance Designer	10	10.2
E- waste recycle operator	2	2.0

Responses on Emerging Occupations	Responses	Valid Per cent %
E- Sales person	1	1.0
New inventors	4	4.1
Total Responses	**98**	100.0

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Further, Electronics Appliance Designer and E-sale person proposed by respondents are already in practice and they will have expanded demand in next five years.

3.15.4 Methods of Disposing the E-Waste

Responses for the question on methods of disposing E-waste are listed in the Table 3.12 below. Majority of enterprises hand over the waste to local government authorities and approved E-waste collectors. Many electronics repairers hand over removed components back to customers and they pass the e-waste issue to customers. Many large-scale enterprises send the e-waste to a cement factory to burn in a high temperature kiln.

Table 3.12: Methods of Disposing the E – wastes by Enterprises in the Sample

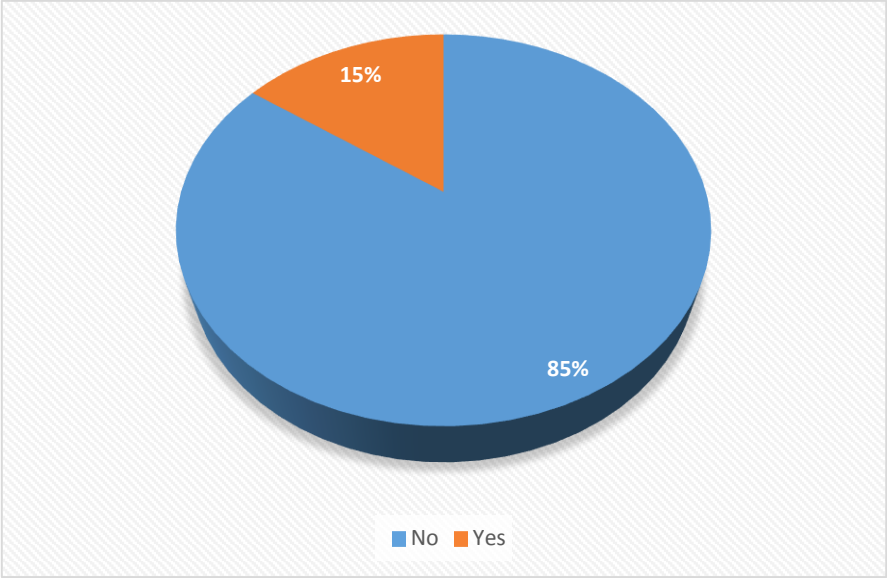
Responses on Methods of Disposing the E – waste	Responses	Valid Percent
Waste (Parts removed) Return to customers	41	18.4
Return to intermediaries approved by the Central Environmental Authority	32	14.4
Given to Local Government Authority	55	24.7
Send to Burning at a high temperature.	15	6.7
Re use and Given to repairers for re-use	51	22.8
Sold by calling tenders	3	1.3
Given for Recycling	26	11.7
Total Responses	**223**	100.0

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.15.5 Employing Persons with Disabilities

All have responded to this particular question and about 15 per cent of enterprises are ready to employ persons with disabilities. They have not clearly indicated the type of disabilities considered by them.

Figure 3.10 Responses by Enterprises on Employing Persons with Disabilities



Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

3.15.6 Effect of National Policies on Electrical and Electronics Industry

One Hundred and fifteen enterprises have responded to the question on effect of national policies and those responses are tabulated with percentages in the Table 3.13. Accordingly, 36. per cent have said that limitations enforced on imports of electronics components have a negative effect on performance of Electronics Industry. Eighteen percent and 14 per cent of respondents have stated that the high prices of imported products and components and high import tariff have become a problem for the industry. About 30 per cent have said that import of low-quality equipment and raw materials has also contributed for poor performance and loss of income of enterprises.

Table 3. 13: Responses on Effects of national policies on Electrical and Electronics Industry

Responses on Effects of national policies	Responses	Valid Percent %
Issues may arise if-electronics devices / parts are not imported	36	31.3
High Tariff on imported EE devises and components	14	12.2

Responses on Effects of national policies	Responses	Valid Percent %
High prices of imported parts / components	18	15.6
Electricians must have minimum qualifications (NVQ certificate)	4	3.5
Low quality equipment/ raw material	30	26.1
Unable to give proper estimates of products/ raw material to customer (May not very relevant)	6	5.2
Lack of Awareness on policy issues	4	3.5
No proper way of garbage disposal	1	0.9
Declining of work	1	0.9
Electricity interruptions	1	0.9
Total Responses	**115**	**100.0**

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Other comments not covered by above questions

Respondents of enterprises were requested to make any other comments on any subject that has not been covered by previous questions and their responses are listed in the Table 3.14.

Table 3.14: Other comments Expressed by Respondents of Enterprises

Other Comments made by Respondents	Responses	Valid Percent %
Not enough skills in practical applications of theories	3	3.5
Government intervention Required to expand business	39	45.3
No proper way of garbage disposal	3	3.5
Trainees should be supervised by TVET	22	25.7
High price in imported raw material (Repeat)	2	2.3
High quality products could be produced within the country	9	10.5
Need Loan Facilities	4	4.6
Lack of awareness of policy issues	4	4.6
Total Responses	**86**	**100.0**

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

They have pointed out eight issues but new comments may be the need of government intervention for expansion of the industry, reduction of high prices of raw materials and need of loan facilities.

3.16 Forecast of Demand for Skilled Craftsmen in Electrical and Electronics sector in next five years

The forecast of demand is a very important component of a VET Plan as it is required to estimate skills gaps in comparison with skills supply. Skill gap is the difference between demand for skills and supply of skills and training plan is prepared to bridge possible skill gaps. Therefore, forecast is required for entry level occupations for which training supplies are available. If training supply is not available for any occupations identified in the demand table (Table 3.4), total demand would be the skills gaps and training plan will be prepared to initiate new training programmes.

In the beginning of industry survey, multiple approaches were built in to the design to make forecast of recruitment for next five years. The Questionnaire survey collected recruitments of technical staff in last three years from 2017 to 2019. It also collected employers' estimates of recruitment in next five years from 2021 to 2025 too. Recruitment trend worked out from the eight-year data could be used to make recruitment forecast for the total population of enterprises in the Electrical and Electronics industry in the next five years.

The other methods planned were to make the forecast based on replacement and growth rate based on either contribution of Electrical and Electronics Sector to GDP or Growth of Energy Generation & Sales. However, at present, any growth forecast may have some doubt or confusion due to the impact of COVID and therefore recruitment trend worked out from recruitment figures given by industries would be safer to make the man human resources demand forecast.

The survey collected the percentage of retirement and resignation for foreign employment as they need replacement. However, the total resignation figures were not collected as there could be mobility within the industry which needs no replacement when the whole system/ total enterprise population is considered.

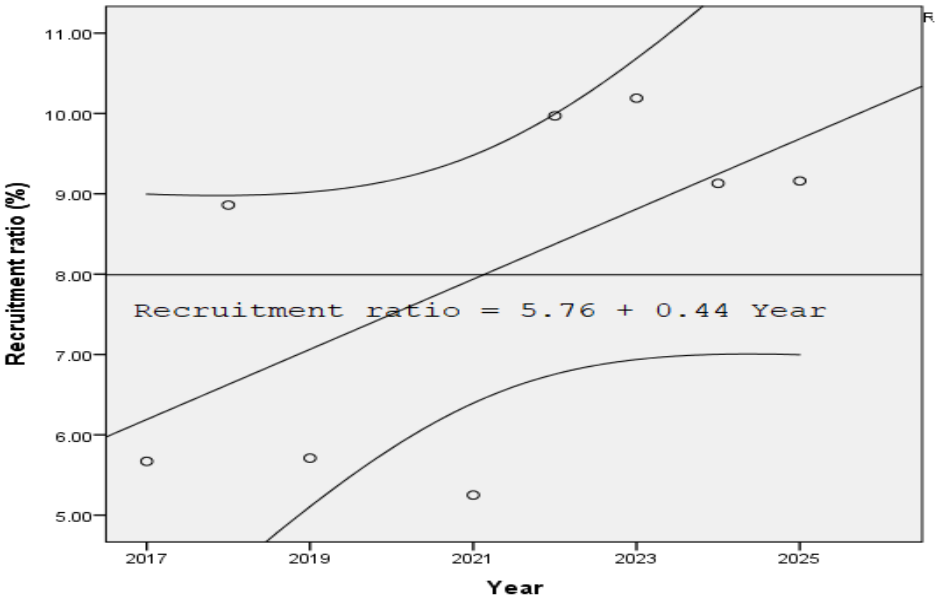
Table 3.15 below gives the figures for Recruitment for eight years, Retirement, Resignation for foreign employment and it has a self-reflection on how recruitment, retirement and resignation ratios have been worked out. As it was decided to use recruitment ratio to make forecast on recruitment, eight-year recruitment ratios were plotted and recruitment trend line has been worked out as displayed in the Figure 3.11. There are two curves above and below the trend line and they represent the confidence levels. Recruitment trend is given by the line equation of '5.76 + 0.44 x Year' which was then used to forecast the recruitment.

Table 3.15: Recruitment, Retirement, Resignation to go for Foreign Employment and Recruitment Forecast for next five years of Craft Occupations

Year	Recruitment Forecasted			Retirement			Resignation for foreign employment			Recruitment Forecast				
	2017	2018	2019	2017	2018	2019	2017	2018	2019	2021	2022	2023	2024	2025
Recruitment, Retirement, Resignation,	420	656	420	44	63	50	79	72	79	389	738	754	676	678
Technical Employees in 2020 in the Sample	7,327													
Recruitment Ratio %	5.7	8.9	5.7											
Retirement Ratio %				0.6	0.9	0.7								
Resignation to go abroad Ratio %							1.1	1.0	1.1					
Forecast on Recruitment in next 5 years %										5.3	10.0	10.3	9.2	9.2
Average Ratios	8.93%			0.71%			1.04%			8.80%				

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

Figure 3.11: Annual recruitment Ratio Vs. Years



Source: Worked Out from Table 3.16

Table 3.16: Forecast of Recruitment for Electrical, Electronics Occupations in Craft and Supervisory at Entry Level to Labour Market.

Occupations	Estimated Number in EE Enterprises	Estimated Number in Non - EE Enterprises	Forecast on Recruitment based on Recruitment Ratio 5.76% + 0.44 per Year				
			Year				
	2020		2021	2022	2023	2024	2025
Electrical Supervisors	10,202	-	633	677	722	767	812
Electricians	36,796	15,614	3,249	3,480	3,711	3,941	4,172
Technicians (Electrical)	17,938	-	1,112	1191	1270	1349	1428
Technicians (Electronics)	2,454		152	163	174	185	195
Electrical Equipment Repairer	1,134	-	70	75	80	85	90
Electronics Craftsmen/ Equipment Repairer	7,630	-	473	507	540	574	607
Motor Winder	2,136	-	132	142	151	161	170
Solar Photovoltaic Technicians	1,787	-	111	119	127	134	142
Electrical Draft Person	4,098	-	254	272	290	308	326
Helper Electrical Works	2,790	-	173	185	198	210	222
Total Estimated number of Electrical and Electronics Employees	102,579		Production Associates/ Line Operators not included				

Source: TVEC (2020) Industry Survey of Electrical and Electronics Enterprises for VET Plan

These forecasts of recruitments will be compared with the training supply to find out the skill gaps.

3.17 Recommendations

Based on the analyses of Industry survey findings, following recommendations could be made for the Training plan.

i. It is necessary to promote NVQ among industries especially outside the Western Province.
ii. Strengthen linkage between TVET Institutions and Industry.
iii. Make comparison of forecast of recruitments in the Table 3.16 with the training supply.
iv. Production Line Operator and Electrical Draft Person would be new occupations to be considered in the Training Plan.

Chapter 04: Training Needs Identified Through Key Informant Interviews

4.1 Introduction

Key informant interviews (KII) are qualitative in-depth interviews with selected individuals who provide needed information, ideas, and insights on a particular subject.

The purpose of key informant interviews held with industry leaders and experts who have knowledge and understanding, particularly informed perspectives on skills issues was to learn the nature and extent of these issues and get recommendations for solutions. However, it may not be very comfortable to discuss sensitive issues and to get in-depth information.

For development of this VET Plan, Key Informant Interviews were held with 26 industrialists based on a set of guidelines or semi-structured questionnaire. In addition, two enterprises made written submissions and they were interviewed by telephone. List of Industrialists is given in Appendix 2 and findings of 28 KIIs are summarized in this chapter under following sub-titles.

i. Shortage of skilled personnel
ii. Recruitment of staff
iii. Skill Gaps
iv. NVQ Issues
v. New National Competency Standards and CBT Curricula proposed for Development
vi. Training of staff
vii. Linkages between Training Centres and Industry
viii. Gender
ix. Innovative (Emerging) Technologies
x. E-Waste Disposal
xi. Policy Issues
xii. Management Practices
xiii. Recommendations

4.2 Shortage of skilled personnel

Following issues on shortage of skilled personnel were highlighted at Key Informant Interviews.

i. None of the key informants emphasized regarding the shortage of electricians and those at higher levels of employment. It was pointed out by one leading organization that during the 2007 / 2008 period, there was a shortage of applicants for Electrician and Technician positions and at present there is no shortage of applicants for Electrician and Technician positions.

ii. One reputed organization pointed out that there is no surplus supply of electricians either. It was pointed out that when applications are called for 100 vacancies of electricians, usually about 100 applications are received and therefore there is no choice or screening. However, it was said that when applications are called for 100 IT vacancies, usually more than 1000 applications are received.

iii. Youth leave monthly waged employment in formal industry to work on their own, as daily wages are higher than monthly wages. Some of them returned back after about one to two years. Reasons quoted were that poor financial disciplines, inability to work independently and inability to have good relationship with customers.

iv. However, some shortage of PCB repair craftsmen was reported by Key Informants, who intend to recruit electronics craftsmen at NVQ Level 3.

v. Key officials of Electronics components manufacturing companies for exports pointed out the difficulty of recruiting Production line Operators / Production Associates. However, this problem is mainly acute in Investment Promotions Zones (IPZ) and not in outstations.

vi. Automation of manufacturing processes have reduced the demand for production line employees

4.3 Recruitment of staff

Strategies followed by industries to recruit their operational staff are listed below. Recruitment is critical with production line operators due to low retention rate and majority stay in the job for short periods of three to five years

i. Some companies obtain the services of Manpower Suppliers to recruit skilled personnel though some companies strictly said 'no' to manpower suppliers.

ii. Employees bring prospective employees for employment. This is a strategy used to find Production Line Operators

iii. Some companies obtain the cooperation of Divisional Secretariats to find staff

iv. Some companies have tied up with some training centres to obtain their skill requirements for employment and provide on the job training for those who complete training from TVET institutions and absorb good trainees. However,

some companies have not been able to get any cooperation from TVET institutions to recruit trainees.

v. Some companies establish their production facilities in outstations to address the labour shortage at operational levels.

4.4 Skill Gaps

It is well accepted that competent personnel will be the drivers of change, growth and innovation. In general, although companies were not critical about non-availability of skilled personnel, they highlighted skills gaps observed / experienced by them. Gaps in technical skills and soft skills highlighted at these interviews are listed below.

4.4.1 Gaps in Technical skills of Supervisors and Senior Officers

a. Hands on Experience
b. Lack of technical flexibility (design, organize, and implement new technologies to adapt to business process changes)
c. Data analyses skills
d. Lack of Business Development skills, Tendering,
e. Machine/tools arrangements for manufacture of new products
f. Employees are not performing to meet expectations of Schemes of Recruitment

Hands on experience is an issue in present day technical courses as hands on skills are not inculcated during school days and it is difficult to give hand on skills after starting technical courses. When technical employees lack experience in use of machine tools, technical flexibility will not be maintained. KII with one research company highlighted the need of development of hands- on skills during schools and those explanations are given in the box below.

a. *Young children with talents* and skills for innovations/inventions need to be captured and nurtured very early. *Identify talents as early as possible and help them to achieve excellence.*
b. However, the parents' mindset is to persuade children to do well in studies and prevent them uncovering their latent creative skills and kill natural talents for the sake of conventional education.
c. Our culture prevents such early childhood creativity.
d. *Western countries allow children to develop skills set, during their schooling but here in Sri Lanka acquiring such manual skills is not given any prominent place.*

4.4.2 Gaps in Soft skills of Supervisors and Senior Officers

a. Mind Gaps (Employees lack skills to identify the gaps in their work and in technology use)
b. No teamwork. Many use the slogan **'I can't work with this person'**
c. Language barriers
d. Fire, Health and Safety, and First Aid
e. Lack innovation skills
f. Sales skills
g. Speaking styles
h. Empowering next generation
i. Record Keeping
j. No focus on workplace learning
k. Do not see the whole picture nor the inter-related links of the works
l. Do not prioritize the works to attend critical work first
m. Poor Attitudes
n. 'Know everything' attitude
o. No Sensitivity and commitment to quality
p. Customer Handling. Need to be customer oriented
r. Low ownership of the job– Do not demonstrate Accountability

Major issue here is 'not seeing the whole picture' and that is an issue of development of skills beyond competencies. For example, NVQ is a competency certificate which is awarded after assessment against competency standards. Accordingly, competency is the ability to work in compliance with standard procedures. Dreyfus and Dreyfus (1986) model of competency development, two more levels beyond competency have been defined. These are Proficiency and Expertise. Accordingly, competent persons follow standardized and routinized procedures and proficient person sees the situation holistically and perceives deviations from the normal pattern. Expert no longer relies on rules, guidelines or maxims and get intuitive grasp of a situation.

When workplace is seen through this concept, two scenarios could happen.

a. Only experienced employees will come to proficient level. Even with experience, some employees do not come to proficiency and expertise levels.
b. Employers expect proficient level performance from all employees

In a march to proficiency, employees acquire all relevant technical and soft skills listed above. To facilitate all employees to reach proficiency and to enable employers to understand the competency level of employees, it is necessary to have performance Management system. In fact, some exporting companies have prepared skills matrix for their company staff which defines competencies required for all positions and thus for the whole organization. A rating system is defined where staff is assessed at four skill levels.

(D- Not yet developed, C- Developing, B- Competent, A- highly Competent and able to train others). This is a performance management system.

(https://www.cornerstoneondemand.com/glossary/skills-matrix/)

4.4.3 Gaps in technical skills of Craft Occupations

i. Many Electricians demonstrate inadequate skills in following subject areas

a. Basic Practical skills
b. PLC Programming (PLC software)
c. Industrial wiring for extra low voltage applications (installation of fire security /burglar alarms and CCTV camera etc.)
d. Identification of tools
e. Application of IEE regulations
f. Wiring regulations of other countries
g. Power factor correction,
h. Motor Controls,
i. Protection and safety accessories
j. Evaluation of energy consumption
k. Building Management Software
l. Automation

ii. Gaps in technical skills of Electronics Crafts Persons

Fault identification, schematic reading, repairing of PCB and their trouble shooting

iii. Gaps in technical skills of Multi-Skills Technicians

Skills gaps of Electricians and Electronics Craft Persons

iv. Gaps in Technical Skills of Electrical Draft Persons

Pass- outs of drafting courses lack electrical drafting skills

v. **Gaps in Technical Skills of** Production Line Operators/ Production Associates

a. Lack knowledge on sensing troubles in machineries in production and production lines.
b. Lack basic maintenance skills as well.

4.4.4 Gaps in Soft Skills of Electricians and other Craft Occupations

i. Not customer Oriented
ii. Lack of Discipline, commitment, speaking styles
iii. Lack of understanding on how to behave in a workplace
iv. Lack Learning skills
v. Take long time to develop skills to work independently
vi. Poor Attitude

a. New entrants have mindset not to stay in first job for a long time. Therefore, they fail to develop a strong foundation
b. Poor leave and holiday habits, when return home for a Full Moon day (Poya-day) holiday, stay back a week
c. Not ready for rough and tough jobs
d. 'know everything' attitude
e. Not Active (Lazy)
f. Not task oriented
g. No concern on productivity
h. Non-flexibility in working hours (8-5 working attitude)
i. Gender sensitivity[2]

vii. Soft skills specific to Production Line Operators/ Production Associate

Table ethics: use of fork and spoons, as hands should not be used due to static electricity

4.5 NVQ Issues

NVQ and related training issues highlighted at KIIs are listed below.

i. Many Companies specially in Investment Promotion Zones are not aware of NVQ and RPL schemes.
ii. One leading organization pointed out that some NVQ holders who obtain NVQ through RPL lack cognitive skills. Many applicants for RPL follow crash courses to prepare for NVQ assessment. What they learn in crash courses stays in the short-term memory only until they get through the assessment and eventually lose what they learn from crash course.
iii. NVQ level 5 is not recognized by the Engineering Council
iv. CEB facilitates training institutions to train electricians for CEB. Its entry qualification is GCE(O/L) or NVQ Level 3. As there is no direct entry to electrician positions in CEB, NVQ level 4 holders also apply for this course, but Management Information System of training institutions do not permit to enroll National Identity Card numbers of NVQ Level 4 holders.
v. There are about 25,000 (non-institutionalized and freelance) practicing electricians in the country and the majority do not possess NVQ qualifications. For licensing purposes, they need to be assessed for obtaining NVQ through RPL to be qualified. Some of these electricians without qualifications may have skills

[2] The concept of **gender sensitivity** has been defined as a way to reduce barriers to personal and economic development created by sexism. **Gender sensitivity** helps to generate respect for the individual regardless of sex. **Gender sensitivity** is not about pitting women against men. (https://www.google.com)

gaps and it is necessary to develop a bridging module and give training to acquire the identified gaps

vi. One company requested to develop NVQ qualification for maintenance work at NVQ Levels 3,4 and 5.

vii. Mechatronic Trainees are competent in mechanical and electrical work but has insufficient coverage of Electronics.

viii. The number of Mechatronics Technicians employed in the industry is not significant but production line automation & innovations will make increasing demands for Mechatronics Technicians in future.

ix. A few companies have established their own training centers to train their own staff as well as outsiders.

x. Two electrical companies have programmes to establish community electricians' clubs and in the process, they conduct training for community electricians. These companies are willing to cooperate with training institutions to promote NVQ among community electricians.

xi. As per section 15 and 18 of the Engineering Council Sri Lanka Act No 4 of 2017, all engineering technicians are required to be registered in the Council. Accordingly, NVQ Level 4 certificate holders in Electrical and Electronics occupations are required to register with the Council to practice as engineering technicians in Sri Lanka.

4.6 New National Competency Standards and CBT Curricula proposed for Development

At the Key Informants interviews, following occupations were identified to develop National Vocational Qualifications (NVQ) with National Competency Standards. All these occupations are not be at entry levels and skills for some proposed qualifications are acquired through experience. Those occupations need only certifications if necessary, with some gap filling. Qualifications at entry level jobs need curricula in addition to the National Competency Standards.

i. Transformer Manufacturing Technicians

In Sri Lanka, there is no curriculum covering all the activities of transformer design and manufacturing. Transformer manufacturing needs people with different occupational skills. They are supervised by persons with knowledge and skills of all these activities. It was explained that it will be effective if they are trained and certified based on a National Competency Standard for Transformer Manufacturing Technician.

ii. System Integrator

Electricians are trained on low voltage work. In future there will be extra-low voltage work such as installation of CCTV, Security system and smart houses etc. Residential buildings may need a person to handle all this work and that person

is usually designated as a system integrator. This term is widely used in IT industry but in future Housing units would also need such persons.

iii. Basic Technical operations (for Production Line Operator / Production Associate and Machine Operators)
In manufacturing industries, there are many Machine operators and machine associates such as assembly line operators, Electronics soldering line operators and production associates. They are given short term training of one to three weeks on those operations. It was proposed to give some training on Basic mechanical and electrical/ electronics practices to enable them to identify noise/sound and vibration that indicates the need for repair of machineries before the breakdown and enable them to attend preventive maintenance works.

iv. Powder Coating Technicians
No NVQ programs are available for powder coating technicians. It was suggested to develop a NVQ or to include a module on powder coating in the Painting NCS and Curricula

v. Maintenance Work in Hotels- An Additional Module to Curriculum for Building Service Technicians
Technicians in hotels are multi skilled persons with competencies in electrical +electronics +A/C + sound systems. As most of this equipment is included in the NCS for Building Service Technicians, it was proposed at the validation to add hotel specific maintenance module to the Building Services Technicians course.

vi. Tower Erection Technician
Electrical Tower Erection is a specialized job which could be recognized as an occupation. A company requested to commence a training programme and have a qualification for such an occupation/category.

Training of staff

Issues related to the training staff highlighted at KIIs are listed below

i. Everything cannot be taught in an electrical and electronics training courses offered at training centers. Once employed only, specialized training of choice could be followed. Therefore, Companies proposed to facilitate part time training for their staff
ii. Electronics component manufacturing companies employ Qualified Master IPC Trainers to provide training to staff as per IPC guidelines/curricula (IPC –

Institute of Printed Circuit) and certify trainees in the company, once they are qualified as CIS (CIS – Certified IPC Specialist).

iii. Many exporting companies provide foreign training to staff with their foreign partners which intends to influence on their behavioral change.

iv. Technical personnel need to develop an interest to learn to adopt to changing technologies.

v. One company said that Sri Lankan youth are highly trainable, but certain characteristics in soft skills areas need to be improved.

vi. One company said that they maintain e-learning portal and learning hours for staff is a Key Performance Indicator (KPI) in performance appraisal.

vii. One leading company has trained their staff during the lock down period using on-line short courses delivered under license by international training agencies with linkages to leading universities.

viii. Staff prefer external training, not workplace learning.

ix. List of training provided to the staff by companies interviewed;

   a. Knowledge of processes
   b. Career pathways
   c. Rights and responsibilities
   d. 5S concept
   e. Total Productivity Management
   f. Kaizen,
   g. ISO 9000, ISO 14.000 (Environment) and ISO 18000, (Health & safety)
   h. Soldering Training

4.7 Linkages between Training Centres and Industry

Observations made and proposals of companies on above subject are listed below

i. Some companies have good linkages with TVET Institutions. Some have approached TVET institutions to get trainees but many of them have not received a favorable response.

ii. A few industries including some BOI industries have never had any linkage with TVET institutions. But they also expressed their willingness to cooperate with TVET Institutions.

iii. Proposed to improve the linkages between TVET institutions and Industry to have multi-pole (multiple and mutual) benefits to both parties

iv. Training centres in close proximity to IPZs could develop good linkages with companies in the zones to get OJT facilities and to provide part time training. For example, NYSC training centre at Sapugaskanda have to develop linkages with Factories in Biyagama IPZ.

4.8 Skills for Export

Electricians have a good demand in many developed countries. Therefore, training for Electricians should include wiring regulations of other countries as well and assistance provided to them to obtain a license to work in those countries. It will boost sales of local electrical products in other countries.

4.9 Female Employment

When asked about employability of females, industry representatives gave following responses.

i. Females are preferred as harness manufacturing line operators due to their high hand dexterity.
ii. In one company, among Production Associates, 60 per cent are females while 40 per cent are males. In Top management two out of four are females while in Middle Management too, 50 per cent are females.
iii. Females perform better in Repetitive and Reproducing (R&R) jobs.

4.10 Innovative (Emerging)-Technologies

Industry representatives made following responses for question on emerging technologies.

i. Industry 4.0, IOT, IIOT, Solar Technology, Robotic design
ii. SMART System – Everything is connected
iii. Remote reading of electric meters
iv. Artificial Intelligence
v. Inverter Pump for power saving with high speed 6000 RPM
vi. Smaller Pump with high power capacity and low noise
vii. Nano Technology
viii. Automation / Robotics
ix. Eco friendly system
x. Predictive maintenance software with Condition Based Predictive Maintenance

As the Industry 4.0 is the trend towards automation and data exchange in manufacturing technologies and processes which include cyber-physical systems (CPS), the internet of things (IoT), industrial internet of things (IIOT), cloud computing, cognitive computing and artificial intelligence, the predictive maintenance has risen to the forefront of the IoT data industry.

xi. Magnetic sensors
xii. Optical devices /laser devices

4.11 E-Waste Disposal

i. Some companies promote re-use of off-cuts.
ii. No way to dispose foundry slags containing lead (Pb) waste in battery manufacturing and a large quantity is stored in a building.
iii. Many companies send/ give the e-waste to waste collectors approved by the Central Environmental Authority.
iv. Many have obtained ISO 14,000 Certifications.
v. Many Companies send their e-waste for burning under high temperature.

4.12 Policy Issues

Policy issues highlighted are listed below.

i. Policy makers actions are mostly reactive and not proactive and the present scenario is not known to them
ii. Raw Material Restriction 90-day credit
iii. High Tariff, Difficult to compete with countries who give tax rebate for exporting. Companies in those countries are working on zero profit as they consider tax rebate as profit
iv. Government should have consistent policy to promote 'made in Sri Lanka'
v. Negative list (list without duty concessions) should be increased in order to protect local industries

4.13 Management Practices

Almost all industry representatives highlighted unique management practices of their companies. Some of them which are not recorded in preceding sections are listed below.

i. 'No Managers, No supervisors only leaders in this company'
ii. Export companies adopt Quality Assurance with international accreditation.
iii. In a leading company, staff are divided to two groups: SVA's (Strategic value adders) and DVA's (Direct Value adders). SVA's are managers who make strategic value addition and their performance are evaluated on business improvement projects implemented. DVA's are those workers who carry out the works assigned by SVA's.
iv. In the present working culture, employees pay much attention to do others' work more than their own work. For example, first thing employees do in the morning is to attend to e-mail. It is mostly others' work. Priority should be given to attend to own essential work first.
v. In an organization, some division and some officers create bottle necks for others to work. In performance appraisal, number of bottlenecks created by any body will be considered as a negative aspect.

4.15 Conclusion

Findings of KIIs were taken for discussion with the Focused Group Discussion of Trainers and their suggestions were taken for the Training plan.

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Chapter 05: Skills Gaps and Training Needs Identified from Focused Group Discussions

5.1 Introduction to Focused Group Discussions

Focus group discussion (FGD) is frequently used as a qualitative approach to gain an in-depth understanding of issues. The method aims to obtain data from a purposely selected group of relevant individuals. It is more of a brainstorming process adding views on views to make optimum findings.

In the process of development of VET Plan, nine Focused Groups Discussions were held with following specialists' groups.

i. Electrical Installation in High-rise Building
ii. Solar Panel Installing Companies
iii. House wiring Electricians in Galle District
iv. Customer Electronics Repair Technicians in Kurunegala District
v. Electric Panel Making Companies
vi. Electric Parts sales Shops
vii. Electrical and Electronics Equipment Service Companies
viii. Electrical and Electronics Industries in FTZ, Katunayake
ix. Electrical and Electronics Trainers /Training Instructors

5.2 Highlights of the Findings of the FGD on Electrical Installation in High-rise Building

Representatives of seven leading construction companies in Colombo took part in this Focused Group Discussion.

5.2.1 Building Management System (BMS)

In high rise building construction and maintenance work, installation of a Building Management system is the trend which has following sub-systems.

i. A central building control system
ii. Security and personnel control systems
iii. Control of heating, ventilation, air conditioning and refrigeration
iv. Automated room and zone controls
v. Power distribution
vi. Fire protection
vii. Protection against burglary and intrusion
viii. Access control
ix. Surveillance systems (CCTV and video)
x. Lighting systems
xi. Display of messages and building data
xii. Additional Technical systems;

a. Lifts, Standby Power Supply system, Water Pressure boosters
b. Energy Management/Use of Photovoltaic system
c. Separate data/communication lines
d. lightning Arrester
e. High Tension Receiving and Transformer/ Low Tension Receiving and Distribution System

5.2.2 Skills Needs of Electrical Maintenance of High-rise Buildings

i. High voltage, low voltage and extra low voltages (ELV) are needed for number of services in a high-rise building.
ii. Electrical wiring / installation and testing including ELV work
iii. Distribution network and lighting control system
iv. Electricians involve not only in laying of electrical conduits but also in laying of data conduits, breaking and cutting walls for conduiting is a part of the skills.
v. Power supply vertical bus bars
vi. Code of Practice for Energy Efficient buildings introduced by Sri Lanka Sustainable Energy Authority
vii. Testing and measurement

5.2.3 Training of Electricians for High-rise Building works

i. There is no a separate occupation in Electrical services for high rise building. It is an Electrician job.
ii. Most companies select a few among the electricians employed and trained them for the additional skills needed in electrical installation in high rise buildings.
iii. In certain companies' plumbers are trained to lay electrical conduits as plumbing pipes are laid along with electrical conduits.
iv. Basic knowledge in all aspects of electrical services in a construction industry/specially in construction and operation and maintenance services in high rise buildings should be included in electrician courses.
v. Specialized further training courses for practicing electricians working specially in high rise buildings should be offered (presently they are learning from each other). However, practicing experts from Industry can be hired or invited as guest lecturers in these modular courses. Teachers/Trainers are also needed to be skilled for such training.

5.2.4 Employment for Electricians in High-rise Buildings

i. Supervisors are recruited from among those who are experienced electricians. NVQ 5 qualified technicians are skilled adequately.

ii. Electricians working in high rise buildings can earn close to LKR 80,000-100,000.00 per month.

iii. Electricians with experience in high-rise buildings have opportunities for foreign employment. Some experienced electricians are taken for projects abroad by their companies.

5.3 Highlights of the Findings of the FGD on Solar Panel Installations

Six Representatives of four leading Solar Panel Installing companies in Colombo took part in this Focused Group Discussion.

5.3.1 Description of Solar Panel Work

i. Solar Panel installation are comprised of Electrical, Mechanical and Civil works. In a team, there may be one or two electricians, other are unskilled or semi-skilled helpers.

ii. Sri Lanka has a high skill level in installing and maintaining solar power/PV cells. All service providers in the business have learnt the skills on the job in the first 5-6 years. Companies outsource to small teams who do only installation. Companies who offer the contracts are the registered installers and total responsibility lies with them, they do inspection and commission the panels. If the subcontracted team makes any mistakes, the service providing company may lose the registration. However, it is reported that there is very less complains from clients.

iii. In Sri Lanka, it is not a separate occupation but an additional work for an electrician with additional skills. But in Australia it is a special occupation requiring to have license to practice.

5.3.2 Skills Issues and Training of Solar Panel Installers

i. There are instances in the past where some workers have damaged planks in the roof and other plumbing pipe works in the walls etc. This shows the need to have some awareness of other work fields or disciplines as well.

ii. When mounting railings on the roof for the solar panels; needs to be careful not to damage anodized aluminum coating. If panels are even slightly damaged/scratched, these panels get oxidized and will not last for 25 years. Therefore, one should not drag these railings of the panels.

iii. Also, incompetence may lead to premature failures of the panels. Even when the products are 100 per cent of perfect quality, still oversight in practices could lead to premature failures. Special cautions are to be taken not to make even a micro crack in panel.

iv. Industry is still young. Therefore, most workers are not aware of such implications caused by unacceptable work practices and after five- six years when these panels get oxidized then only they may see any failures.

5.3.4 Issues with Solar Power

i. Solar sources are non-dispatchable and therefore solar PV alone are not used to meet the demand. At present most of the solar PV are connected at the distribution level. These distributed generators may create voltage unbalance, flickers and harmonic issues.

ii. Since electricity generation from solar PV highly depends on environmental conditions, electricity demand can be met only together with other conventional sources of energy. Needs to depend on other sources to balance the load and frequency control or moderate.

iii. Integration of energy storage devices (such as battery energy storage devices) to the solar PV systems will make the solar PV a dispatchable source of energy. However, in Sri Lanka this has not been well developed at the grid level.

5.3.5 New Developments of Solar Power

i. Solar parks have both roof mounted and ground mounted solar panels and ground mounted solar panels are becoming popular.

ii. Presently only 12 MW solar parks/plants are available. Documentation process for construction of ground mounted solar panels is now going on, plants totaling output of 72 MW have been approved. Irrespective of roof top solar panels or ground mounted solar PV, electrical related work is almost same. Therefore, the skills required will be the same. However, mechanical related works are different.

iii. Floating plant in Jaffna is operating on pilot basis. It is now accepted that up to 30 per cent of the water surfaces in the country could be made use for floating solar plant without affecting its flora and fauna (**Statement by a participant*). This option is more feasible for country like Sri Lanka due to land limitation (ex: Israel).

iv. Construction of floating solar PV is associated with additional cost, however there are additional benefits with less temperature on the surface of the water. Even on roof top it is raised about 6 inches allowing natural circulation of air.

5.3.6 Solar Power Service providers

i. There is a total of 228 rooftop solar power service providers registered with Sri Lanka Sustainable Energy Authority, however only 70 companies are active.

ii. Companies registered as **EPC with SLSEA p**rovides **Engineering, Procurement, and Construction (EPC)** of a full solar system. An EPC company provides a full-service experience to seamlessly acquire a solar installation and receive continual support in maintaining the system, but however some work on installation may be outsourced to Installers.

5.3.7 NVQ and Skills Upgrading

i. Companies know about NVQs. They have recruited electricians with NVQ and trained by companies for Solar Panel works. They need to learn welding, basic masonry, wood working and metal works skills.

ii. Though National Competency Standard (NCS) for Solar Photovoltaic System Technicians is already developed, those technicians should have strong electrical foundation. Therefore, it is better to add a module of Solar to NCS for Electricians. They have to acquire skills for supervision of welding, Masonry and Carpentry work though work experience. They could get NVQ for Solar Photovoltaic System Technicians though RPL.

5.3.8 E –Waste in Renewable Energy Storage system

In twenty years, e waste (discarded batteries and contaminate silicon etc.) will be an issue.

5.3.9 Export Market for Skills

i. If Solar Technicians are well trained and skilled, there will be a market especially in Middle Eastern countries in the very near future. However, technicians need to know about grid codes of those countries.

ii. Growth rate of harnessing Solar power is very low compared to our knowledge and skill base.

iii. In addition to solar installation, solar companies present at the discussion stated that Sri Lankans' knowhow of mini hydro is excellent. Sri Lanka mini hydro companies have excellent performance in African continent. Therefore, there is potential for skills export in Mini Hydro.

5.4 Highlights of the Findings of FGD with Small Scale Electronics Repair Shop

Representatives of nine Electronics Repair shops took part in this Focused Group Discussion.

5.4.1 Issues Identified in Small Scale Electronics Repairs

i. Majority of Small-Scale Electronics Repair shop do not like to employ assistants or trainees as they have bad experiences with them on non-loyalty and make damages to equipment.

ii. In small shops, assistants and trainees are expected to attend to all activities starting from housekeeping to customer services. Vocational Trainees show reluctance to do these tasks and adhere to rules, regulations and other enterprise practices.

iii. Electronics is a field with continuous development in technologies and it demands continuous learning. Trainees coming from vocational training centres have basic skills but only about 50 per cent of trainees take any interest on learning.

iv. First task given is soldering. Although the trainees in electronics courses are trained on soldering, that exposure given in soldering is not adequate. They may have used the bout (Iron) and but at work, soldering is done by hot blow guns.

v. Respect for the customer and handling of the customer is the key element in running a business. The word of mouth of the loyal customers/clients is the best advertisement for an electronics shop. Emphases was given on respect for others, especially the customers.

vi. Having smart phones with the trainees is a real distraction to work.

5.4.2 Skills Gaps Identified in Small Scale Electronic Repair Shop

i. The show-room staff needed to be trained on special features of various electronics products; therefore, the electronics related knowledge is essential in addition to sales skills.

ii. The knowledge of CCTV cameras and burglar alarms is becoming increasingly essential.

iii. Software has become the key part of LED. More than the hardware problems it's the faults in Software. Need to learn software of LED operation.

iv. For the purpose of bridging such skills gaps, they have initiated support groups like WhatsApp /Face Book groups and such networks and share knowledge and awareness of about new software etc. resulting mutual updating.

5.4.3 Earning of an Electronics shop

i. Average shop can have a profit of LKR 3000 per day.

ii. Franchise holders stated that the average monthly revenue is around LKR 250,000-300,000 and the profit after deduction of expenses is around LKR 80,000.00 per month.

iii. Many companies pay about LKR 2000 - 2500 daily for a skilled assistant.

iv. On an average, an assistant needs to earn three times his daily wage for the enterprise. Overhead cost and other expenses are incurred for running the enterprise. There is a need to keep the premises attractive too.
v. Clients tend to gauge the payments for the repair works based on the duration and do not think of the complexity of the work.

5.4.4 Advanced Technology Required

References made to following Equipment and Machinery

i. LCD panel and PCB combination bonding machine made in China now costing around LKR. 1,100,000 to import for repairs of 14-65-inch LCD/LED panels. Presently all defective panels are replaced. Prices are high and have gone further up after Corona pandemic.
ii. Hot Press-LCD screen repair Machine for high repair rate, precision positioning can repair all kinds of LED screens.
iii. To justify buying such a machine, a large number of job orders for panels' repairs need to be entertained. If panels could be repaired, cost of repair will come down fourfold.
iv. State support may be necessary to reduce taxes in getting such machinery (at affordable prices) available for the LED panel repairing which eventually reduce cost of import of new LED Panel or new TVs.

5.5 Findings at the Focused Group Discussion with Free-Lance Electricians

Nine Free-Lance Electricians took part in this Focused Group Discussion.

5.5.1 New Technologies relevant to current / Future Electricians

i. For Wall cutting for laying of conduit, dust- free machines are available and trainees should have exposure.
ii. Electrical Line sensors (to detect the wires inside the wall)
iii. Wi-Fi, – GPS Technology
iv. Smart – Home
v. Facebook Grouping

5.5.2 Challenges Faced by Electricians

i. NVQ Level 4 alone is not sufficient to stay in the self-employment market as they are required to meet customers' requirement.
ii. Two electricians who are earning above LKR150,000 have followed many courses such as GPS Technology, SMART Homes, Wi-Fi application, Network cabling etc.
iii. Local customers – time sensitive, Foreign Customers – work sensitive.

5.5.3 Skill Gaps and Weaknesses in Training

i. Training does not cover skills on laying conduits and wall cutting. Trainees do not like to do such jobs too. At the validation of the report, it was pointed out that it is available in the curricula.
ii. OJT is narrow. No opportunity to practice many activities such as CCTV in OJT.
iii. Need telephone ethics. Work interrupted due to prolong calls.
iv. Need to convince trainees about need of learning lot more in workplaces and need of doing lifelong Learning.
v. Trainees should have skills on maintaining good relationship with customers.
vi. Trainee get upset when head craftsman is away. They should have confidence to work independently.
vii. Trainees need basic skills on preparation of quotations/costing as laymen could understand.
viii. Need to have market knowledge.

5.5.4 Skill Upgrading Opportunities

i. Many companies conduct short term skill upgrading.
ii. There are many Facebook groups in Electronics which share experience and help learners.

5.5.5 Issues in Entry Qualifications

Many youths with aptitude for electrical and electronics works but without GCE(O/L) may not get opportunity to follow courses in public sector training centres when there are sufficient applicants with GCE(O/L). A story of such rejected boy is given in the box below.

An instructor in Electrical and Electronics in non-formal education division of a school was present for a Focused Group Discussion. He had not been selected for NVQ Level 4 electronics course at a College of Technology (COT) as he has followed art subjects in the school. Thereafter, he has followed an electronics courses in a private training centre and worked as a free-lance repairer. He has got NVQ Level 3 for Electronics through RPL. Thereafter he has got admission to NVQ 5 Mechatronics course at the same COT.

He said that youth who does not have good GCE(O/L), but with aptitude for electrical and electronics work follow courses at Non-formal education and he requested to introduce NVQ Level 2 for students with poor school performance and facilitate their entry to NVQ Level 3 and 4 courses at Technical Colleges.

5.6 Highlights of Findings of the FGD with Electrical product, parts and Components Sales Shops

Representatives / owners of five Electrical product, parts and Components Sales Shops took part in this Focused Group Discussion. These shops employ people without any technical skills and they need long work experience to get required skills but with persistent skill gaps. They stated that this FGD gives them a new hope and proposed to train sale assistants with following skills.

i. Knowledge on power tools; names of tools and their uses
ii. Customers come with problems without any knowledge on application. Salesman should be able to explain a solution for them.
iii. Know English words
iv. Measurements (mm / inch (metric / British)
v. Communication with customers
vi. Billing, Basic Mathematics and writing skills
vii. Store management, habit of placing the items in the assigned places
viii. Should be patient
ix. Product differentiation
x. Sale Closing skills
xi. Thinking skills
xii. List of Further skills required
    a) Basic knowledge about AC/ DC Current, Watts, HP etc.
    b) Basic knowledge on single and 3 - phase
    c) Wire sizes
    d) Type of holders, socket outlets, Industrial socket types
    e) Switches
    f) Isolators and MCB types and MCCBs
    g) RCD(Specialty Tripping current- Residual Current Device)
    h) Basic knowledge on Contactors and Overloads
    i) Testing and assembling contactors
    j) Relays and Relay testing
    k) Identifying sensors, limits switches, push batten types
    l) Basic knowledge on PFR and ELR (Phase Failure Relay, Earth Leakage Relay)
    m) IP Rating (International Protection Rating)
    n) Testing electrical items correctly and safely

5.7 Findings of the Focused Group Discussion with Electrical and Electronics Service Divisions of Large-Scale Electrical Sale Companies

Eight Representatives of Electrical and Electronics Service Divisions of Large-Scale Electrical Sale Companies took part in this Focused Group Discussion and their suggestions are listed below.

i. Service divisions are multi-functional units and their technicians should be skilled in electrical, electronics and mechanical repairs of equipment with connectivity and IOT.
ii. They suggested to combine two NCS; Electrical Appliances Repair Technician and Electronics Appliances Repair Technician and add a unit on 'Repair of Business Appliances'.
iii. Present day businesses demand specific solutions which means that a company have to find solutions beyond the standards product available in the company and get third party products and software to find solutions requested by clients. That needs wider product and software skills.
iv. They find technicians without software skills and software people without technical skills. Employees are inclined to work on software side and they do not like to undertake the Electrical and Electronics repair work. That is one reasons for shifting repairs to replacement market. Besides, it is difficult to replace many electronics components to the quality and accuracy done through automatic soldering.
v. There are many motor windings jobs and no trained staff to do winding. They are usually outsourced and it is done as a self-employment. Girls could be trained as Motor Winders and they could do it at home.
vi. Most companies pay about LKR 25,000 + commission which may be amounted to LKR35,000 - 40,000 take home salary. Young people first concern is 'What is in it for me in current monetary terms'. The participants requested to train students to think in term of experience and future income. **In spite of all these negative features there are TVET students who learn very fast and go beyond the supervisors in a short time.**

5.8 Highlights of the FGD with Electrical Panel Manufacturing Companies engaged in both Local and Export Markets.

Representatives seven Electrical Panel Making Companies took part in this Focused Group Discussion.

5.8.1 Work of Occupational Area

i. Engineering Design part- Design work done possibly by Engineers and may be Diploma Holders.
ii. The Initial Manufacturing activities are all mechanical done mostly by craft level workers.
iii. Sheet metal works –fabrication; Marking (Measurement); Machine works- cutting /punching or bending usually done by CNC Machine operators
iv. Welding, powder coating for surface finish by Welders and spray painters.
v. Finally, the Assembly work of Electrical components in the Power Panel and electrical power wiring and automation related works; bus bar allowance, MCB, Form separation - Work of an Electrician.

5.8.2 Skills /Knowledge Required, Identified for Present and Future

i. Sheet Metal works involve knowledge of metallurgy, selection of materials, knowledge of their properties, measurements and operation of CNC machinery, IoT; future is artificial intelligence /learning of machine code and machine languages for punching.
ii. CNC machine Operation: Awareness of programming for CNC machines for punching (CNC Press), CNC bending, CNC laser welding; laser cutting. Many industries use laser welding instead of MIG welding.
iii. Powder coatings -raw materials, machinery involved, chemicals used, disposal.

5.8.3 Waste Disposal

Powder coating waste - epoxy resin remaining in powder and powder goes to air as dust. Programme with Cleaner Production Centre to make bricks with remaining dust implemented; however not a total solution. Some manufacturers send the waste to burn in high temperature kilns at a cost.

5.8.4 Skills Issues

i. Most trainees coming from training centres are not practically skilled to do MiG welding although it is included in the curriculum.
ii. Welders and Machine operators (CNC) may need some awareness of work carried out on the electrical floor.

iii. Engineering Drawing with AutoCAD, Knowledge of 3 D development, CAD, CAM software, CNC with AP100 programming, some introduction to IoT; Smart Technologies and Artificial Intelligence which are the future.

iv. Powder Coating is a necessary process in Panel Manufacturing. Trainees from Auto Painting courses who are skilled in spray painting are recruited to work in this field. However, retention of spray painters for this process is a problem.

v. One company said that trainees from private training centres are more committed to learn and work.

vi. MEP (Mechanical, Electrical and Plumbing) Draftspersons are the future. Any Draftsperson should see the big picture of the use of his/her drawing in the follow up manufacturing processes to do a better job.

vii. Technology Stream introduced in the general education will enable the engineering establishments to directly recruit youth for various occupations available.

viii. When sending the students for OJT, it was proposed to inculcate following knowledge and attitude.

a) Trainees should be convinced to understand OJT as an opportunity for learning and fine tuning the skills.
b) When students are sent for OJT, they should be advised to work according workplace norms.
c) Trainees should be ready to get all possible skills from the workplace and they should have mind set to give some useful contribution to the workplace.
d) Trainees should be advised to go beyond occupational boundaries and explore multi-skilling opportunities. Most trainees have self-imposed occupational boundaries such as 'I am an Electrician', 'I am a welder' etc which is not a workplace friendly attitude.

5.8.5 Skills Upgrading

i. With the experience, welders, machinists and electricians may get expertise in Panel Making. They could even can become supervisors. To realize this aspiration, they should have opportunity to follow short term skills upgrading courses in welding, machining and electricity.

ii. Panel Makers have employment opportunities in Singapore and Malaysia. For that, they need panel maker qualifications. Therefore, it is recommended to develop NCS for Panel Makers to get qualification through RPL.

iii. Trainees in all the courses related to metals should have knowledge on protecting metals from corrosion. NCS and Curricula of Metal related courses should have a module on protecting metals from corrosion.

5.9 Findings from the Focused Group Discussion with Electrical and Electronics Industries in IPZ, Katunayake

Representatives of four BOI Companies in Katunayake and a Lecturer and Deputy Principal of the Institute of Engineering Technology took part in this Focused Group Discussion. At the discussion, following Skill Issues were discussed at length.

i. On production line, both boys and girls are working and they are required to do high-quality lead-free soldering.
ii. Companies give four weeks training for production line workers.
iii. No shortage of production line operators when factories are established in outstation districts.
iv. Draft Persons are employed to prepare programs for CNC machines.
v. One company produces short training videos and displays during short breaks allowed for workers to rest.
vi. Quality assurance is most important as one failure in the field may have a very high cost.
vii. They have repetitive jobs but need to be completed with quality.
viii. Most trainees lack confidence. (Example- When they are asked to fill a form, one student fills it and majority copy it.)
ix. Trainees lack hand-eye coordination (Example -Some cannot hit a nail head and some cannot wind insulation tape).
x. Requested to send trainees with good basic skills, knowledge and flexibility to enable industry to groom them as skilled employees.
xi. All industries need to be given awareness about development in TVET such as NVQ, RPL, Industry Sector Councils and Mature candidate routes. Almost all industries have employees passed out from TVET Institutions. They are ready to assist TVET institutions and that should be explored.
xii. Trainees at all levels should be given skills to read and understand technical reports and documents as products and technical requirements come as documents.
xiii. Short videos on Skills and NVQ should be prepared and disseminated to training centres and industry.

5.10 Findings from the Focused Group Discussion with Trainers

Fourteen Trainers from CGTTI, DTET, VTA and NYSC took part in this Focused Group Discussion. They were presented with issues identified at Key Informant interviews and Focused Group Discussions held with industry representatives. Their explanations and suggestions on those issues are given below and their suggestions are taken in the training plan.

5.10.1 Skills Gaps

i. PLC Programming

When the industry opinion on trainees' lack of skills on PLC programming was presented, instructors explained that they teach about PLC but software available with them are outdated. Downloading updated software is expensive. It was explained that if .'edu' is used in the mail, free or low cost down loading is possible. At the Validation meeting, it was suggested to include how to learn new PLC software in the curriculum.

ii. Extra Low Voltage Applications

This subject is related to installation of CCTV, Security system and fire alarm etc. Trainers said that these subjects are taught, but practical works are expected during 'on the job training'. **Need of guided OJT was highlighted.**

iii. Use of social media

Passed out students use social media groups (FB and WhatsApp groups) to share their experiences and learn new things. In the Facebook, there are more than 1000 Electrical and Electronics groups. Trainers pointed out that everything included in social media group is not accurate and some mislead the members of the group.

Therefore, it was proposed to develop and maintain media group of Electrical and Electronics subjects by the institutions with subject's authority. CGTTI agreed to do a Facebook Group and YouTube if staff and funding (for data) are provided.

Further, it was proposed to develop videos on bridging skills gaps and maintain a YouTube.

iv. IEE regulation

Lack of knowledge in IEE regulations has been identified in Key Informant interviews. Further key industrialists have proposed to give them knowledge on Electrical regulations of developed countries to enable them to get license for employment in those countries.

Trainers explained that IEE regulations are frequently revised and it is expensive to get updated versions timely. At the Validation meeting, it was suggested to include 'how to learn new revised version of IEE regulation' in the curriculum.

v. Competency Level of Trainees at one NVQ Level is not Uniform

In response to view of Industry that skills levels of passed outs are not uniform and some students lean very fast and exceed the skills levels of supervisors in short time, following responses were given by trainers.

a. It has happened due to diverse course durations and diverse enrollment criteria. Even among trainers, skills levels are not uniform. There are very well delivered courses and poorly delivered courses. They suggested to have periodic **Technical forums among trainers in respective courses separately to enable all trainers to understand the best practices.**

b. Trainers pointed out the Radio, TV and Allied Equipment Repairer courses had a problem on recognition and employability and therefore, Electronics Appliance Technician was introduced. However, many centres still conduct Radio, TV and Allied Equipment Repairer course. Electronics Appliance Technician course has deeper content, but trouble shooting content is reduced compared to radio and TV repairer course.

vi. Skill Upgrading

Industry has pointed out that it is not possible to cover everything in courses and TVET institutions should facilitate skills upgrading. Trainers explained that non-availability curricula for specialized skills is a problem. They suggested to include stand-alone competency units in National Competency Standards (NCS) and curricula and facilitate assessment for Record of Achievement for those unit.

5.11 Recommendations

Following recommendation are made by summing up findings of above Focused Group Discussions.

i. It is proposed to combine two NCS; Electrical Appliances Repair Technician and Electronics Appliances Repair Technician and add a unit on 'Repair Business Appliances'.
ii. Females could be trained in Motor Winding and do it from home.
iii. Students should be trained to think of long term and not short-term benefits; not for instant gratification as delayed gratification gives higher dividends.
iv. Skills acquired in pre-employment courses are not sufficient for a career and self-employment. Therefore, skills upgrading courses of advanced skills should be available at technical colleges / training centres.
v. Facebook groups could be used as a learning and skill sharing platform.
vi. Freelance / Self-employed electricians need variety of skills to meet customer requirements. Some skills include emergency alarm system, smoke sensing, CCTV Cameras, Wi- fi applications, SMART homes etc.
vii. Trainees should be given skills on telephone ethics. Work is interrupted due to frequent and prolong calls while working.
viii. Develop NCS and Curricula for Technical Sales Assistant.

ix. It was suggested to have periodic technical forums among trainers in respective courses separately to enable all trainers to understand the best practices.

x. Training Instructions should use word ‘edu’ in their web and email names and it will facilitate download at the lower fee.

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Chapter 06: Demand for Electrical and Electronics Skilled Persons for Foreign Employment

6.1 Introduction

Major issue in foreign employment is that departures for foreign employment is much less than vacancies received for most of the occupations. There may be many reasons for low departures. One of the reasons may be that there is no sufficient number of qualified and competent people in respective occupations in the country. The chapter aims to analyze relevant foreign employment data in electrical and electronics occupations and formulate a training strategy to train people to take up these vacancies.

This chapter therefore, compiles and analyses data published by Sri Lanka Bureau of Foreign Employment on vacancies received from foreign countries (Overseas demand for occupations) and departures to accept those vacancies (the local supply of skills) for Electrical and Electronics related Industry occupations in the past three consecutive years 2017, 2018 and 2019.

In the data analysis, top 20 occupations with a demand of more than 50 job orders in any of the three years are considered, for foreign employment in electrical and electronics sector and tabulated in a Table. These 20 occupations represent more than 90 per cent of total number of job-orders received and also more than 90 per cent of the total number of departures in a given year. The selection very well complies with the Pareto Principle. Based on these findings, training interventions are recommended to be included in the training plan.

6.2 Foreign Employment Market

Foreign Employment is an important structural feature of employment in Sri Lanka. Estimates show that our workforce in the foreign employment is around 1.8 Million, ie almost 20 per cent of the total number in the labour force. Table 6.1 and Figure 6.1 show the number of workers migrating annually and the migrants' yearly remittances during the past nine 9 years. The number of migrant workers in 2011 was 262,961 and it gradually increased to 300,703 in 2014 and then continued to decline to 203, 186 in 2019.

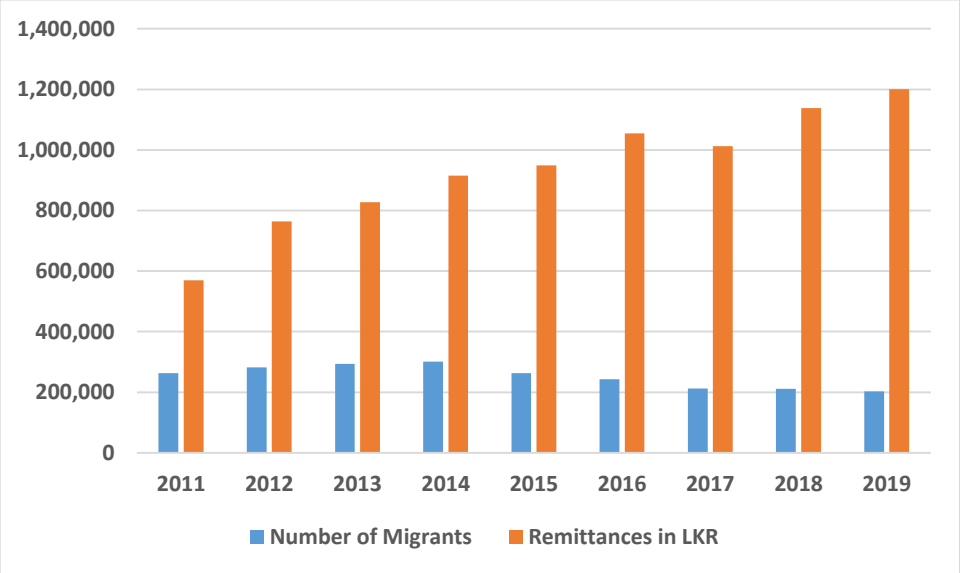
In contrast, the remittances from the migrant workers in 2011 which was LKR. 569,103 Million continually increased to LKR.1,200,766 Million / USD 6.7 Billion in 2019 which is 12.3 per cent growth of the earnings in 2011.

Table 6.1: Number of Workers Migrating Annually and the Migrants' Yearly Remittances from 2011 -2019

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of Migrants	262,961	282,447	293,218	300,703	263,443	242,816	211,992	211,459	203,186
Remittances in LKR	569,103	763,980	827,689	915,344	948,957	1,054,989	1,011,972	1,138,124	1,200,766

Source: Central Bank of Sri Lanka, 2020-Economic and Social Statistics of Sri Lanka

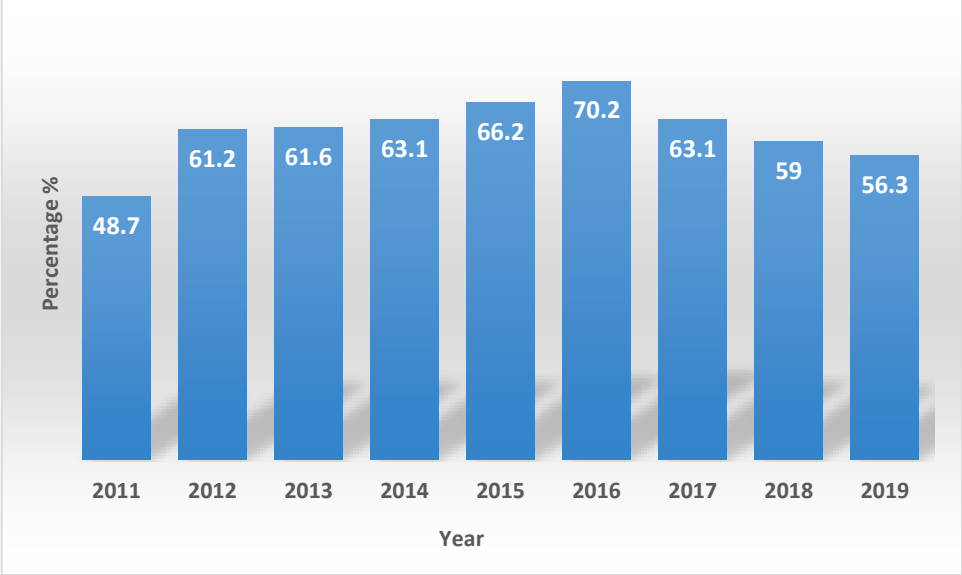
Figure 6.1: Number of Workers Migrating Annually and the Migrants' Yearly Remittances



Source: Central Bank of Sri Lanka, 2020-Economic and Social Statistics of Sri Lanka

These remittances from migrant workers were 48.7 per cent in 2011 and 56.3 per cent in 2019 of the country's total export earnings as shown in Figure 6.2.

Figure 6.2: Remittances of Migrant Workers as a Percentage of Export Earnings by Year

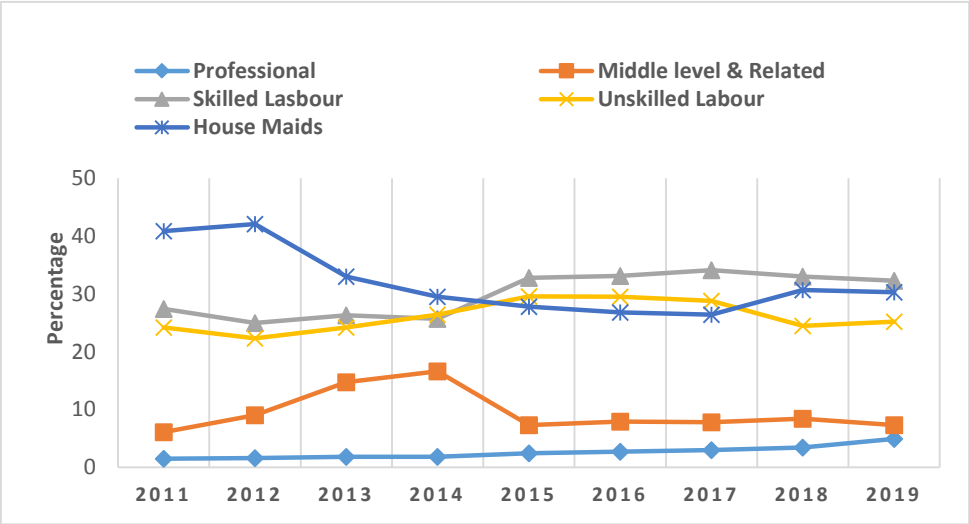


Source: Central Bank of Sri Lanka, 2020-Economic and Social Statistics of Sri Lanka

This continuing increase in remittances is irrespective of the decline in the total number of migrants mainly due to the decline of the number of females migrating as housemaids. As shown in Figure 6.3, migrant housemaids constituted 40.9 per cent in 2011 and 30.3 per cent in 2019 of the overall number of migrants. It indicates the migration for employment under different skills levels categorized as Professional, Middle level, Clerical related, Skilled and Unskilled labour in addition to House maids as percentages of the total number of migrants yearly, during the last nine years from 2011 to 2019.

As Figure 6.3 further shows, there is a continuing increase in the number of migrants at professional level from 1.5 percent in 2011 to 4.9 per cent in 2019; increase in skilled labor level from 27.4 per cent in 2011 onwards with a slight drop to 25.7 per cent in 2014 to 32.3 per cent in 2019 and decrease in the proportion of migrant workers at unskilled level from 29.6 per cent in 2015 to 25.2 per cent in 2019. The rise in the percentages of Professional and Skilled levels migrant workers apparently contributed to offset any losses of earnings due to substantial decline in the outflow of unskilled housemaids. *(CBSL, 2020 Economic and Social Statistics of Sri Lanka)*

Figure 6.3: Percentage Distribution of Migrant Employment by Skills Level and Year

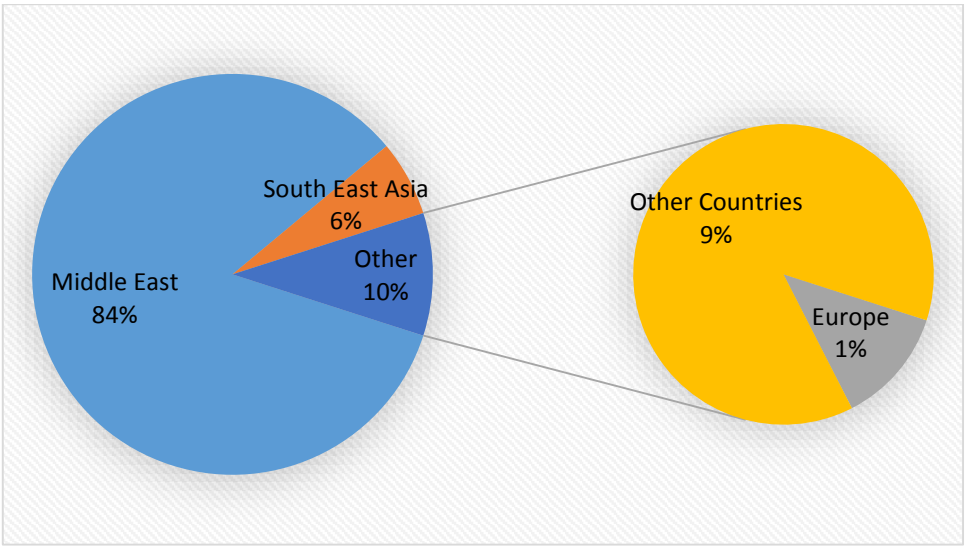


Source: Central Bank of Sri Lanka, 2020- Economic and Social Statistics of Sri Lanka

Total number of departures by Sri Lankan migrant workers for foreign employment in 2019 is 203,186. Figure 6.4 shows the percentage of departures to various regions of the foreign labour market in the world in 2019. Eighty-four per cent of these departures are to Middle Eastern Countries, in the descending order to the labour markets in Kuwait, Qatar Saudi Arabia, Oman, Jordan, Bahrain and Lebanon.

South Eastern Countries attracted 6.1 per cent of Migrant workers, mainly to labour markets in South Korea, Malaysia, Singapore , Hongkong and Brunei. One percent (1.2%) migrated to the countries in Europe, majority to Cyprus followed by Italy and Greece, the remaining 8.7 per cent workers migrated to Maldives, Seychelles, Mauritius, United States and few more countries.

Figure 6.4: Total Departures for Foreign Employment by Country in 2019.



Source: Central Bank of Sri Lanka, 2020- Economic and Social Statistics of Sri Lanka

In addition to remittances of foreign currencies by Sri Lankan in foreign employment having a huge positive impact on the country's balance of payments, there is also transfer of both technologies and good work practices to local industry.

6.3 Overseas Demand for and Local Supply of Skills in Electrical and Electronics Industry related Occupations

Data published by Sri Lanka Bureau of Foreign Employment on vacancies received from foreign countries (Overseas demand for occupations) for Electrical and Electronics related Industry occupations and departures to accept those vacancies (the local supply of skills) show that there is always a shortfall in the supply compared to demand for such occupations.

Foreign employment data in terms of the number of Foreign Job Orders and number of Departures of Workers in Electrical and Electronics related occupations in Years 2017, 2018 & 2019 is given in the Table A4.1 in the Appendix 04 of this report and summary of the foreign employment data in total numbers of Job Orders and Departures by skills level in Electrical and Electronics related occupations is given in the Table 6.2 below.

Table 6.2 gives information on the total number of vacancies available in foreign countries and the departures (vacancies filled) by Sri Lankan Electrical and Electronics workers at different skills levels during the period 2017 – 2019. Table 6.2 also shows that the demand for middle levels, skilled, semi-skilled job positions in Electrical and Electronics related industry occupations had increased slightly between 2017 and 2019; but the departures as a percentage of job orders received during this period were 26.1 per cent in 2017 and has drastically reduced to 8.5 percent in 2018 and to 6.9 percent in 2019.

Table: 6.2: No of Foreign Job Orders Received & No of Departures of Workers in Electrical and Electronics Related Occupations in Years 2017, 2018 & 2019

Job Category	2017		2018		2019*	
	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures
Professional	71	9	84	8	41	2
Middle Level	191	68	168	4	51	4
Skilled	2,851	733	3,482	307	4,250	293
Semi-Skilled	69	10	0	0	0	0
Demand for middle, skilled, semiskilled job positions- Excluding the Category of Professionals Total	3,111	811	3,650	311	4,301	297

Job Category	2017		2018		2019*	
	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures
Departures as Percentage from Number of Vacancies from above row.		**26.1%**		**8.5%**		**6.9%**
Including the Category of Professionals Total	**3,182**	**820**	**3,734**	**319**	**4,342**	**299**
Departures as Percentage from Number of Vacancies from above row.		**25.8%**		**8.5%**		**6.9%**
Total in all Occupations in all sectors	• **328,641**	• **68,319**	• **377,075**	• **66,924**	• **495,405**	• **69,379**
		20.8%		**17.7%**		**14.0%**

Source: TVEC-2020, IS Division- Data received from SLBFE *provisional

Table 6.3 shows the top 20 occupations with highest Demand/Job Orders selected among all occupations in Electrical and Electronics industry sector listed for the three years 2017, 2018 and 2019. These 20 occupations represent more than 90 per cent of the total number of job orders and more than 90 per cent of total number of departures. This complies very well with 80:20 rule of the Pareto Principle.

Table 6.3: Top 20 Electrical and Electronics Occupations of High Demand in Foreign Job Market from Year 2017 to 2020

Job Category	2017		2018		2019	
	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures
Foreman – Electrical	19	0	71	1	20	0
Supervisor – M.E. P	82	3	25	3	-	-
Supervisor – Electrical	52	56	56	0	1	1
Technician – Electrical	275	56	579	73	183	50
Technician – Instrument	52	0	10	0	4	0
Technician – CCTV	30	0	20	0	71	0
Operator CCTV	50	0	19	0	10	0
Technician - Home Appliance	0	0	150	0	-	-
Technician Electrician	2	0	150	2	25	0
Technician -Security system	-	-	-	-	110	0
Technician - Fire Alarm	24	2	78	0	88	0
Installer – Electrical	0	0	103	0	90	0
Electrician – General	2016	619	1491	196	1764	127
Electrician – Building	61	2	23	9	76	7

Job Category	2017		2018		2019	
	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures
Electrician – Industrial	35	3	86	10	221	10
Electrician – Maintenance	78	3	60	0	3	0
Mechanic – Electro	0	1	400	0	1335	58
Mechanic – Generator	110	1	20	1	-	-
Technician- Electronics	28	15	96	9	161	23
Assistant – Electrician	69	10	0	0	0	0
Total number of Job Orders and Departures in Top 20 occupations	**2,983**	**771**	**3,437**	**304**	**4,152**	**276**
Total in all Related occupations	3,111	**811**	**3,650**	**319**	**4,301**	**301**
Performance of Top 20 Occupations as a % of the Total	95.9	95.1	94.2	95.3	96.5	91.7

Source: TVEC-2020, IS Division- Data received from SLBFE

This VET Plan proposes to pay special attention to these Top 20 occupations to achieve at least 50 per cent supply rate (Satisfying 50 percent of Job Orders). The departure scenarios are presented below.

Table 6.4: Performance Analyses in terms of Possible Departures at 50 percent of Satisfying Job Order

Vacancies in 3 years	10,572
Departures in 3 years	1,351
Supply Rate Departure / Vacancies	12.8%
Departures if supply rate increase to 50%	5,286
Increase of Departures in Top 20 occupations are focused (5,286/1,351)	391%
Increase of Departures in Top 20 occupations are focused (5,286/1,351)	391%

Derived from data given in Table 6.2 & Table 6.3

Table 6.5: Training Interventions proposed to address foreign employment needs identified in Top Twenty Occupations in TVET Development and Delivery

Identified 20 Occupations	Training Interventions
Foreman – Electrical	Revise NVQ 5 & 6 Electrical Technology to meet foreign employment needs
Supervisor – M.E. P	Revise Relevant NVQ 5 & 6 courses to meet Mechanical, Electrical and Plumbing needs of foreign employment.
Supervisor – Electrical	Revise NVQ 5 & 6 Electrical Technology to meet foreign employment needs
Technician – Electrical	Develop NCS for technicians /multi-skilled electricians
Technician – Instrument	Develop Stand- alone Unit on Instrumentation
Technician – CCTV	Revise Security and Surveillance System Technician (CCTV System) already existing if there are gaps with foreign employment requirements.
Operator CCTV	Security and Surveillance System Technician (CCTV System) already exists -Unit on Operation is in it. Study and revise if it is necessary.
Technician - Home Appliance	Revise electronics Appliances Repair Technicians to meet the foreign employment needs
Technician – Electrician	Revise Present NCS if there are gaps with foreign employment requirements.
Technician – Security	Development of relevant BMS module is already proposed
Technician - Fire Alarm	Develop Stand- alone Unit on Instrumentation
Installer – Electrical	Development of Electrification of high-rise building already identified and incorporate a stand-alone unit.
Electrician – General	As per letter given in the Appendix 5, NCS of Sri Lanka is 80% matched with Saudi Skill Standards. Revise Electrician NCS and Curricula to meet balance 20% and any other foreign employment needs.
Electrician – Building	Development of Electrification of high-rise building already identified
Electrician – Industrial	Develop a stand- alone unit for industrial wiring
Electrician – Maintenance	Develop a stand-alone unit for Maintenance
Mechanic – Electro	Millwright course of CGTTI could be revised to train Mechanics – Electro Skills
Mechanic – Generator	Develop a stand- alone unit for Generator Maintenance for Millwright Mechanics
Technician- Electronics	Revise Electronics Craftsmen course to meet foreign employment need
Assistant – Electrician	Revise Electricians Assistant NCS, if there are gaps with foreign employment requirements.
Source: Worked out based on Table 6.4 and TVET Training Information	

Mechanical Electrical Plumbing Supervisor (MEP Supervisor) Career / A job as a Mechanical Electrical Plumbing Supervisor (MEP Supervisor) falls under the broader career category of Electrical and Electronics Installers and Repairers.

Also known as closed circuit television technicians, CCTV technicians work for firms that specialize in security and personal safety systems and/or home maintenance. Individuals working as CCTV technicians are required to have very specific knowledge and experience.

6.4 Recommendations

Following recommendations are made based on the analyses of the above data from Sri Lanka Bureau of Foreign Employment and also on findings highlighted in number of Key Informant Interviews and Focus Group Discussions held during the study for identifying skills gaps in the Electrical and Electronics Industry sector.

6.4.1 Data Analyses

a. Assistance of the foreign job agencies or returning migrant workers will be taken to identify the skills gaps if current competencies of available workers are not up to the required level. Special programmes could be implemented to qualify migrant workers at NVQ levels through RPL and use the opportunity to capture and identify any special skills they have acquired during their work spell in the foreign labour market. Such competences could be included into our own NCS and Curricula in the relevant occupations in the sector.

b. The Initiative to introduce Skills Passport (Smart Card) to skilled workers in the country by TVEC (with ILO) will certainly promote NVQ certification of migrant workers.

c. Communication from a Business Analyst- (Saudi Government Enabler) informs TVEC officials that Saudi Arabia Skills Development Authorities have compared the Sri Lankan National Skills Standards for occupations, (electrician, plumber) and they are within the acceptance percentage “80% and higher” of the Saudi National Occupational Skills Standards.

6.4.2 Foreign Employment Trends Identified from Key Informant Interviews

a. There exists a good demand for Electricians in Australia which is currently dominated by Indian workers. Therefore, wiring regulations of other countries need to be included in training and assistance to be given to get licenses to work in such foreign labour markets. It will boost sales of local electrical products in other countries as well.

6.4.3 Foreign Employment Trends highlighted in Focus Group Discussions

a. Sri Lanka has high skills level in installation and maintenance of solar power/PV cells. If Solar Technicians are well trained and skilled, there will be a good demand for substantial number for foreign employment, specially, in Middle East countries in the very near future. However, Technicians need to be made familiar with grid codes/ electrical regulations in different countries.

b. Sri Lankan knowhow of mini hydro is excellent. Performance of Sri Lankan companies in African continent is excellent. Therefore, this potential for skills export in Mini Hydro works needs to be made use of.

c. Panel Makers have employment opportunities in Singapore and Malaysia, for which their skills need to be recognized through a panel maker qualification. Therefore, it is recommended to develop a NCS for Panel Makers to get qualification through Recognition of Prior Learning.

6.4.4 Revision of NCS and Curricula to facilitate foreign employment

a. According to the Table 6.3, Electricians General have very high demand for foreign employment. But most of other demanded occupations are electricians with some specialty such as Generator Maintenance, Cable jointing, instrumentation, Building Management Systems in High rise Buildings and many such specialties. Training of electricians for these specialties would be skill upgrading for electricians and that will be useful for both local industry and to get opportunities of foreign employment. At the Focused Group Discussion with trainers, they suggested to add competency units of skills upgrading as stand-alone units to the respective National Competency Standards. Therefore, it is recommended to add standalone competency unit to the NCS for electricians, as suggested in Table 6.5.

b. There is a foreign employment demand for 1,335 Mechanic –Electro or Electro Mechanics. This may be equivalent to millwright technician trained by the CGTTI (German Tech). It is recommended to find equivalent course for Electro mechanic and rename it as electro mechanic. If not, it is proposed to develop a new NCS or add skills upgrading stand-alone units on electro-mechanics to relevant NCS and Curricula.

c. There is a demand for Assistant Electricians. The recently introduced (March-2020) NCS qualification with the title Electrician- Assistant has the package level of NVQ 2 only. It is suggested that the relevant NITAC to explore the possibility of upgrading it to satisfy the skills needs of an Assistant Electrician in the foreign employment market and making it a NVQ Level 3 qualification as well.

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Chapter 07: Supply of Skills from TVET Institutions to the Electrical and Electronics industry Sector

7.1 Introduction

In this chapter, the skills supply to the Electrical and Electronics industry sector in the country is examined. The formal training in the sector is provided in training Institutions and also at workplaces through apprenticeship.

Institutional training is offered both in full time Courses and in Part time courses. The enterprise-based apprenticeship training is provided or arranged at three levels; Craft Apprenticeship, Situational Apprenticeship and Village Level Apprenticeship. The Total training supply in Electrical and Electronics sector for 2019 is summarized and presented in Table 7.8. The availability of Academic staff in major Public Training Institutions under the Ministry In charge of Skills Development and Vocational Training is also looked at.

Under the section on NVQ Implementation, the National Competency Standards Developed, availability of NVQ assessors for assessment activities and issuance of NVQ certificates in Electrical and Electronics Occupations and Occupational Areas are covered**.**

In addition, some youth enter the electrical and electronics industry through work experience and they are counted for some extend but not fully from NVQ assessments through recognition of prior learning.

7.2 Institutional Training

7.2.1 Institutional Training in Full Time Courses

The Training in Electrical and Electronics industry occupations is carried out mainly by public sector institutions spread island wide, such as Technical Colleges and Colleges of Technology under the Department of Technical Education and Training, Vocational Training centres of the Vocational Training Authority, National Training centres of the National Apprentice and Industrial Training Authority (NAITA) and the National Youth Services Council.

The private sector training institutes including centres run by both private and non-governmental organizations too are involved in skills training mainly in common and conventional occupations in the sector.

The Table 7.1 A below shows the training performance of TVEC registered training providers in the occupations and occupational areas in Electrical Industry sector in 2019. The number of full- time programmes registered with TVEC which are active (the ones reporting to IS-Division, TVEC) during 2019 giving their annual training capacities with

actual total number enrolled and the number completed in the relevant occupations and occupational areas are also shown in the Table 7.1 A.

The number of training programmes delivered by each training provider island wide and also the training performance by individual training providers in each occupation which when add up gives the total skills supply in each occupation or occupational areas in the Electrical sector in the country are also shown in this Table 7.1 A.

In summary, Table 7.1 A shows that the total number of full-time programmes registered with TVEC in Electrical sector related occupations is 326, while the number of programmes reported active in 2019 was only 252 with a total intake capacity adding up to 6,130. That is 74 programmes were considered inactive. Training performance in the Electrical subsector as per TVEC data, shows 6,342 trainees have enrolled while only 4,455 have completed the training.

In 2019, 209 programmes in Electrician, 21 in Electric Motor Winder, 10 in Electrical Appliance Maintenance Technician and a programme in Solar Photovoltaic System Technician had been offered while the number of programmes in Electrical Technology (NVQ Level 5 &6) was 11.

Table 7.1 A: Training Capacity and Training Performance in Full Time Courses in Electrical Industry Related Occupations in 2019

Occupation /Occupational Area	TVET Agency	Number of Programmes Registered with TVEC as in TVET Guide	* No of Active Programmes in 2019 reported to TVEC	Annual Training Capacity in active programmes	Training Performance in 2019	
					Number Enrolled	**Number Completed
Electrician	VTA	149	108	2,005	2,615	2,234
	CGTTI	01	01	50	49	48
	DTET	46	49	1,440	1,569	702
	NAITA	11	11	310	270	361
	NYSC	20	29	648	531	357
	Other Gov.	01	01	30	27	00
	Private	37	10	233	319	182
	Sub-Total	265	209	4,716	5,380	3,884
Electrician-CEB Temporary Partnership	VTA	-	12	290	228	06
	DTET	-	14	420	320	319
	Sub-Total	-	26	710	548	325
Electric Motor Winder	VTA	23	20	340	345	277
	NAITA	01	01	20	06	10
	Private	04	-	60	-	-
	Sub-Total	28	**21**	**420**	**351**	**287**
Electrical Appliance Maintenance Technician	VTA	03	02	35	25	19
	DTET	13	06	440	159	107
	NAITA	01	01	20	12	00
	Private	02	01	50	08	05
	Sub-Total	**19**	**10**	**545**	**204**	**131**

Electrical Technology/ Engineering NVQ Level 5&6	VTA	01	01	40	19	00
	DTET	03	03	90	41	00
	NAITA	02	02	80	73	65
	UC	02	02	120	177	13
	Other Gov	01	01	19	12	08
	Private	02	02	85	68	67
	Sub-Total	11	11	434	390	153
Solar Photovoltaic System Technician	VTA	02	-	-	-	-
	Private	01	01	15	17	00
	Sub-Total	03	01	15	17	00
	***Grand Total**	**326***	**252****	**6,130**	**6,342**	**4,455**

Source: IS Division-TVEC; TVEC Database, 2020

**In working out the grand total in the above total, the programmes under CEB Electrical* (under temporary partnerships of CEB with training providers) are not included.*

***Numbers Completed in 2019, do not necessarily relate to the number enrolled in 2019, as course duration of some of the courses vary from 6-12-24- 36-42-48 Months.*

It is also to be noted that Programmes are considered active only when the data on enrollment and completion are reported to and made available by IS Division -TVEC. Programmes registered are the ones included in the TVET Guide. Only accredited courses of private sector training centres whose registration with TVEC still valid are reported to be included in the TVET guide-2020. However, except a number of courses offered by NYSC, rest of the courses offered in public sector institutes are also accredited courses which could award NVQ Certificates.

Table 7.1B gives a summary of full-time course/programme -mix in each district in the six electrical occupations/occupational areas, based on information provided in the TVET Guide-2020 depicting the registered courses with TVEC irrespective whether the courses are active or not. This is for comparison of the Mix of the full-time courses/programmes by District.

As stated earlier as well, the total number of 326 full-time programmes/courses are distributed among the twenty-five districts. Highest number offered is in Western province with 29 followed with 23 numbers in Gampaha and 21 in Kandy Districts. The lowest is in Mannar district only with two programmes and both Vavuniya and Mullative districts are with 3 programmes.

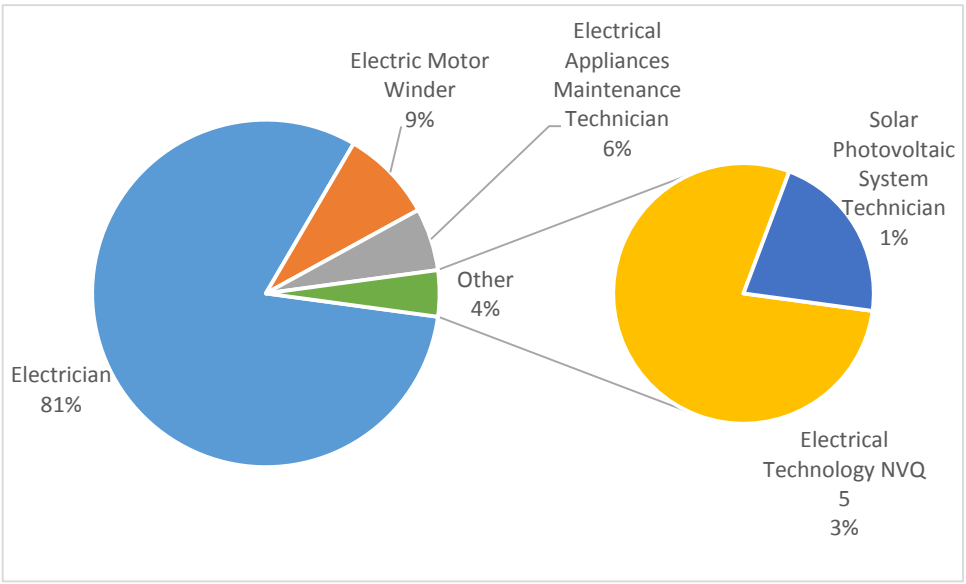
Table 7.1 B Distribution of Course-Mix in Electrical Occupations-by District

District	Electrician	Electric Motor Winder	Electrical Appliances Maintenance Technician	Electrical Technology NVQ 5	Solar Photovoltaic System Technician	Total
Colombo	24	-	-	04	01	29
Gampaha	16	03	01	03	-	23
Kalutara	18	01	-	-	--	19
Galle	11	04	01	-	02	18
Matara	09	01	-	-	-	10
Hambantota	10	04	-	-	-	14
Ratnapura	07	01	-	-	-	08
Kegalle	09	-	01	-	-	10
Kandy	18	-	02	01	-	21
Matale	07	-	-	-	-	07
NuwaraEliya	12	-	04	-		16
Kurunegala	12	01	01	-	-	14
Puttalum	12	01	02	-	-	15
Badulla	14	01	-	-	-	15
Monaragala	10	02	01	-	-	13
Anuradhapura	13	02	-	-	-	17
Polonnaruwa	04	-	-	-		06
Ampara	16	03	02			21
Trincomalee	10	02	02			14
Batticaloa	10	02	-	-	-	12
Vavuniya	03	-	-	-	-	03
Mannar	02	-	-	-	-	02
Mullative	03	-	-	-	-	03
Kilinochchi	05	-	-	01	-	06
Jaffna	10	-	-	-	-	10
Total	265	28	19	11	03	326

Source: TVEC Database, 2020

Figure 7.1 shows the percentage distribution of Courses/Programmes in Electrical related Occupations and Occupational areas. 81 percent is in Electrician courses, next highest percentage of courses is in Electric Motor Winder occupation.

Figure 7.1: Percentage Distribution of Courses in Electrical Related Occupations



Source: TVEC Database, 2020

Two Tables 7.2A & 7.2B show the training in occupations in Electronics sub sector. Table 7.2A with Training Performance through full-time courses/programmes in 2019 and Table 7.2 B showing summary of full time Course-mix of in Electronics Occupations & Occupational areas by District.

Table 7.2 A below shows the total number of programmes registered with TVEC as 96 while total number of active programmes in Electronics sub sector in 2019 as 92 with a total intake capacity of 2,808. Training performance in this sub sector shows that 1,963 trainees were enrolled in 2019 while 773 have completed the training.

Table 7.2 A: Training Capacity and Training Performance in Full Time Courses–in Electronics Industry Related Occupations in 2019

Occupation /Occupational Areas	TVET Agency	Number of Programmes Registered with TVEC as in TVET Guide	*No of Active Programmes in 2019	Annual Training Capacity in Active Programmes	Training Performance in 2019	
					Number Enrolled	**Number Completed
Electronics Appliances Technician	VTA	25	28	470	351	234
	DTET	02	02	40	34	15
	NAITA	02	04	80	15	23
	NYSC	-	07	130	85	68
	Private	-	01	30	00	00
	Sub-Total	29	42	750	485	340
Radio, TV and Allied Equipment Repairer	NAITA	04	04	80	24	34
	NYSC	07	-	-	-	-
	Private	19	04	83	31	15

Occupation /Occupational Areas	TVET Agency	Number of Programmes Registered with TVEC as in TVET Guide	*No of Active Programmes in 2019	Annual Training Capacity in Active Programmes	Training Performance in 2019	
					Number Enrolled	**Number Completed
	Sub-Total	30	08	163	55	49
Industrial Electronics Craftsman	DTET	16	18	540	370	117
	NAITA	03	01	50	54	25
	Sub-Total	19	19	590	424	142
Industrial Mechatronics Technician	CGTTI	01	01	50	45	25
	DTET	-	01	15	22	0
	Private	03	02	50	97	50
	Sub-Total	04	04	115	164	75
Mechatronics Technology NVQ 5, 6, 7	VTA	01	01	40	22	00
	DTET	05	05	150	159	49
	NAITA	01	-	-	-	--
	UC	02	-	30	26	02
	UVT	01	01	80	80	24
	Private	01	03	275	118	30
	Sub-Total	11	10	575	405	105
Electronics Technology/Engineering NVQ 5,6	VTA	-	01	40	15	00
	DTET	01	02	80	40	00
	NAITA	02	02	90	66	53
	UC	-	01	90	94	03
	Private		03	315	215	06
	Sub-Total	03	09	615	430	62
	Grand Total	96	92	2,808	1,963	773

Source: TVEC Database; IS Division-TVEC; 2020

** It is also to be noted that Programmes are considered active only when the data on enrollment and completion are reported to and made available by IS Division -TVEC.*

***Numbers Completed in 2019, do not necessarily relate to the number enrolled in 2019, as course duration of some of the courses vary from 6 -12-24- 36-42-48 Months.*

Tables 7.2 A and 7.2 B show, out of a total number (96) of courses/programmes registered, (29) is in Electronics Appliances Technician occupation, (30) in Radio, TV and Allied Equipment Repairer, (19) in Industrial Electronics Craftsman, (04) in Industrial Mechatronics Technician and (14) both Mechatronics and Electronics Technology occupations and occupational areas.

In addition, Table 7.2 B gives the comparison of Course -mix of full-time courses/Programmes in Electronics related occupations and occupational areas by District. Gampaha district has the highest number with 19 followed by 17 in Colombo and 10 in Galle Districts. There is none In Trincomalee, Mannar, Mullaitivu and Vavuniya districts and a very few numbers in all other remaining districts.

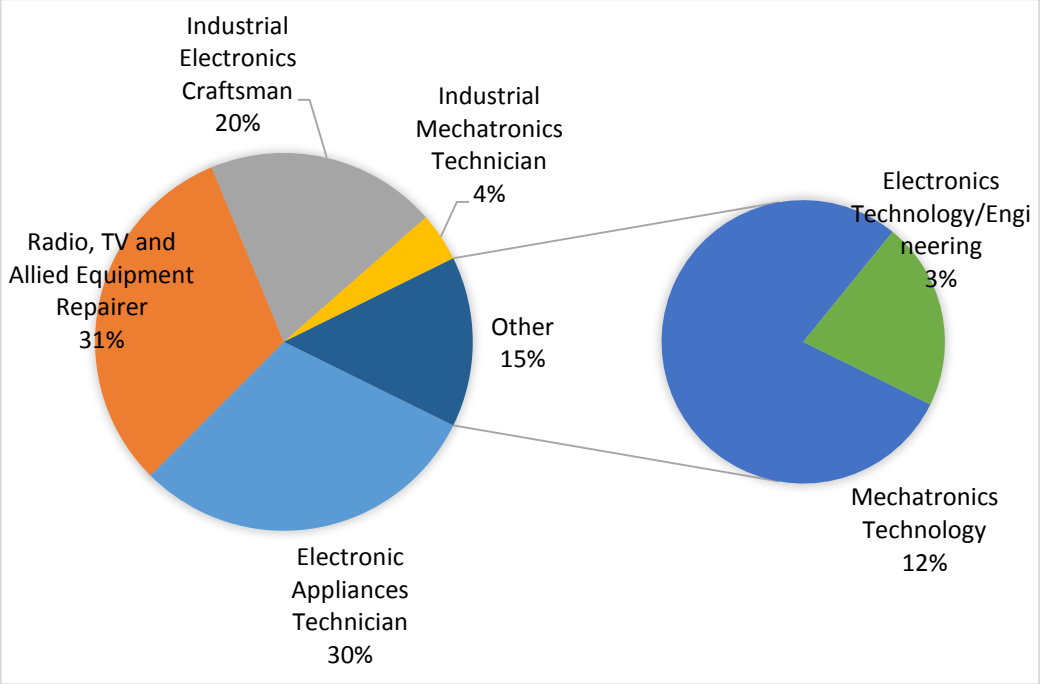
Table 7.2 B: Distribution of the Full Time Course-Mix in Electronics Occupations by District

District	Electronics Appliances Technician	Radio, TV and Allied Equipment Repairer	Industrial Electronics Craftsman	Industrial Mechatronics Technician	Mechatronics Technology	Electronics Technology	Total
Colombo	02	03	05	01	05	01	17
Gampaha	03	10	00	03	01	02	19
Kalutara	01	05	01	-	-	-	07
Galle	06	01	01	-	02	-	10
Matara	01	-	01	-	-	-	02
Hambantota	02	01	01	-	-	-	04
Ratnapura	01	-	01	-	-	-	02
Kegalle	01	-	02	-	-	-	03
Kandy	01	01	01	-	-	-	03
Matale	01	01	-	-	-	-	02
Nuwara Eliya	01	04	-	-	-	-	05
Kurunegala	01	01	01	-	-	-	03
Puttalum	01	-		-	-	-	01
Badulla	01	-	02	-	-	-	03
Monaragala	01	-	-	-	-	-	01
Anuradhapura	01	-	-	-	-	-	01
Polonnaruwa	00	-	01	-	-	-	01
Ampara	02	01	-	-	-	-	03
Trincomalee	-	-	-	-	-	-	00
Batticaloa	01	01	-	-	-	-	02
Vavuniya	01	-	-	-	-	-	01
Mannar	-	-	-	-	-	-	00
Mullativu	-	-	-	-	-	-	00
Kilinochchi	-	01	01	-	01	_	03
Jaffna	-	_	01	-	02	-	03
Total	**29**	**30**	**19**	**04**	**11**	**03**	**96**

Source: TVEC Database, 2020

Figure 7.2 below shows graphically the percentage distribution worked out from the data given in 7.2A & 7.2B of the full-time courses in Electronics related occupations and occupational areas. Radio, TV and Allied Equipment Repairer has the highest percentage with 32 followed with Electronics Appliances Technician with 29 percent and lowest is for Industrial Mechatronics Technician (4 per cent).

Figure 7.2: Percentage Distribution of Full-time Courses in Electronics Related Occupations



Source: TVEC Database, 2020

7.2.2 Institutional Training-Part Time Courses in Electrical and Electronics related Occupations.

The part time courses are usually offered to the already employed for the purpose of up skilling in the same occupation of employment or skilling/retraining in a different occupation for those who are planning change of careers. It is also reported that some of the youth mainly the school leavers who have completed general education who are exploring labour market for their future careers enrol in the short-term courses offered by TVET agencies to check their career choices.

The part time courses offered by DTET, VTA, NYSC, CGTTI, UOVT and other government and private training providers with names, duration, number of centres, training capacity, enrolment and completion numbers in 2019 are tabulated and shown in Table A3.4 in the Appendix 3 attached.

It is learnt that during the focus group discussions with representatives from small service providers specially in the electronics and electrical consumer markets that most of them have followed only short-term part-time courses. After their formal training in vocational training centres, they now follow any available short-term training in the alternative fields. For instance, all entrepreneurs who had training in electrical occupations have

followed electronics courses offered mostly by individual resource persons. That is the kind of training they believe will help them in their careers.

In the advent of the smart technologies, more and more short-term part-time training is now available for those who are interested and also well aware of the possible disruption of the work and the labour markets, therefore the motivation to master such technologies.

Such part time courses also provide opportunity of formal vocational training to those who are said to be tech- savvy to prepare for employment. Successful course completion may help to achieve competences for self-employment, opportunities for local or foreign employment and also mid-career training completers could expect for better promotional prospects

Table 7.3 below lists part time courses offered by training providers in each occupation or occupational area with number of centres offering such training under each TVET agency, annual training capacity in active programmes and training performance with numbers enrolled and completed in the year 2019. In compiling the data, part time courses are grouped under the relevant occupations based on the course title and the relevancy of skills set offered in training to that occupation.

Number enrolled in and number completed the part time courses in 2019 are 1,925 and 1,714 respectively as shown in Table 7.3

Table 7.3: Training Performance in Part time Courses offered by Training Institutes in 2019

Occupation /Occupational Area	TVET Agency	Number of Centres	Annual Training Capacity in Active Programmes	Training Performance in 2019	
				Number Enrolled	Number Completed
Electrician	VTA	09	415	177	96
	NYSC	05	320	189	150
	Other Gov	02	115	107	103
	Private	01	15	12	08
	Sub-Total	17	865	485	337
Electric Motor Winder	VTA	01	15	15	15
	NYSC	02	90	50	38
	Sub-Total	03	105	65	53
Electronics Appliances Technician	VTA	01	10	22	11
	NYSC	04	260	150	121
	Other Gov	02	55	56	46
	Sub-Total	07	325	228	178
Radio, TV and Allied Equipment Repairer	NYSC	02	65	21	14
	Sub-Total	02	65	21	14
Electrical Technology/ Engineering NVQ 5	DTET	19	19	950	1113
	Sub-Total	19	19	950	1113

Occupation /Occupational Area	TVET Agency	Number of Centres	Annual Training Capacity in Active Programmes	Training Performance in 2019	
				Number Enrolled	Number Completed
Mechatronics Technology NVQ 5	DTET	02	90	176	19
	Sub-Total	02	90	176	19
	Grand Total		1,469	1,925	1,714
Source: IS-TVEC, 2020					

It is assumed that all those who have followed training in part time courses are already employed and the purpose of training is for up skilling in the same occupation of employment or skilling/retraining in a different occupation for change of careers.

7.3 Enterprise Based Training (EBT)

Enterprise Based Apprenticeship named as Enterprise Based Training is considered to be the cheapest and also most effective way of skills training in many industrialized countries. In Sri Lanka, the apprenticeship training supplements the institutional training in the pre-employment skills training to some extent.

The enterprise-based training is provided or arranged at three levels by NAITA which has the mandate, and these are; Craft Apprenticeship, Situational Apprenticeship and Village Level Apprenticeship. It is accepted that apprenticeship training takes longer duration than structured institutional training to acquire required competences, as it depends on the activities taking place at a given workplace. Therefore, it has been suggested that entry qualifications and durations of training for apprenticeship training in different occupations will have to vary and generally to be agreed upon by NAITA as the provider with the mandate and TVEC as the certifying body.

Trainees are directly enrolled for training at workplaces owned and managed by employers on full time. These workplaces may be both private and public enterprises, however majority are in private sector. The skilled persons in the workplaces are expected to guide the apprentices to learn the trade and their learning is monitored by the field inspectors attached to NAITA district offices by regular visits to the workplaces. These field officers coordinate the assessment and certification of these trainees.

7.3.1 Enterprise Based Craft Apprenticeship Training.

Craft Apprenticeship is well formalized apprenticeship programmes based on Craft trades or occupations. NAITA restructured some craft programmes to award NVQs and therefore there are now two categories Craft -NVQ and Craft -Non NVQs.

Table A3.5 in Appendix 3; shows craft occupations with Number of Districts where apprenticeship training is offered, with duration and number of enrolment and completion in both NVQ and Non-NVQ programmes.

7.3.2 Situational Apprenticeship -Non NVQ

There are many emerging trades or jobs, specific or situational to some work places. Although these trades have not developed with widespread applications, still, there is a demand for training and opportunity for employment in these trades. Curricula for training in situational trades are set by the employer in consultation with NAITA Inspector and final assessments are conducted by the same parties. Situational Apprentices are usually enrolled with job guarantee letter issued by the employer. These programmes are not accredited for NVQ certification.

7.3.3 Village Level Apprenticeship

This progarmme aims to train village artisans. It is reported to have a declining trend as most youth are aiming to get national level certificates.

Table A3.6 in Appendix 3 shows EBT inclusive of both Situational and Village levels in occupations and technology areas of Electrical and Electronics Trades by NAITA in 2019. These programmes are also not accredited for NVQ certification.

Table 7.4 below depicts EBT performance in terms of the total numbers of trainees enrolled and completed apprenticeship in the three modes /levels combined, in the Electrical and Electronics occupations in 2019. It also indicates the number of districts where Training was arranged for a given occupation, in the year 2019.

Figure 7.3 shows the Distribution of Total Numbers completing EBT at Craft, Situational and Village Levels programmes by Occupation in 2019.

The number of districts for EBT in various occupations is an indication of the industry base and also the extent to which the enterprises cooperate with NAITA in providing opportunities for skills training.

Enterprise based training in Electrician occupation is possible and done in all the 25 districts in the country and total completion number is 210 and the numbers trained in other occupations are significantly low.

While Radio, TV and Allied Equipment Repairer Apprenticeship training is offered in 16 districts, Household Electrical Appliance Repairer training is done in 15 districts and Security and Surveillance System Technician training is in two districts, Matara and Mullative.

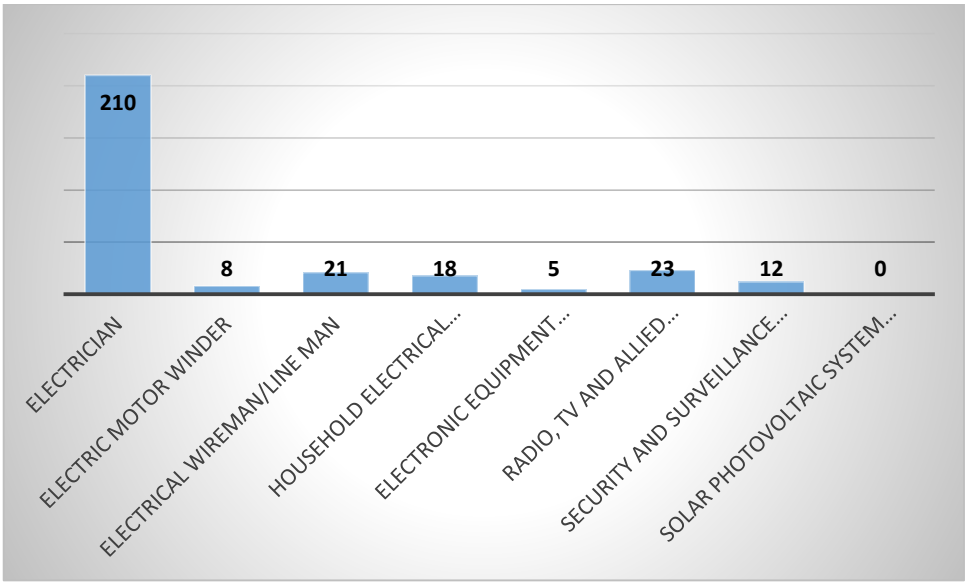
Table 7.4: Total Number Completing EBT at Craft, Situational and Village Levels by Occupation in 2019

Craft Occupation	Number of Districts Having Relevant EBT	Enrollment	*Completion
Electrician	25	185	210
Electric Motor Winder	13	37	08
Electrical Wireman/Line man	07	29	21
Household Electrical Appliance Repairer	15	29	18
Electronics Equipment Mechanic	05	09	05
Radio, TV and Allied Equipment Repairer	16	31	23
Security and surveillance system technician	02	15	12
Solar Photovoltaic System Technician	05	87	00
Total		422	297

Source: IS Division-TVEC, 2020

**Numbers Completed in 2019, do not necessarily relate to the number enrolled in 2019, as EBT duration of some of craft/occupation can vary from 24- 36-48 Months.*

Figure 7.3: Distribution of Number of Trainees Completing EBT by Occupation in 2019



Source: IS Division-TVEC, 2020

7.4 Availability of Academic staff in Major Public Training Institutions under the Ministry In charge of Skills Development

The Skills Sector Development Programme (SSDP 2014 -2020)- ADB and WB funded project implemented under the Ministry in charge of Skills Development and Vocational Training monitored the academic staff availability in the major public sector training institutes. The SSDP reaching almost the end of its period reports that ***around 30 per cent over*** **all** vacancies still exist in the public training institutes while the target was to achieve a vacancy ratio of less than 20 per cent. TVET sector apparently has difficulty of recruiting and retaining qualified academic staff for vocational training delivery in spite of payment of an additional LKR 8000 monthly performance-based allowance to all relevant academic staff which need to be earned by satisfying number of performance criteria agreed by trainers, TVET agencies and the Ministry.

As at 31st September,2020, of the DTET's approved academic cadre positions of 76 for teaching in Electrical Occupations, only 35 instructors are available, 41 positions are vacant, showing 54 per cent vacancy ratio, while in Electronics trade out of 33 cadre positions 12 are vacant with a vacancy ratio of 36 per cent.

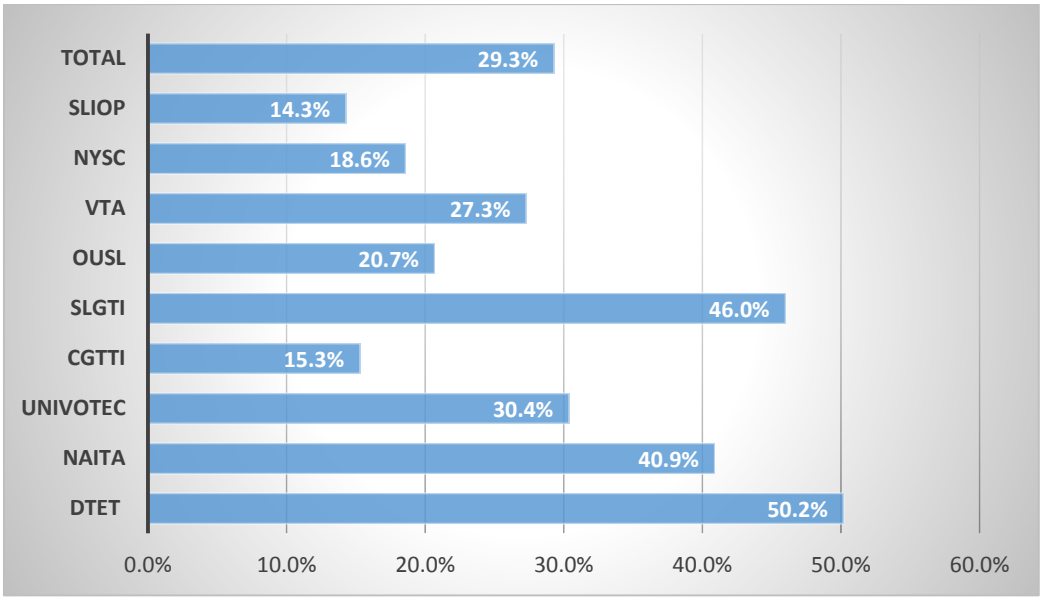
In VTA as per the information provided by its Academic Division on 28th September,2020, three vacancies exit in a total number of 85 instructors in Electrician courses; one vacancy exists in Mobile Phone repairing and one vacancy in a total of 12 instructors in Electric motor winder courses.

Figure 7.4 shows the vacancy ratios worked out by dividing the total number of vacancies with respect to the total number of the approved academic cadre positions for all occupations and trades trained in each public sector TVET institution under the Ministry. Highest vacancy ratio of 50.0 per cent is in DTET followed with 46.0 percent in-Sri Lanka German Training Institute under NAITA and 41.0 per cent in NAITA.

Table A3.7 in the Appendix 3 gives further details on the vacancy ratios in the Training Agencies with the numbers of approved cadre positions and numbers of existing staff in permanent and on contract and on visiting basis.

These unfilled teacher vacancies affect the training capacities in the training centres.

Figure 7.4: Staff Vacancy Ratios by Training Agency as at end of September, 2020



Source: HRD section -SSDD as at 31st September,2020

7.5 NVQ Implementation

National Competency Standards developed for various Occupations and Occupational Areas in Electrical and Electronics sub sectors are shown in the Table 7.5. At present, there are 17 NCS have been developed and training for 15 occupations and occupational areas are now being offered based on them.

Table 7.5: List of National Competency Standards in Electrical and Electronics related Occupations

NCS	Occupation Name	NVQ level
E40S001.2	Electrician	3-4
E40S002.2	Electrical Appliance Maintenance Technician	3-4
E40S003.1	Electric Motor Winder	3-4
E40S006.0	Linesman (Electrical)	3 -4
E40S007.0	Electrician (Domestic)	3
E40S009.0	Solar Photovoltaic Systems Installer	3
	Solar Photovoltaic Systems Technician	4
E40S010.0	Electrician - Assistant	2
D32S002.1	Industrial Electronics Technician	3-4
D32S003.0	Electronics Appliances Technician	4
D33S001.1	Industrial Mechatronics Technician	4
D32S001.1	Radio, TV and Allied Equipment Repairer	2-3-4
D33T003.0	Automation and Robotic Technology	5
E40T001.0	Electrical Technology	5-6
D32T001.0	Electronics Technology	5-6
D33T001.1	Mechatronics Technology	5-6
E40T002.0	Renewable Energy Technology	5-6

Source: TVEC Database,2020

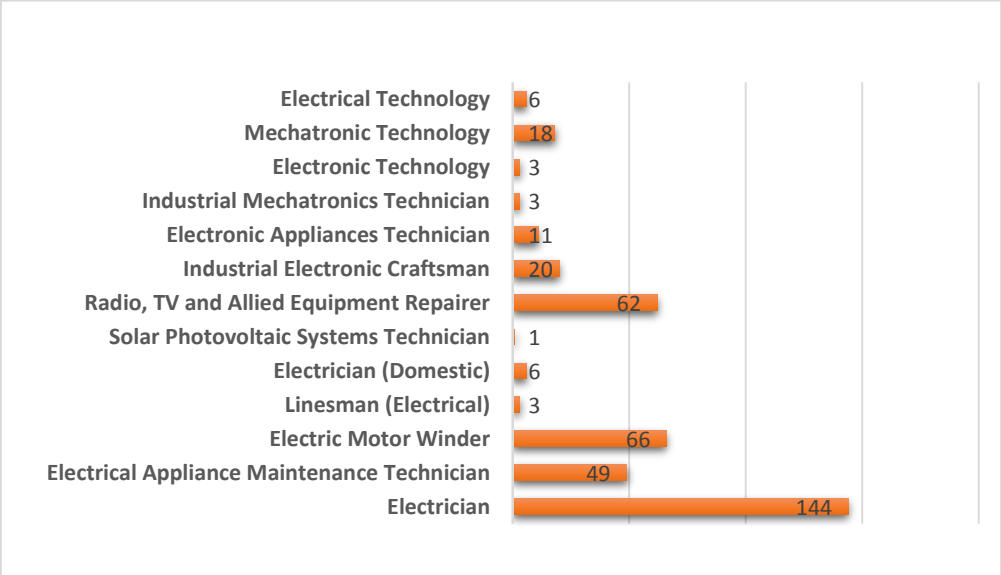
7.6 NVQ Assessors in Electrical and Electronics related Occupations and Occupational Areas

TVEC maintains a database of registered NVQ assessors, who have been selected from among qualified and experienced persons in the relevant vocational fields by TVEC and trained in competency-based assessment methodologies at the University of Vocational Technology. In TVEC database there are assessors who are on probation, those who are registered and also assessors who are in the class of licensed Assessors who have satisfied the requirement of completing assessment of a predetermined minimum number (25) of candidates in a year in the occupation or the occupational area and undergoing regular refresher training programmes on assessment.

As Figure 7.5 below indicates there are, a total of 392 NVQ assessors in the relevant fields, highest number of 144 is in Electrician occupation followed with 66 numbers in Electric Motor Winder, 62 in Radio, TV and Allied Equipment Repairer and 49 NVQ Assessors in Electrical Appliance Maintenance Technician occupations. These are the

common/conventional occupations practiced in the country for which vocational training courses are offered for a considerable time. It is also evident from this data that there are only a very few assessors trained and registered with TVEC for emerging occupations for which the NCSs have been developed recently.

Figure 7.5: Number of NVQ Assessors Available by Occupation



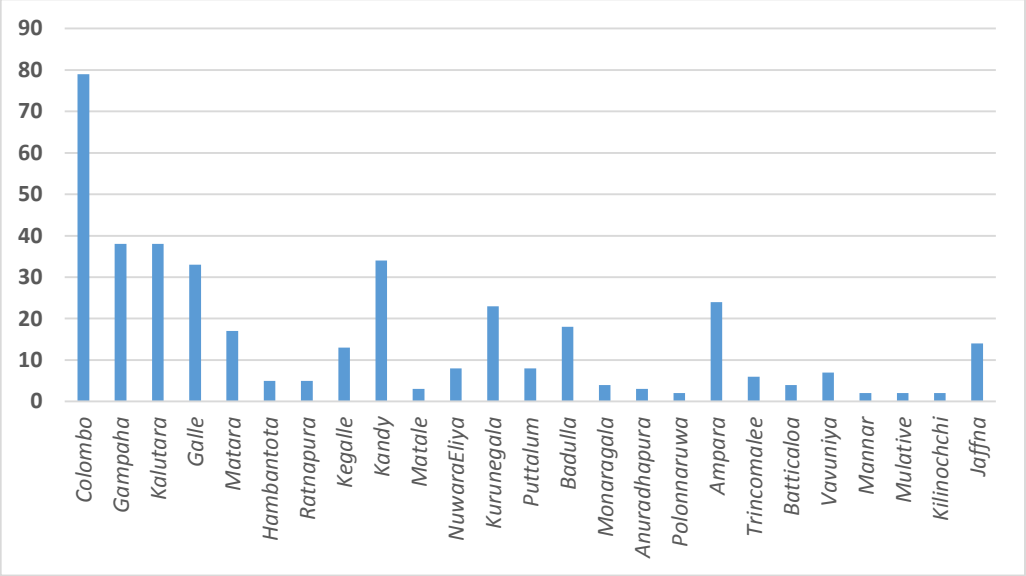
Source: Assessment Division-TVEC, 2020

Figure 7.6 shows distribution of NVQ assessors in Occupations in Electrical and Electronics industry sector by District. Highest numbers of Assessors are in the three districts, Colombo (79), Kalutara and Gampaha (38 each) in the Western Province. In eight districts, the number of assessors available are less than five, in six districts number of Assessors registered are between five to ten (5 -10) The Districts having only two NVQ Assessors are Polonnaruwa Mannar, Mullaitivu and Kilinochchi while Anuradhapura and Matale are with 3, and Monaragala and Batticaloa districts are having only four NVQ Assessors.

Table A3.7: included in the Appendix 3 shows the extent of the availability of NVQ Assessors district wise for different occupations in the Electrical and Electronics sector.

It is also to be noted that as a NVQ assessor can be registered/licensed to do assessment in a number of related occupations, Study of the assessor registry data on TVEC website shows the available NVQ assessors in persons are only 212. The smaller number of assessors in persons could make a smaller number of assessment or even make the assessment a delayed activity resulting some candidates losing interest in appearing for assessment.

Figure 7.6: Availability of NVQ Assessors in Electrical and Electronics Occupations by District



Source: Assessment Division-TVEC as at 6th August, 2020

7.7 NVQ Certification

As per TVEC data, up to 7th September, 2020, a total number of 445,804 NVQ certificates had been issued out of which 27,197 were on basic competencies for work and building career skills at NVQ level 1. Developing career skills (359) and Advancing career Skills (682) account for 1,041 NVQ certificates.

10.5 per cent (42,414) of the remaining 417,566 numbers are NVQ certificates issued for Electrical and Electronics industry related occupations and occupational areas

7.7.1 NVQ Certification in Electrical and Electronics Industry related Occupations up to Sept, 2020

The following Table 7.6 shows the total number of NVQ Certificates issued by occupation and NVQ Levels in the Electrical and Electrical industry sector up to 7th September, 2020.

Of the total number of 42,414 certificates, 89.3 per cent is in occupations in Electrical sub sector, 10.7 per cent is in Electronics sub sector.

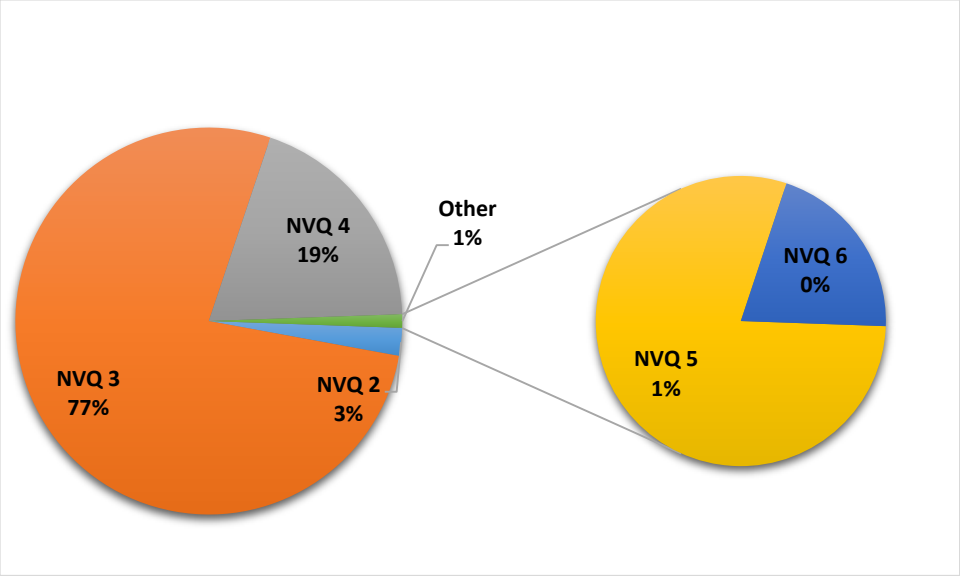
Table 7.6: Total Number of NVQ Certificates Issued in Electrical and Electronics Sector by Occupation and NVQ Level

Competency Standards Code	Occupation/Occupational Area	NVQ 2	NVQ 3	NVQ 4	NVQ 5	NVQ 6	Total
E40S001	Electrician		27,592	6,577			34,169
E40S002	Electric Appliance Maintenance Technician		1,160	12			1,172
E40S003	Electric Motor Winder		2,220	162			2,382
E40T001	Electrical Technology				139	06	145
	Sub-Total		**30,972**	**6,751**	**139**	**06**	**37,868 (89.3%)**
D32S001	Radio, TV and Allied Equipment Repairer	985	1,736	1,018			3,739
D32S002	Industrial Electronics Craftsman		64	55			119
D32S003	Electronics Appliances Technician			70			70
D32T001	Electronics Technology					03	03
	Sub-Total	**985**	**1,800**	**1,143**	**-**	**03**	**3,931 (9.3%)**
D33S001	Industrial Mechatronics Technician			284			284
D33T001	Mechatronic Technology				242	89	331
	Sub-Total			**284**	**242**	**89**	**615 (1.4%)**
	Total	985	32,772	8,178	381	98	42,414
	Total remaining -417,566						42,414
							10.2%

Source: Assessment Division-TVEC, Data refers (is up to 7th September, 2020)

Figure 7.7 shows the number of certificates issued up to September, 2020 at different NVQ levels. Highest is at NVQ 3 level (32,772) followed with 8,178 at NVQ Level 4. Around 77 percent of NVQ certificates issued are at NVQ Level 3, 19 per cent are at NVQ level 4, Both NVQ levels 5 & 6 account for 1 per cent and NVQ level 2 is 3 per cent.

Figure 7.7: Percentage Distribution of Total Number of Certificates Issued by NVQ Level in Electrical and Electronics Sector



Source: Assessment Division-TVEC, Data refers (is up to 7th September, 2020)

7.7.2 NVQ Certificates Issued in Electrical and Electronics Sector in 2019

Table 7.7 A shows the number of NVQ certificates (Levels 2-4) issued in the sector by Occupation and Mode in 2019. A total number of 7,249 certificates are issued in 2019. 68.7 per cent (4,912) of this total number is in CBT assessment, 31.0 per cent (2,215) in RPL mode and only 0.3 per cent (18) from the assessment in EBT apprenticeship training.

Table 7.7 A: Number of NVQ Certificates (Levels 2-4) Issued in 2019 in Related Occupations in Electrical and Electronics Sector

Competency Standard	Occupation	CBT			EBT			RPL			Total Number
		NVQ 2	NVQ 3	NVQ 4	NVQ 2	NVQ 3	NVQ 4	NVQ 2	NVQ 3	NVQ 4	
E40S003	Electric Motor Winder	-	170	16	-	05	-	-	-	06	197
E40S002	Electric Appliance Maintenance Technician	-	112	-	-	04	-	-	02	01	119
E40S001	Electrician	-	2,996	1,276	-	07	02	-	1,770	429	6,480
E40S009	Solar Photovoltaic System Technician	-	-	-	-	-	-	-	-	-	-

	Sub-Total	00	3,278	1,292	00	16	02	00	1,772	436	6,796
D32S001	Radio, TV and Allied Equipment Repairer	21	92	90	-	-	-	-	1	3	207
D32S002	Industrial Electronics Craftsman	-	18	14	-	-	-	-	-	-	32
D32S003	Electronics Appliances Technician	-	-	43	-	-	-	-	-	3	46
	Sub-Total	**21**	**110**	**147**	**00**	**00**	**00**	**00**	**01**	**06**	**285**
D33S001	Industrial Mechatronics Technician	-	-	**64**	-	-	-	-	-	-	**64**
	Sub-Total	**00**	**00**	**64**	**00**	**00**	**00**	**00**	**00**	**00**	**64**
		21	**3,388**	**1,503**	**00**	**16**	**02**	**00**	**1,773**	**442**	**7,145**
	Grand Total			**4,912**			**18**			**2,215**	**7,145**
				68.7%			**0.3%**			**31.0%**	

Source: Assessment Division-TVEC,2020

A higher number of 6,869 certificates are in Electrical related occupations while only 380 certificates are issued in Electronics related occupations.

Table 7.7B: Number of NVQ Certificates (Levels 5&6) Issued in 2019 in Related Occupational Areas in 2019.

Competency Standard	Occupational Area	CBT			EBT	RPL	Total
		NVQ 5	NVQ 6	Total			
E40T001	Electrical Technology	71	2	73	No Provision for NVQ certification at Levels 5 &6 in EBT or on RPL		
D32T001	Electronics Technology	0	2	2			
D33T001	Mechatronic Technology	18	11	29			
D33T003	Automation and Robotic Technology	00	00	00			
		89	15	104			
	Sub- Total	**104**					
	Proportion from Total	**100%**			-	-	100%

Source: Assessment Division-TVEC,2020

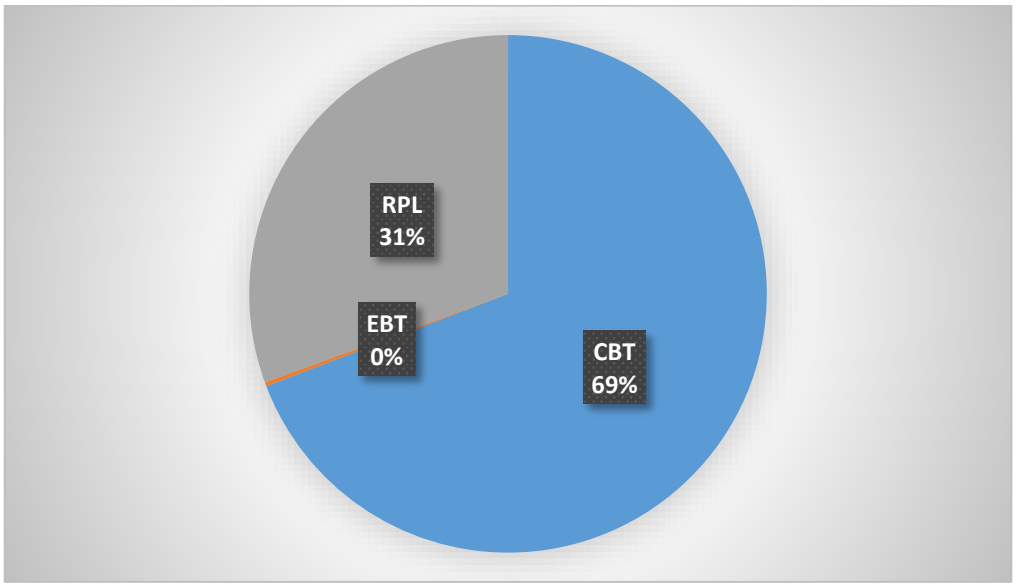
Table 7.7B shows the number of NVQ certificates at Level 5 & 6 in related Occupational Areas in Electrical and Electronics sector issued is 104, all are in CBT assessment. Again, in Electronics technology areas it is only two which is s relatively very low. No NVQ Certificates will be issued in RPL mode or for EBT Training at NVQ 5 level and above.

Figure 7.8 shows the total number of NVQ Certificates issued in CBT, RPL and EBT modes in 2019.

Total number of NVQ certificates issued in CBT mode is 5,016 while number in RPL is 2,215, in EBT only 18 totaling 7,249.

Figure 7.8 indicates that 69.2 percent of the total number of NVQ certificates issued in the sector is in CBT institutional training assessment. Less than 0.3 percent is through EBT. Remaining 30.5 per cent of certificates issued through RPL mode.

Figure 7.8: Percentage of Certificates Issued in Electrical and Electronics Sector Related Occupations and Occupational Areas by Mode in 2019.

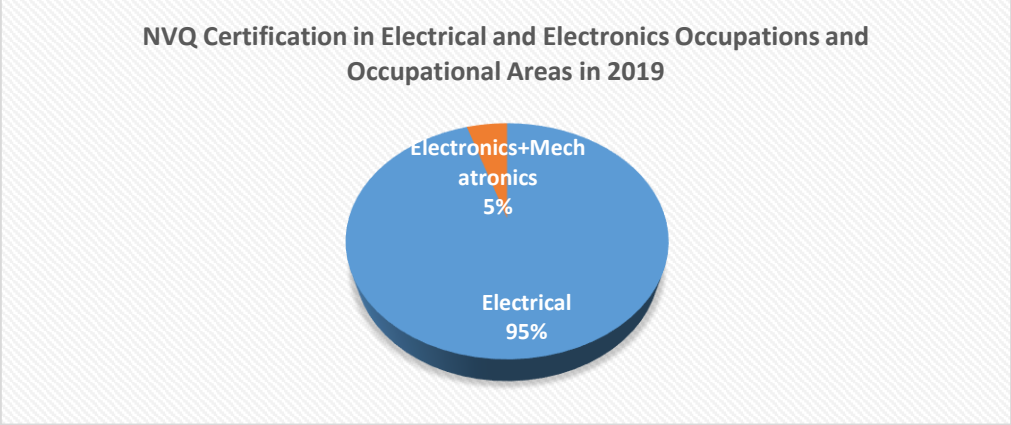


Source: Assessment Division-TVEC, 2020

Figure 7.9 shows that 95 per cent of the total number of NVQ Certificates issued in Occupations and Occupational Areas is in Electrical sub- sector while the remaining five percent is in the Electronics sub- sector.

This shows the slow and poor response of TVET in supplying skills in the emerging and expanding occupations in the futuristic Electronics sub- sector.

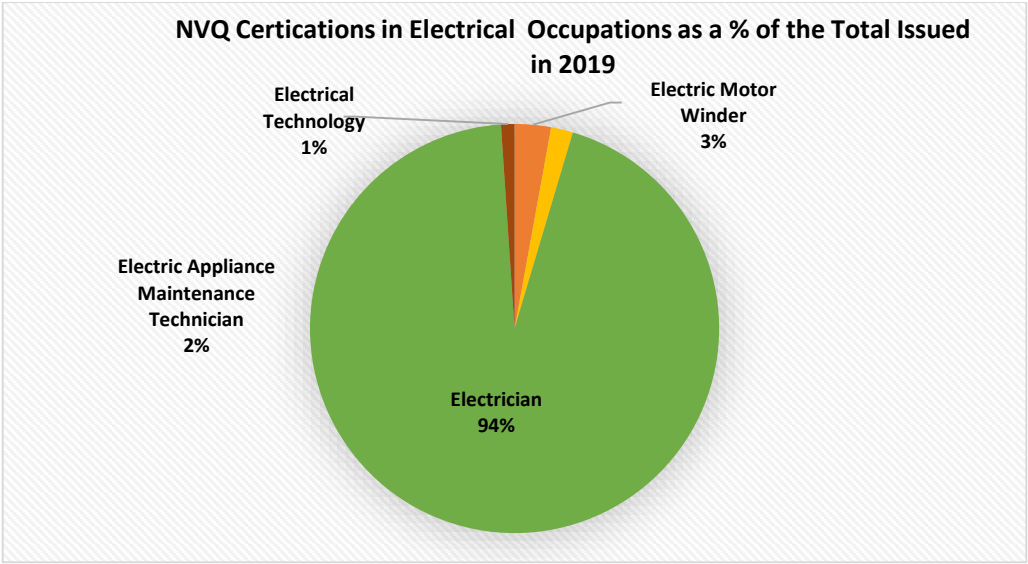
Figure 7.9: Percentage of NVQ Certificates issued by Sub Sector in 2019



Source: Assessment Division-TVEC,2020

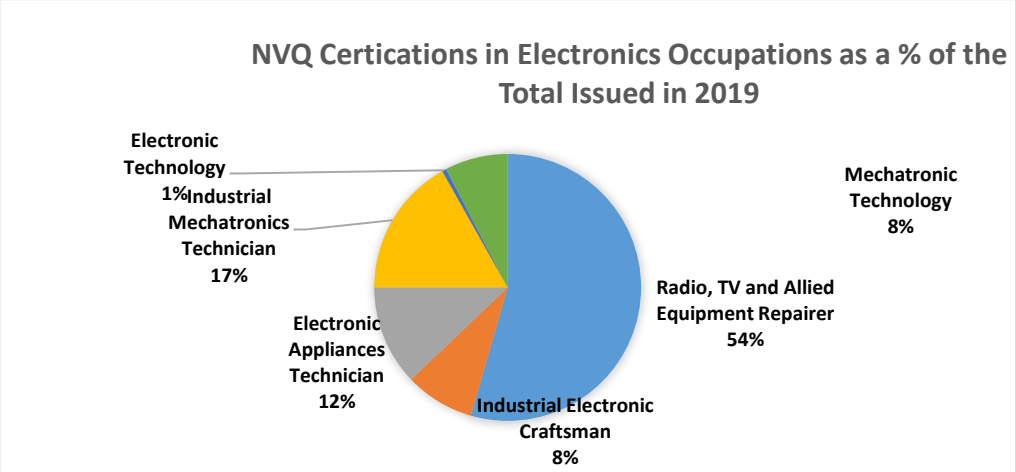
The Figures 7.10 and 7.11 below show the respective percentages of NVQ certificates issued in different occupations and occupational areas in the Electrical and Electronics sub sectors and these are self-explanatory.

Figure 7.10: Percentage Distribution of the Number of NVQ Certificates issued in the Electrical subsector.



Source: Assessment Division-TVEC, 2020

Figure 7.11: Percentage Distribution of the Number of NVQ Certificates issued in the Electronics subsector



Source: Assessment Division-TVEC, 2020

7.8 Total Training Supply

To develop the training plan, data on annual enrolment in pre-employment training courses conducted by TVET institutions and apprenticeship in enterprise- based training, their course completion and details of NVQ certifications by occupations and occupational areas in Electrical and Electronics Industry sector were collected from TVEC. Annually TVEC collects course details to be published in The TVET Guide for the following year and also to monitor training progress.

All the relevant data on total training supply in 2019 are compiled in the Table 7.8 below.

An important point to note from the Table 7.8 is that number of NVQ certificates issued in 2019 will not only be to those completing the course in 2019, but most probably to those who have completed in the previous years as well. Also except for the Electrician occupation in other occupations, the number of NVQ certificates issued is low in comparison to the number completing courses. This is not due to most of the course completers fail in the assessment, but they do not actually appear for the final NVQ assessment due to various reasons. As NVQ assessment is conducted after completion of OJT, some trainees get employed even without having a NVQ Certificate and also when NVQ assessment get delayed further and these course completers loose interest and also confidence in getting certified. However, these course completers may opt for getting certified through RPL mode. TVET providers need to focus on this issue and take remedial actions.

Table 7.8: Total Training Supply in Institutional & Enterprise- based Training and Training in Part-Time Courses-2019

Occupation/ Occupational Area	Pre-Employment Training Supply in 2019						Total Number of NVQ Certificates issued in 2019			Training in Part Time Courses in 2019		
	Institutional Training			Enterprise Based Training		Total Pre-Employment Training Supply NVQ & Non NVQ						
	Capacity	Enrolment	Completion	Enrolment	Completion		CBT	EBT	RPL	Capacity	Enrolment	Completion
Electrician	4,716	5,380	3,884	185	210	4094	4,272	09	2,199	865	485	357
Linesman Electrical				29	21	21						
Electric Motor Winder	420	351	287	37	08	295	186	05	06	60	65	53
Electrical Appliances Maintenance Technician	545	204	131	29	18	149	112	04	03	-	-	-
Solar Photovoltaic System Technician	15	17	00	87	-	00	-	-	-	-	-	-
Electronics Appliances Technician	750	485	340	09	05	345	43	-	03	285	192	178
Radio, TV and Allied Equipment Repairer	163	55	49	31	23	72	203	-	04	65	21	14
Industrial Electronics Craftsman	590	424	142	-	-	142	32	--	-	-	-	-
Industrial Mechatronics Technician	115	164	75	-	-	75	64	-	-	-	-	-
Security & Surveillance System Technician	-	-	-	15	12	12		-	-	-	-	-
Electrical Technology/Engineering NVQ 5	434	390	153	-		153	73	-	-	850	1113	121
Mechatronic Technology NVQ 5	575	405	105	-		105	29	-	-	90	176	17
Electronics Technology /Engineering NVQ 5	615	430	62	-	-	62	02	-	-	-	-	-
	8,938	**8,305**	**5,228**	**422**	**297**	**5,525**	**5,016**	**18**	**2,215**	**2,215**	**2,052**	**740**
Derived from Table 7.1 A; Table 7.2A, Table 7.3; Table 7.4 ; Table 7.7A and Table 7.7B												

Total supply in pre-employment training entails both institutional training delivered in full-time courses and in enterprise-based apprenticeship training in a given year. Training in part-time courses is not considered as pre- employment training as majority of them are offered to persons already employed. In calculation of the total pre-employment training supply in 2019, in the electrical and electronics industry related occupations and occupational areas listed in the Table 7.8, the total numbers of trainees completing the institutional training courses and EBT apprenticeship are summed up in the column titled in Total Pre employment training Supply NVQ and Non NVQ.

In the VET plan being developed, Total Preemployment Training Supply figures for the occupations and occupational areas indicated in this column are used to estimate the Skills gaps quantitatively.

7.9 Recommendations

i. Establish electronics courses in outstation districts to have uniform course mix in districts. Suggestion is to introduce a minimum number of courses to districts having no courses at all to improve accessibility to TVET by the aspiring youth living in the districts.

   Comparison of the Full-Time course mix offered district wise in the country in the Electrical and Electronics related industry sector show stark differences and non-uniformity, perhaps denying equal opportunities to a large number of youths living in far-flung districts in TVET accessibility. This situation is more prominent in the occupations in the Electronics sub sector. TVET authorities have to find solutions to resolve this unfairness and inequality in the course offering and training delivery.

   The need to recruit qualified trainers and their retention in TVET system with regular upskilling to maintain currency of the competences specially in the growing Electronics sub sector has to be a priority.

ii. Increase NVQ assessment in CBT and EBT courses
   Similarly, the actions need to be taken to increase the availability of NVQ assessors for various occupations and for uniform availability /distribution geographically as well.

iii. Strengthen training management to increase enrolment to the full capacity in all relevant courses and increase the completion rate.
   When the numbers enrolled in training and the numbers completed training in TVET institutions are compared, there appears to be significant numbers of drop-outs. TVET management needs to take remedial measures to improve the efficiency and effectiveness in the utilization of resources. Introduction of new courses for emerging occupations in the Electrical and Electronics industry sector as suggested in the VET plan should also be a priority for Training Management.

iv. Promote RPL for certifying the workforce already employed in the Electrical and Electronics industry sector thus providing them necessary upskilling, initiating career paths and improving their retention in continuing employment.

Such actions will also result in the increased human capital formation required to meet the envisaged growth of the Electrical and Electronics manufacturing sub sector covered in this study for developing the VET Plan.

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Chapter 08: Tracer Study on NVQ Certificate Holders in Electrical and Electronics Industry Related Occupations

8.1 Introduction

Tracer study on the TVET passed outs was carried out to identify issues in the skills supply side. The objective of the tracer study was to determine the employability of the NVQ certified trainees passing out from the vocational training institutes in the country in Electrical and Electronics related occupations and obtain their feedback on the institutional training they have undergone and suggestions for any course improvements. 93 NVQ Certified TVET pass outs in 2018, responded in this study done by postal survey targeting 200 participants.

The chapter presents the findings of this study on the employment status of the respondents by occupation and province, nature of employment, monthly income and their comments and suggestions.

8.2 Sample Selection

The survey method was used to gather basic data which can then be collated to draw a broad picture. A questionnaire was developed to ask the same questions of all informants among the NVQ certificate holders, and then use the specific findings to generalize among the larger population of course completers.

There was a total of 3,033 NVQ certificates in occupations in Electrical and Electronics related industry sector issued in the country from 1st of January, 2018 to 31st of December, 2018 through Competency Based Training mode. As Tracer study was to be among 200 NVQ course completers, it was decided to have a sample size of 300 for this study as it was planned to be postal survey. To make the sampling more representative, based on the total number of NVQ certificates issued in occupations in Electrical and Electronics industry sector by district, by various training providers and by vocations (thus inclusive of both clustering and stratification of samples), proportionate numbers to be traced in each cluster were determined. The names and the addresses of the persons to be contacted for the survey were randomly picked from TVEC -NVQ Certificate data base.

However only 93 have responded to the postal survey, a rate of response is a little more than 46 per cent, this figure could be considered fairly appropriate to serve the purpose of the study. Among the respondents there are four females.

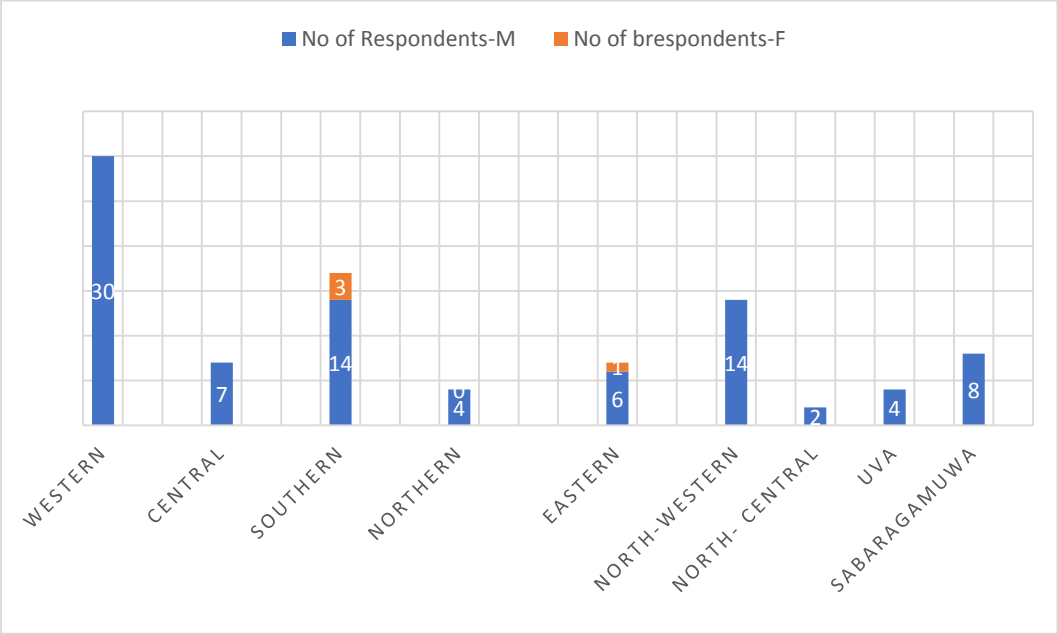
The margin of error of the estimates based on this sample is 10.01%. This implies that there is a 90% chance -Confidence level that the true value is within ± 10.01 *of the estimated value.*

8 .3 Sample Details

8.3.1 Sample Distribution by Province and Gender

Figure 8.1 below shows the Distribution of the sample by Province and Gender. The percentage distribution of the respondents shows that 95.7 per cent among respondents are males and 4.3 per cent are females.

Figure 8.1: Number of Respondents by Province and Gender



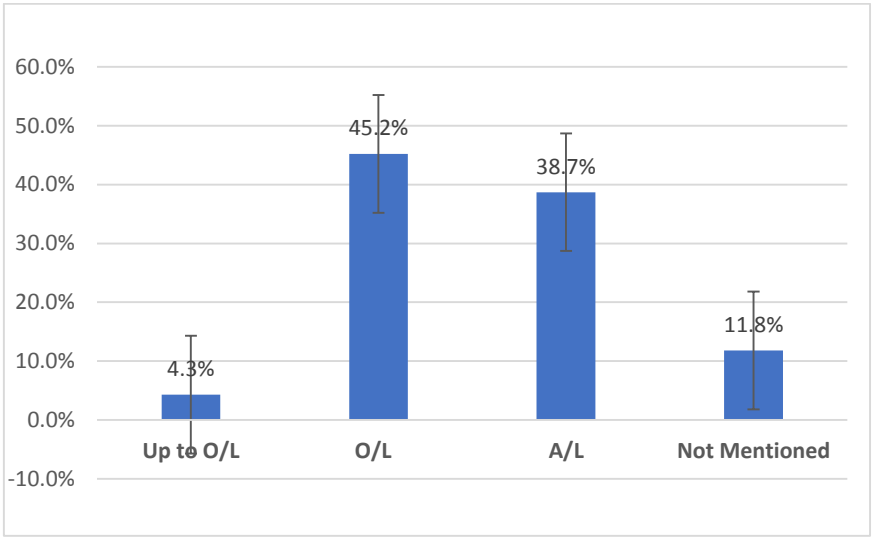
Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8.3.2 Respondents by General Educational Level

In the Electrical and Electronics related industry, among the NVQ certificate holders, 45.2 per cent are G.C.E. (O/L) qualified and 38.7 per cent are G.C.E.(A/L) qualified totaling 83.9 per cent, although 11.8 per cent have not responded to this question as shown in the Figure 8. 2.

As per the Figure 8.2, among respondents in the survey, more than 83 per cent have either G.C.E(O/L) or G.C.E(A/L*). It indicates that Electrical and Electronics occupations have higher attraction among youth with good school grades and relatively higher general educational back ground. It also shows their trainability and potential for acquisition of advanced skills.*

Figure 8.2: Percentage Distribution of Respondents by General Educational Qualification

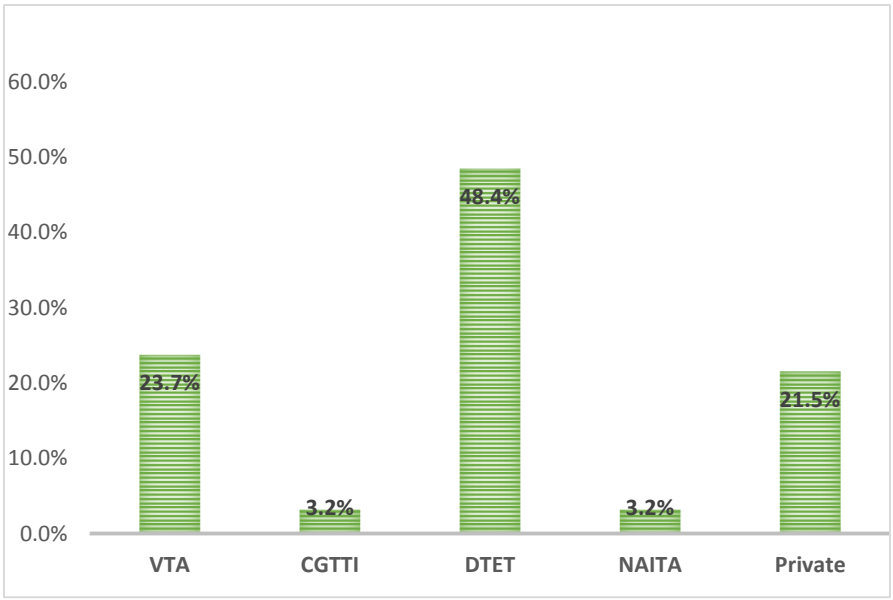


Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8.3.3 Respondents by Training Provider

Figure 8.3 show the distribution of the survey respondents by the training provider, highest percentage of 48.4 is from DTET followed by VTA and Private providers with 23.7 per cent and 21.5 per cent respectively. 3.2 per cent each are from CGTTI and NAITA.

Figure 8.3: Percentage Distribution of Respondents by Training Provider

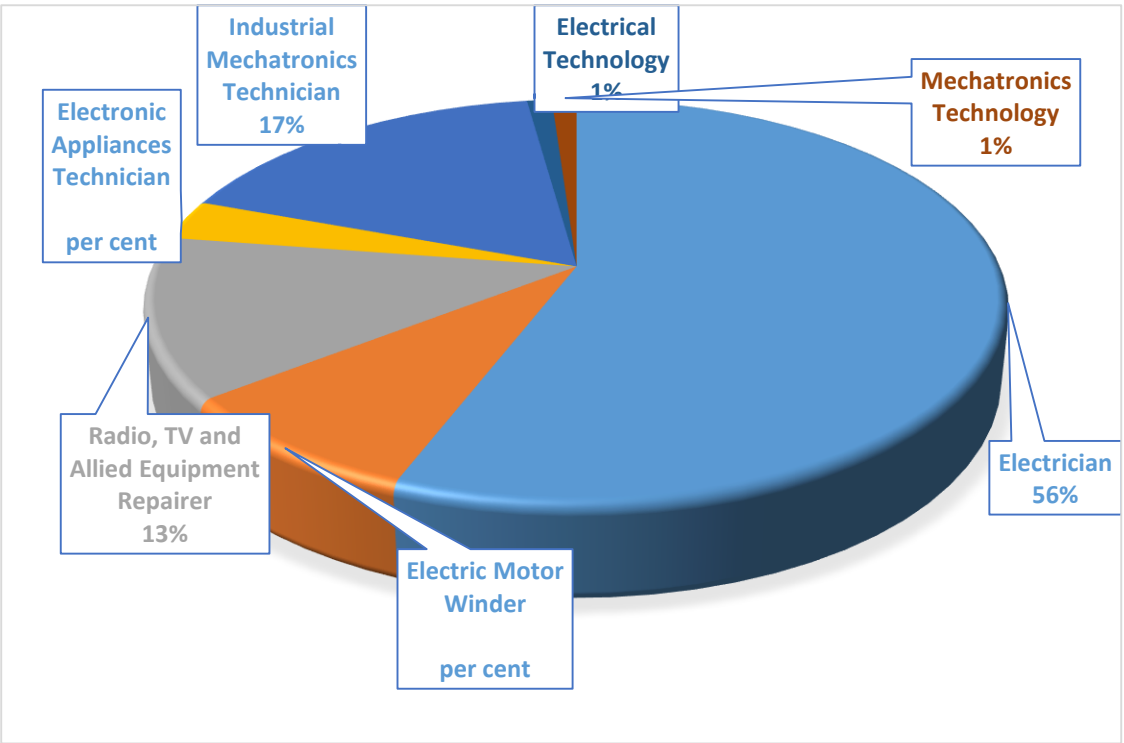


Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8.3.4 Distribution of the Sample by Occupation

Figure 8.4. shows that Majority of the respondents are from Electrician (55.9 per cent), Industrial Mechatronic Technician (17.2 per cent) and Radio, TV and Allied Equipment Repairer (12.9 per cent) occupations.

Figure 8.4: Percentage Distribution of the Respondents by Occupation



Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8.4 Employment Status of the Surveyed NVQ holders in Provinces

Table 8.1 shows the overall employment rate - employability of the total responded sample, province wise and overall, in the country.

Table 8.1 indicates an overall employment rate of 59.1 per cent of the NVQ Certificate holders in the Electrical and Electronics related industry based on the definition[3] used in the previous tracer studies by TVEC (Jaythilaka et al, 2013) and Centre for Poverty Alleviation/ ADB- 2016 as well.

TVEC Tracer Study of the TVET pass- outs in 2011 found 50.0 per cent of NVQ holders in employment while the CEPA *Tracer Study for ADB- 2016* found this employment rate to be

[3] Employment Rate = (Number of people who are currently employed) / (Total number responded in the survey)

57.4 per cent. Thus, the figure for employment rate of NVQ holders has improved in the 5 years from 50.0 per cent in 2011 to 57.4.per cent in 2016 irrespective of their fields of training.

Table 8.1: Analyses of Current Employment of Surveyed NVQ Holders by Province

Province	mployed A	Self-Employed B	nemployed & Looking for Employment C	Not seeking Employment in EE Sector	In further Education and not employed E	Total Employment A+B	Total
Western	16	05	03		06	21(70%)	30
Central	02		04		01	02(28%)	07
Southern	06	04	02	01	04	10(58.8%)	17
Northern	01	02	01			03(75%)	04
Eastern	03		03		01	03(42.9%)	07
North-Western	07	01	04		02	08(57.1%)	14
North-Central	01	01				02(100%)	02
Uva	01		02		01	01(25.0) %	04
Sabaragamuwa	05		02		01	05(62.5%)	08
	42	**13**	**21**	**01**	**16**	**55(59.1%)**	**93**
Overall Percentage	**45.1**	**14.0**	**22.6**	**1.1**	**17.2**	**59.1**	**100**

Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

The Employment rate of 59.1 per cent found in this tracer study of NVQ certificate holders in 2020 is specifically trained in the Electrical and Electronics fields.

Table 8.1 also indicates the employment rates of the NVQ respondents by province. *However, these figures are to be treated with caution as some of the cell sizes are relatively small.*

Further study on the data presented in the Table 8.1 above also shows that 45.2 per cent is in paid or waged employment, 14.0 per cent employed as own account workers, while 1.1 per cent is currently not looking for employment in the electrical and electronics sector and around 17.0 per cent is in further education. Thus 18.2 per cent of the NVQ holders surveyed do not actively participate in the labour force.

Overall Unemployment Rate of the sampled NVQ Certificate Holders is only 22.6 per cent.

A 90 percent confidence interval for true unemployment rate of NVQ Certificate holders varies somewhere between 14.1 per cent and 31.1 per cent.

8.5 Province- wise Employability

Employability or the percentage of employment of the sampled group is worked out based on the definition[4] of total number who are actively participating in the Labour Force.

In Table 8.2, the columns are designated with alphabetical order stating with

a. A for the second column (Number Employed),
b. B for the third column (Number Self-Employed)
c. C for the fourth column (Numbers unemployed but looking for Employment).

Employability = [(A+B)/(A+B+C)]x100]

Thus, the employability figures determined overall and province wise employability of this surveyed sample, are listed in the Table 8.2 and graphically depicted in the Figure 8.5 below. The indicated overall figure for the employability of the NVQ certificate holders in the Electrical and Electronics related industry is 72.4 per cent. *In comparison to the relevant employability figure based on this definition for CEPA Tracer Study-2016 for NVQ graduates is 73.1 per cent irrespective of their training fields.*

Although some of the respondents in the present tracer study (2020) who have indicated that they are presently unemployed in the questionnaire, when contacted on the telephone said they were employed earlier, but were discontinued due to Pandemic. Therefore COVID 19 certainly had affected their employment status, thus lowering the employability rate determined in the study.

Table 8.2: Employability of the Surveyed Sample by Province

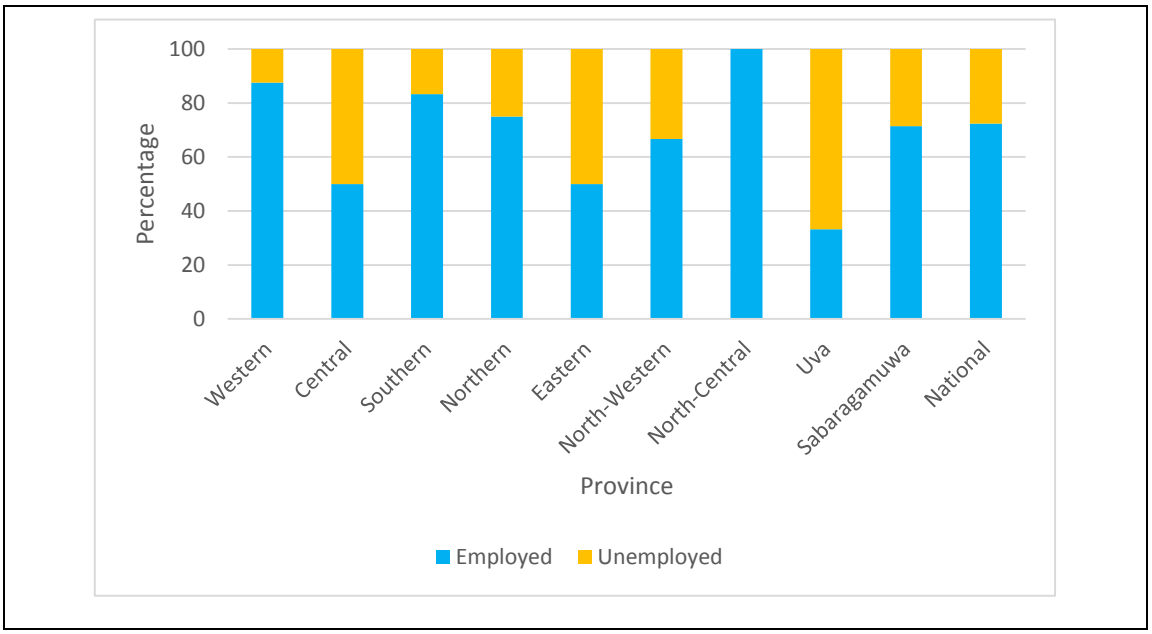
Province	Employed A	Self-Employed B	Unemployed Looking for Employment C	Percentage in Employment A+B/A+B+C	Percentage in Unemployment C/A+B+C
Western	16	05	03	87.5	12.5
Central	02		04	50.0	50.0
Southern	06	04	02	83.3	16.7
Northern	01	02	01	75.0	25.0
Eastern	03		03	50.0	50.0
North-Western	07	01	04	66.7	33.3
North-Central	01	01	-	100	0
Uva	01		02	33.3	66.7
Sabaragamuwa	05		02	71.4	28.6

[4] Employability or Employment rate = (Number of people who are currently employed) /((Total number of respondents in the sample) – (voluntary unemployment)), i.e., excluding voluntary unemployment from the denominator.

Total	42	13	21	72.4	27.6
Percentage	**55.3**	**17.1**	**27.6**		

Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

Figure 8.5: Employability of the Surveyed NVQ Certificate Holders by Province



Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8.6 Employability of NVQ Certificate holders by Occupation

The tracer study has found that overall employability of NVQ Certificate holders in Electrical and Electronics Industry related occupations and occupational areas is 72.4 per cent.

Table 8.3 and Figure 8.6 show the employability of the NVQ holders by occupation.

Table 8.3: Employability of NVQ holders Surveyed by Occupation

Occupation	nber Employed A	Self Employed B	Unemployed but Looking for work C	Employability as a Percentage
				A+B/A+B+C
Electrician	22	06	15	65.1
Electric Motor Winder	01	03	03	57.1
Radio, TV and Allied Equipment Repairer	07	03	02	83.3

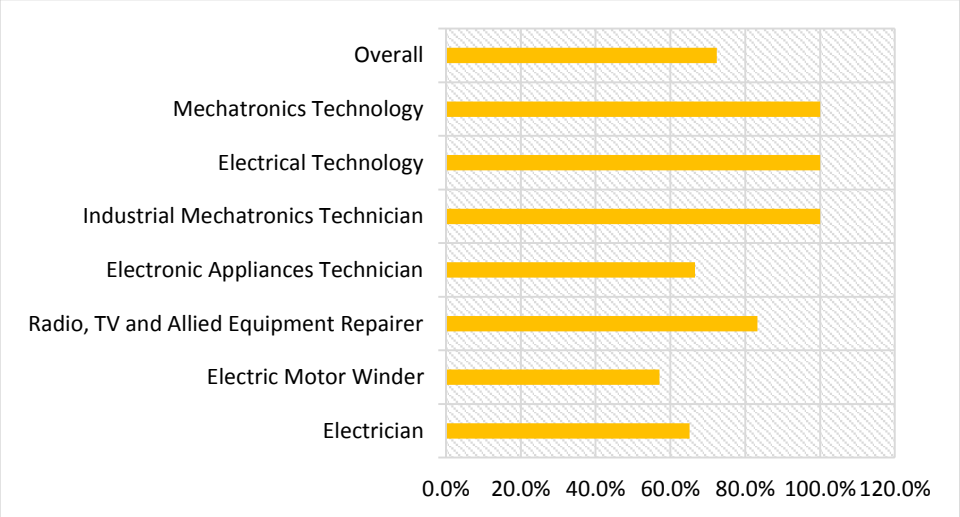
Occupation	nber Employed A	Self Employed B	Unemployed but Looking for work C	Employability as a Percentage
				A+B/A+B+C
Electronics Appliances Technician	02	-	01	66.6
Industrial Mechatronics Technician	09	-	-	100
Electrical Technology	01	-	-	100
Mechatronics Technology	00	01	-	100
Total	**42**	**13**	**21**	**72.4**

Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

NVQ holders at level 5 in occupational areas related to Electrical and Electronics industry sector are all employed, while lowest employability is shown in Electric Motor Winder Occupation. The highest employability of the NVQ certificate holders who are in the labour market in the Electrical and Electronics related sectors are mainly in occupations or occupational areas in Electronics fields which are either relatively new or for which only comparatively a smaller number of training courses are offered by public training providers.

However, these figures are to be treated with caution as some of the cell sizes are relatively small.

Figure 8.6: Employability by Occupation

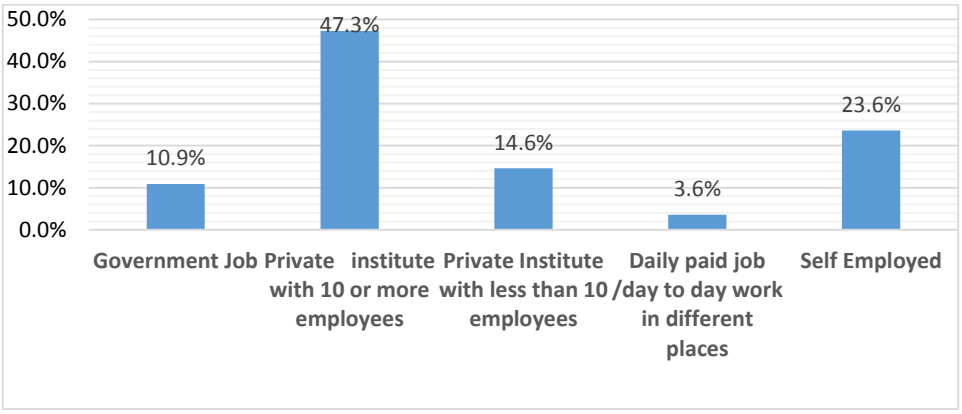


Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8.7 Nature of Employment

The Figure 8.7 below depicts the nature of employment of the sampled NVQ holders in the industry. Almost half (47.3 per cent) of the paid employees in the sample, work in private establishments which employ 10 or more workers, while 23.6 per cent are self-employed /own account workers or are employers. The government sector employs 11 per cent of these NVQ holders while only 3 .6 per cent falls into the category of daily paid working in different places to make their living.

Figure 8.7: Nature of Employment of the Surveyed Sample

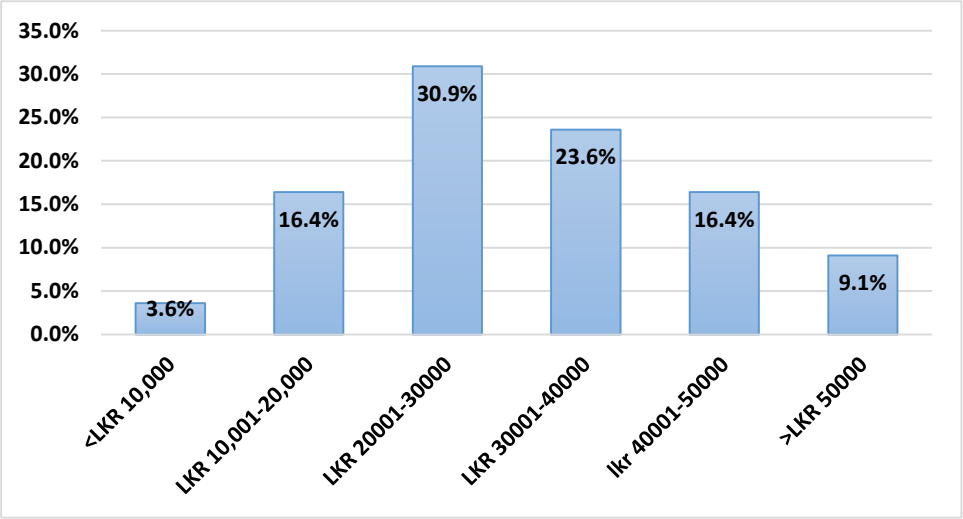


Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8.8 Monthly Income of the NVQ Levels 3 & 4 Holders

Eighty per cent of the NVQ holders surveyed draw a monthly salary /receive an income of more than LKR 20,000, close to forty-eight (47.6) per cent draw more than LKR 30,000 and Around twenty-five (25.1) per cent draw more than LKR 40,000 while only a lower 9.1 per cent draw more than LKR 50,000 per month. More details of above are graphically presented in Figure 8.8.

Figure 8.8: Percentage Distribution of Respondents by Monthly Salary Range



Source: Tracer Study on NVQ Certificate Holders done for VET Plan – 2020

8. 9 Comments and Suggestions on Training Improvements from Respondents

Training Needs Identified to improve the employability of NVQ certificate holders based on tracer survey responses together with important comments/suggestions are listed below in this section.

All of the respondents in the survey, had been exposed to world of work either through OJT and or through their employment in industry. With this exposure to the work place /industry, respondents apparently had found the need of being multi skilled at work. This is evident from their suggestions to include following subject areas into their institutional training.

a. Add more modules, include training in PLC Programming for micro controllers, Internet of Things, Include Electronics in electrical training, LCD, CCTV Technology.

b. Training with Arduino projects- Provision of single-board microcontrollers and microcontroller kits for Hands-on Skills in building digital devices aiming to provide a lo w-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators.

c. Auto Cad with Electrical drawings.

d. Training on motor winding.

e. Give more and better training in soldering practices.

In addition, surveyed NVQ holders had suggestions to improve the institutional training that they have previously undergone. The areas which are most frequently cited as needing improvement are to:

a. Update the workshop facilities with modern equipment,
b. Ensure the availability of the operable equipment (taking prompt action to repair any out of order equipment)
c. Provide up to date practical training.
d. Need more training on troubleshooting and more training on equipment

Improvements in NVQ Assessment- The delay in scheduling of NVQ assessments and the issuance of certificates has been highlighted as a key area for improvement.

It was pointed out that many trainees who do not get OJT in reputed industries do not have opportunity to acquire relevant skills. Provide OJT in larger companies for wider exposure to technology and

a. Request to conduct NVQ Assessment after undergoing OJT as trainees understand theory and their application in industry and workplace.

8.10 Summary of Findings of the Tracer Study

Among respondents in the survey, more than 83 per cent have either G.C.E.(O/L) or G.C.E(A/L). It indicates that Electrical and Electronics occupations have higher attraction among youth with good school grades and higher general educational back ground compared to those working in technical trades/occupations in other manufacturing sectors. It also shows their higher trainability and potential for acquisition of advanced skills.

This augurs well for the requirement of Increasing the availability of an adaptable workforce with the advanced skill sets and training which are considered crucial for the intended growth of export oriented Electrical and Electronics Component Manufacturing sector in the country.

The tracer study has found that overall employability of NVQ Certificate holders in Electrical, Electronics and Mechatronics Industry related occupations and technology areas is 72.4 per cent.

a. Over 90 per cent of those surveyed NVQ holders who responded to the question on the relevance of training rated their training as useful for their current work

b. More than 46.0 per cent of surveyed NVQ holders earn more than LKR 30,000 per month.

8.11 Recommendations

a. Include training in new / smart technologies related to automation and digitization, PLC programming, CCTV technology and IoT as stand-alone modules.

b. All trainees should be given some opportunity to follow at least a short-term training in large & reputed companies.

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Chapter 09: The Electrical and Electronics Component Manufacturing Sector for Export Market

9.1 Introduction

The Main focus of this chapter is on the skills requirements in the upcoming subsector of Electrical and Electronics Component manufacturing for export Market. In this chapter, export performance of the Electrical and Electronics products in terms of its share in the earnings of the total merchandise exports of the country during the last 10-year period is examined. Skills gaps and training needs identified, particularly in enterprises engaged in the Electrical and Electronics Component Manufacturing subsector among the participants in the Industry Survey, Key Informant Interviews, Focused Group Discussions, are gleaned out from the overall findings and analyzed and reported in this chapter. Further, the skills requirements for the next five years based on the growth forecast for the sector are worked out and most importantly skills issues are also addressed to be included in the training plan.

9.2 Performance of the Electrical and Electronics Component Manufacturing Sector in the Export Market

a. Export Earnings

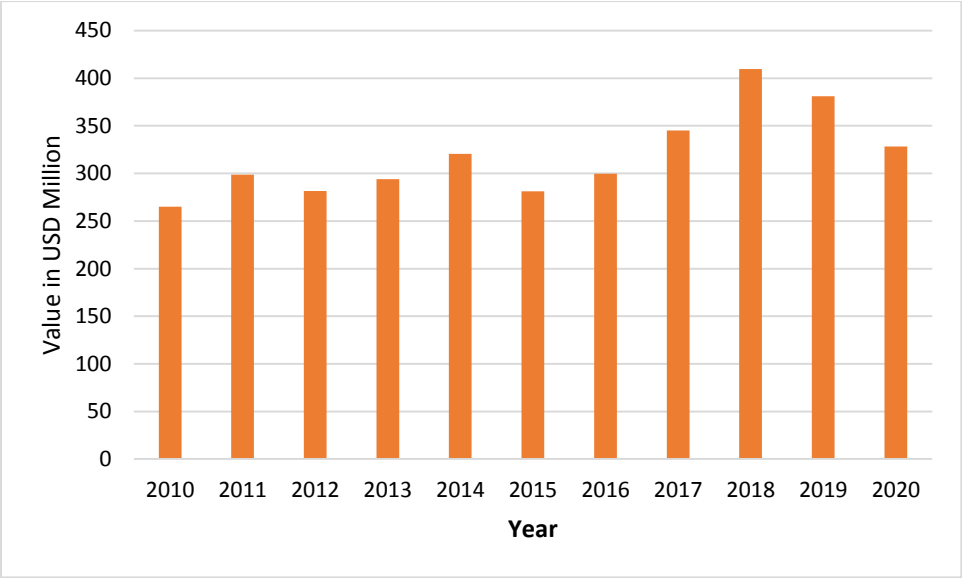
The Electrical and Electronics Industry in Sri Lanka is a major industrial manufacturing sector and the sector 's contribution to economy during the last 10 years is shown in the Table 9.1 & Figure 9. 1 below. Export earnings in 2010 of USD 265.1 Mn has grown up to USD 381.7 Mn in 2019 and USD 328.27 Mn in 2020. It is reported that the sector employs around 35,000 workforce in 85 industry enterprises engaged in design, manufacture and export.

Table 9.1: Export Performance- Electrical & Electronics Products Export Performance

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
SD Mn	*265.08*	*298.65*	*281.65*	*294.12*	*320.44*	*281.1*	*299.64*	*345.05*	*409.72*	*381.17*	*328.27*

Source: Information Technology Division - Sri Lanka Export Development Board, 2020

Figure 9.1: Export Performance -Electrical & Electronics Sector-2010-2020



Source: Information Technology Division - Sri Lanka Export Development Board, 2020

b. Electrical and Electronics Products/Components Exported

It is to be noted that the export based electrical and electronics industry in sri Lanka is still at a growing stage. Currently majority of the export product portfolio consists of lower end products as can be seen from the list of product categories catering mainly to industry sectors of Automobiles, Telecommunication, Consumer Electronics, power generation, transmission and distribution and Industrial Automation.

Among the top Electrical and Electronics products exported are the Insulated Wires and Cables, Switches, Boards & Panels; Electrical Transformers; Tea Bagging, Packing, Cleaning, Weighing Machines, Printed Circuits; Telephone Sets, Audio/Video Equipment & Parts; Lamps and Lighting Fittings; Electronics Circuits, Transistors, Valves, Cathode Tubes etc.; Refrigerators & Freezers; Air-Conditioning Machines; Boilers, Piston Engines, Pumps & Vacuum Pumps and Automatic Data Processing Machines.

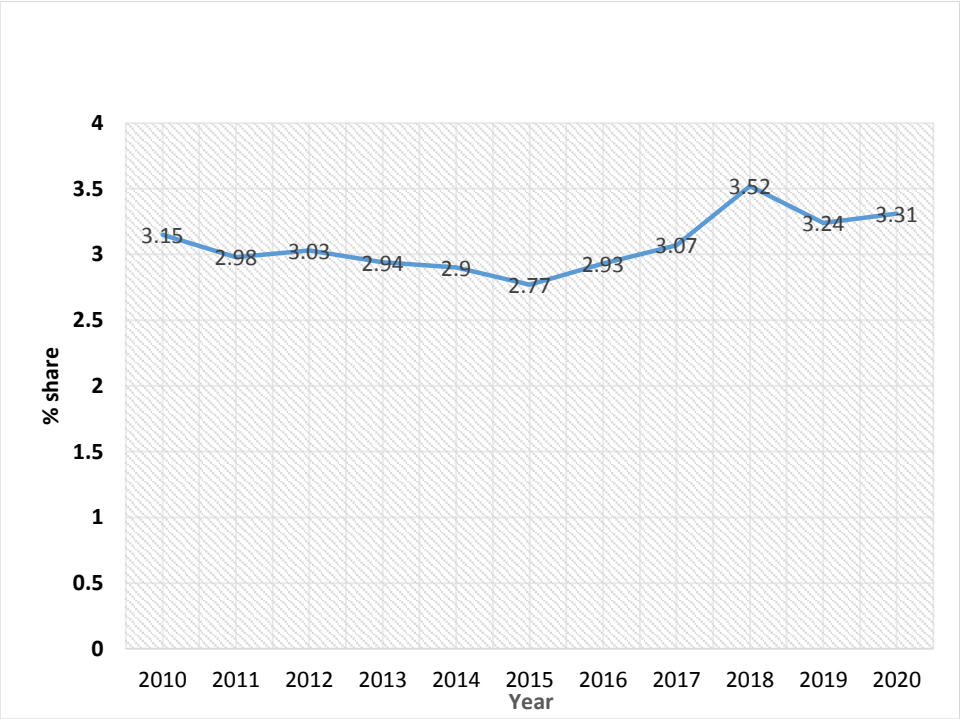
The percentage share of the Electrical and Electronics components exports of the total export earnings of the country stands around 3 to 3.5 percent during the period from 2010 to 2020 as shown in the Table 9.2 and Figure 9.2 below.

Table 9.2: Percentage Share of Electrical and Electronics Products in the Total Merchandise Exports 2010- 2020

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020[(a)]
% Share of Total Export	3.15	2.98	3.03	2.94	2.90	2.77	2.93	3.07	3.52	3.24	3.31

Source: Information Technology Division - Sri Lanka Export Development Board,2020 [(a)]provisional

Figure 9.2: Percentage Share of Electrical and Electronics Products in the Total Merchandise Exports 2010- 2020



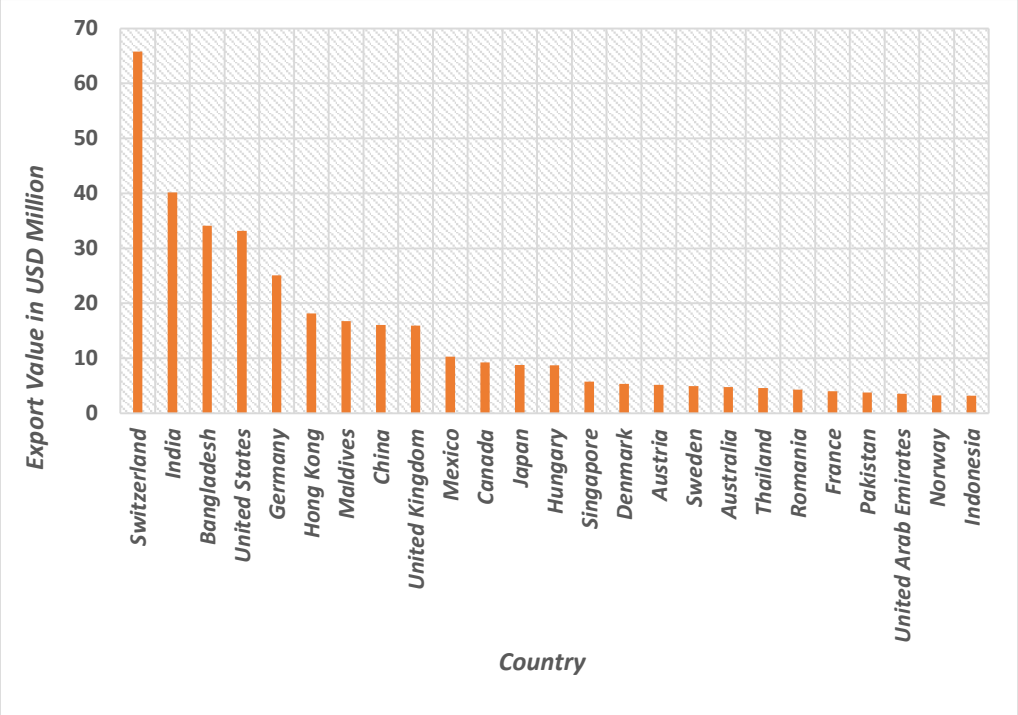
Source: Information Technology Division - Sri Lanka Export Development Board,2020

c. The export destinations

As reported by Export Development Board of Sri Lanka export destinations are the markets based in following countries. Switzerland, India, Bangladesh, United States, Germany, Hong Kong, Maldives, China, United Kingdom, Mexico, Canada, Japan, Hungary, Singapore, Denmark, Austria, Sweden, Australia, Thailand and Romania.

The Figure 9.3 below shows Sri Lanka's main export markets in the descending order of export earnings in 2019. The main export markets in 2019 (Top 25) were in Switzerland, India, US, Germany, Hongkong, Maldives, China, UK, Canada, Japan, Hungary, Singapore, Denmark, Austria, Sweden, Australia, Thailand, Romania, France, Pakistan, UAE, Norway and Indonesia.

Figure 9.3: Major Markets of Electrical and Electronics Sector-2019



Source: Information Technology Division - Sri Lanka Export Development Board,2020

The Table 9.3 below shows the earnings from disaggregate electrical and electronics export products during the period from 2010 to 2020.

Table 9.3: Export Performance Indicators - Electrical and Electronics Industry Sector											
Description of EE Product	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
	Value in USD Million										
Electrical Transformers	56.2	43.65	32.42	39.54	34.31	42.09	32.48	0.41	38.21	27.87	22.13
Telephone sets, audio/ video equipment & parts	6.96	4.83	5.55	6.03	6.52	7.59	6.07	0.95	9.01	6.26	6.30
Printed Circuits	23.31	28.68	26.49	16.93	10.91	6.86	5.13	4.28	9.62	8.85	5.42
Switches, lamp holders, Boards & Panels	15.71	17.59	13.5	28.27	39.63	33.07	36.3	2.21	51.28	44.3	42.47
Discharge Lamps	0.16	0.75	0.2	0.52	0.49	0.64	0.9	1.99	4.08	2.31	0.93
Electronics Circuits, Transistors, Valves, Cathode tubes etc.	0.64	0.49	0.99	1.11	0.71	0.46	0.93	0.9	0.96	1.87	0.85
Insulated Wires and Cables	48.97	53.07	56.87	53.82	55.04	45.1	53.36	9.52	59.61	63.53	49.37
Boilers, Piston Engines, Pumps & Vacuum Pumps	0.67	1.42	1.32	3.36	2.04	2.15	1.44	2.37	1.7	1.26	0.99
Air Conditioners	...	...	0.04	0.15	0.5	0.45	0.69	0.3	1.25	1.72	1.33
Refrigerators & Freezers	20.58	26.49	31.3	29.63	14.68	5.22	1.74	3.01	4.36	1.87	0.44
Tea bagging, packing, Cleaning, Weighing Machines	10.87	9.63	9.13	15.28	15.58	12.8	17.54	2.34	24.72	22.88	20.14
Automatic Data Processing Machines	0.54	0.23	0.24	1.14	1.56	1.73	3.54	3.86	0.94	0.34	0.18
Others Electrical a& Electronics Products	80.46	111.81	103.61	98.35	138.45	122.95	139.52	47.9	93.98	198.1	177.7
Sub Total	265.08	**298.65**	**281.65**	**294.12**	**320.44**	**281.1**	**299.64**	**45.05**	**409.72**	**381.17**	**328.27**

Source: Sri Lanka Customs/Central Bank of Sri Lanka/Sri Lanka Export Development Board,2020

9. 3 Present Status and Changes Envisaged in Next Five years

Most of the companies engaged in the Electrical and Electronics Component manufacturing for export market are Original Equipment Manufacturers (OEMs) and Electronics Manufacturing Service (EMS) producers. That is most Electrical and Electronics Component manufacturers in the country are contract manufacturers who manufacture the products / components and supply to a variety of companies in Japan, Scandinavia and the United Kingdom of Great Britain and Northern Island.

This industry, is a globally integrated industry having supply chains across the globe. No any major player in any country can manufacture all necessary components for a product, they all have to depend upon imports of significant part of such necessary items.

The vision of the Sri Lanka Electrical and Electronics Component manufacturing industry is to develop to be a part of this global value chain.

As envisaged in the *National Export Strategy 2018-2022* developed by the industry stakeholders and the government, the existing capacity of the country as an Electronics Manufacturing Service is expected to be driven to increase manufacture of electrical parts and products and to move towards becoming a component manufacturing base.

In addition to the above approach suggested, there are two more approaches identified in *National Export Strategy 2018-2022* to be taken to realize the stated vision.

These are;

i. To become a component manufacturing base for large multinational brands by linking with the software industry, helping Sri Lankan producers to move up the value chain; and
ii. To get academia and industry work in close liaison to achieve the status of a global hub to focus on R & D initiatives and transform the innovative ideas available with both the groups to high-tech products such as robotics or Internet of Things devices (IoT), among other growth opportunities.

9.4 Government Policy and Other Factors that may Impact the Industry

In the Policy framework- **'the Vistas of Prosperity and Splendour',** of the government, at the Macroeconomic level following policies can be identified to have a major impact on the Electrical and Electronics Industry.

a. Reducing the trade deficit; promoting domestic resources-based exports, import substitution and expanding the export economy via increasing valued-added industries.
b. Reducing import taxes on raw materials and intermediate goods to promote domestic production.
c. Making free of import tariff on machinery and technical equipment to develop internationally competitive industries

In the sub sector of Technology and Innovations, sectorial policy component of Establishing a Technology Based Society (Smart Nation) entails number of strategies and activities that will promote Electronics and ICT.

a. Establish Sri Lanka as a Global Innovation Hub

It is suggested to maximize the use of innovative measures in

i. Internet of Things (IoT),
ii. Artificial Intelligence (AI),
iii. Biotechnology, Robotics, Augmented Reality,
iv. Cloud Computing, Nanotechnology, 3D printing

b. Establish Digitally Inclusive Sri Lanka

i. Establish a country wide high speed optical data transmission system and a high speed 5G Mobile Broadband System to facilitate data transmission
ii. Establish digital cities with digital administration & monitoring

Overall, these sub-sectorial policy components and activities will have a great impact on Electronics and ICT sectors in the country opening up opportunities for research & development and economic growth in manufacturing for local and export markets and EE services.

In addition, the achievement of the sectoral policy objectives requires human capital formation. In such human capital formation TVET sector invariably has a role to play in skills development of the citizenry of the country.

9.5 Forecast of Demand for Skilled Craftsmen in Electrical and Electronics Components (EEC) Manufacturing Sector for export market in next five years.

Though electronics has a global consumer and industrial product market, almost all countries compete in this market. The prerequisites to compete in the global market therefore, are to possess the production factors such as advanced manufacturing capabilities, competitive

production cost and also total commitment to quality. These competitive production factors will all depend on availability of competent and productive and also committed human capital.

9.5.1 Limited Availability of Skilled and Semi-skilled labour

The National Export Strategy (NES)-(2018-2022) has identified the Labour shortages as a challenge for both local and foreign manufacturers operating in Sri Lanka. Sri Lanka's workforce is very small with (about 8.8 Million) when compared to that in China's Pearl River delta and Sri Lanka's more populous South Asian neighbors such as India (481 Million) and Bangladesh (77 Million).

Therefore, Increasing the availability of a workforce with the requisite skill sets and training is crucial for the progress of this sector.

9.5.2 Export Growth Projection for next 5 years

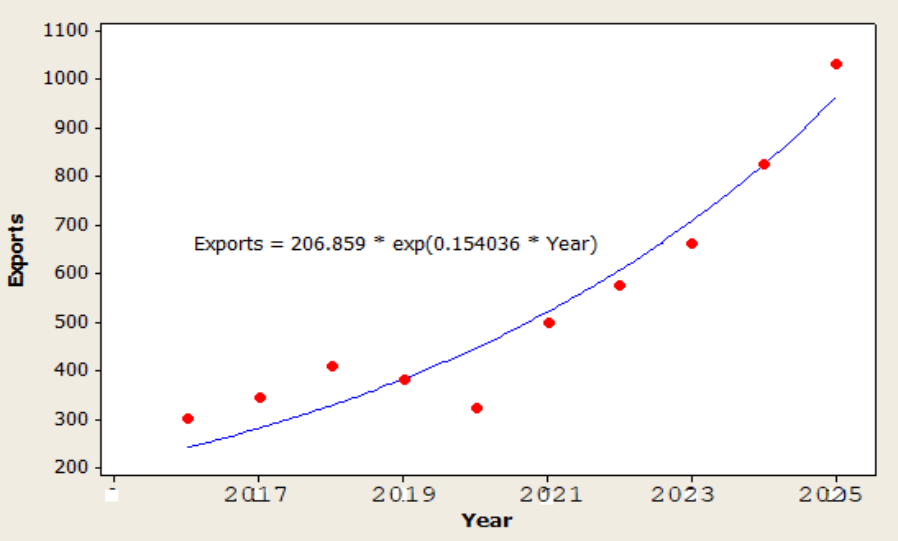
In Sri Lanka, there are about 85 industrial establishments at present involved in manufacturing of electronics products and component for export and generated about USD 381 Million in 2019 with over 35,000 employees. As Table 9.4 indicates SLEDB is planning to develop this industry to generate USD 1000 Million with following exponential export income. Figure 9.4 Graphically represents the envisage growth.

Table 9.4: Future Forecast of Export Remittances in USD

	Exact values				Future forecast					
Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Export (USD) Million	300	345	410	381	322	500	575	661	826	1032

Source: "industry based ambitious targets" as stated by EEC Industry Experts at the Validation Workshop of the EE -VET plan

Figure 9.4: Expected Export Income Projection for next 5 years



Source: Derived from Table 9.4

9.6 Findings of the Industry Survey

Survey of Industries for VET Plan has enumerated 18 Electrical and Electronics Component Manufacturing industries for exports and number of employees in various occupations working in these 18 industries are listed in Table 9.5 below.

Table 9.5: Estimates of Employees in Exporting Electronics Industries

Key Occupations	Total Number of Employees in the Sample (18 Enterprises)	Number of Employees in 85 Enterprises (Population) in 2020	95% confidence Level
Electrical Supervisor	85	401	(362 - 441)
Technicians – Multi skills	415	1,960	(1872-2046)
Motor Winder	14	66	(50- 82)
Electricians	179	845	(788 - 902)
Production Line Operator / Production Associate	2,183	10,309	(10110 -10,508)
Other numerous Technical Occupations	1,229	5,804	-

Key Occupations	Total Number of Employees in the Sample (18 Enterprises)	Number of Employees in 85 Enterprises (Population) in 2020	95% confidence Level
Total number of Technical Employees Sum up of above rows)	4,105	19,385	-
Total Number of Management and supporting Staff (Taken from survey data)	3,480	16,433	-
Total Number of Staff (sum of above two rows)	7,585	35,818	-

Source: TVEC (2020) Industry Survey for VET Plan

Note: Other numerous technical occupations are the various mechanical and electrical helpers.

This estimate has not considered retirement rate and Resignation to go abroad as those rates are very small as found in the survey. They are 0.71% and 1.04% respectively in reference to Table 3.16 in Chapter 3.

The SLEDB Article on 'INCREASE EXPORTS OF ELECTRONICS & ELECTRICAL PRODUCTS FROM USD 0.4 BN (2019) TO USD1.0 BN BY 2025 has identified number of employees in 85 exporting industries as above 35,000. This industry survey has identified number of employees in 18 number of industries in the sample as 7,585 and when estimated for 85 industries, it is 35,818. Therefore, sample survey is well matched with the census of industries.

9.6.1 Demand for New Employees in Export Electronics Industries in Next 5 Years

Export targets of Electrical and Electronics Components Manufacturing Sector is given in the Table 9.6 and growth rate of Electrical and Electronics Components export is worked out by plotting the Forecast of Annual Export Earnings Vs Year and indicated in the Table 9.6 and Figure 9.5 given below.

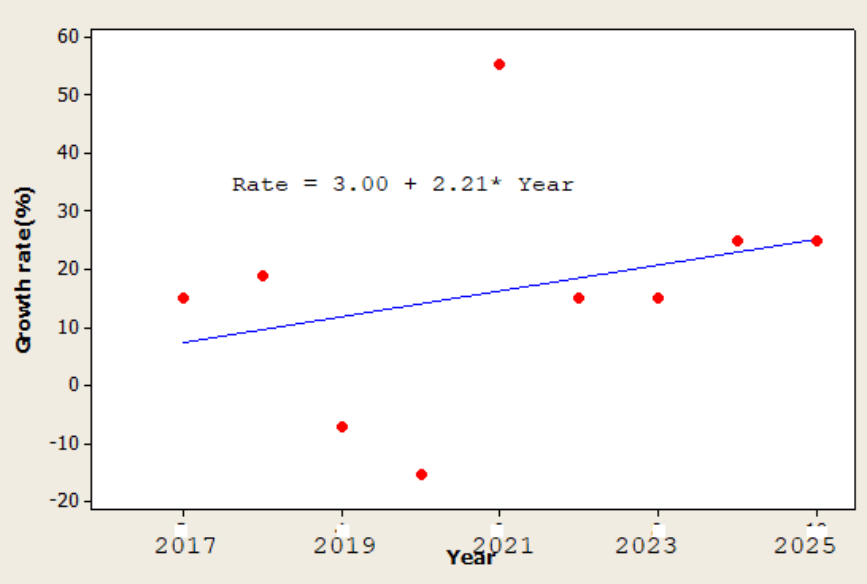
Table 9.6: Future Forecast of Export Remittance in USD

	Exact Values				Future Forecast					
Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Export (USD Million)	300	345	410	381	322	500	575	661	826	1032
Growth rate (%)	-	15.00	18.84	-7.07	-15.49	55.28	15.00	14.96	24.96	24.94

Source: "industry based ambitious targets" as stated by EEC Industry Experts at the Validation Workshop of the EE -VET plan

In the Table 9.6, growth rate in export is negative in 2019 and 2020 as forecast for export remittance has been reduced for the year. Here the effect of lock down and worldwide recession due to COVID-19. This is a temporary effect in setting the best fit line in the graph given in the Figure 9.5.

Figure 9.5: Growth Rate of the Electronics Manufacturing Sector



Source: Worked out from Table 9.6

Table 9.7: Estimated Demand for New Employees in Exporting Electronics Industries in Next Five Years

Occupation	Number of Employees in 85 Enterprises (Population) in 2020	Demand for New Employees in 2021	Demand for New Employees in 2022	Demand for New Employees in 2023	Demand for New Employees in 2024	Demand for New Employees in 2025
Growth Rate		3+2.21 Year	3+2,21x2	3 + 2.21 x3	3 +2.21 x 4	3+.2.21 x 5
		5.21	7.42	9.63	11.84	14.05
Electrical Supervisor	401	21	30	39	47	56
Technicians (Electrical + Electronic)s	1,960	102	145	189	232	275
Motor Winder	66	3	5	6	8	9
Electricians	845	44	63	81	100	119

Occupation	Number of Employees in 85 Enterprises (Population) in 2020	Demand for New Employees in 2021	Demand for New Employees in 2022	Demand for New Employees in 2023	Demand for New Employees in 2024	Demand for New Employees in 2025
Growth Rate		3+2.21 Year	3+2,21x2	3 + 2.21 x3	3 +2.21 x 4	3+.2.21 x 5
		5.21	7.42	9.63	11.84	14.05
Production Line Operator / Production Associate	10,309	537	765	993	1221	1448
Other numerous Technical Occupations	5,804	302	431	559	687	815
Technical Employees (Sum of Above)	19,385	1,010	1,438	1,867	2,295	2,724
Management and supporting Staff(Taken from Data set)	16,433	1,122	1,442	1,762	2,082	2,402
Total Number of Employees	35,818	2,132	2,880	3,629	4,377	5,126
Cumulative Total number of Employees	35,818	37,950	40,830	44,459	48,836	53,962

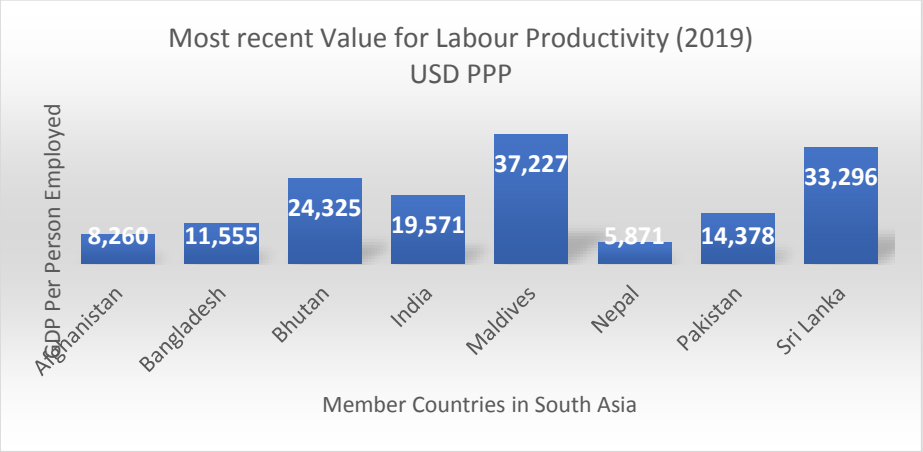
Source: Worked from Table 9.5 and Growth Rate

The growth rate was taken by drawing best fit curve as depicted in the Figure 9.5 and growth rate is equal to' 3.0 +2.21x year'. This growth rate is used in the Table 9.7 to calculate the demand for new employees in next 5 years. Table 9.7 has estimated demand for 5 key electrical occupations and other occupations. Further Table 9.7 indicates the estimated /forecasted cumulative number of employees in each year.

9.6.2 Skills to attract Foreign Direct Investment

It is usually said that in 1980s foreign investors came to Sri Lanka due to cheap labour available in the country and that is no longer applicable at present. Therefore, it has become necessary to facilitate other production factors to attract foreign investors. Higher productivity in labour force of Sri Lanka is an attraction for foreign investment.

Figure 9.6: Labour Productivity in South Asian Countries



Source: ILOSTAT data base

(*https://data.worldbank.org/indicator/SL.GDP.PCAP.EM.KD?locations=LK*

Figure 9.6 gives estimates and projection of labour productivity in South Asian countries based on recent value for labour productivity in 2019 in USD PPP[5] of member countries of South Asia. These productivity indicators verify that Sri Lanka has the second highest labour productivity in the South Asia. Maldives has the highest in the region.

Sri Lanka has a small labour market and any age cohort has about 350,000 youth and majority of them are attracted to the service sector. According to the Labour Force Survey, there is a salary issue too. As Table 9.8 shows the service sector salaries are higher than Industry (manufacturing) sector salaries. In the Industry Sector daily wages are higher than monthly wages.

Table 9.8 Mean and Median Monthly Gross Salary by Major Industry Group-2019

Measurement	Agriculture	Industry	Service
Monthly Wage/ Salary Earners (LKR)			
Mean	21,852	35,672	43,378
Median	18,500	28,000	35,800
Daily Wage/ Salary Earners (LKR)			
Mean	19,345	28,521	25,317
Median	16,000	25,500	22,500

Source: Labour Force Survey 2019-DCSSL

[5] GDP per person employed is gross domestic product (GDP) divided by total employment in the economy. Purchasing power parity (PPP) GDP is GDP converted to 2017 constant international dollars using PPP rates. An international dollar has the same purchasing power over GDP that a U.S. dollar has in the United States.

A further constraint is that youth – particularly students -and also career guidance staff in Schools and Training centres– are not aware of the career opportunities in this sector. This may be due to the lack of national recognition for the industry. In order to become a manufacturing hub and become globally competitive, the industry needs to attract skilled workforce.

In addition to introducing new skills training programmes, creating awareness among youth about the opportunities in Electrical and Electronics Components manufacturing sector to create interest in pursuing education and training in Electrical, Electronics and related subjects for continuous availability of skilled/semi-skilled workforce has been identified in the National Export Strategy. The purpose is to expose youth to the industry and motivate them to consider the Electrical and Electronics Component Manufacturing sector as an exciting industry to be employed. These initiatives will help to increase the availability of more numbers to be employed and lead to possible expansion and new start-ups with in this sector.

It is also recommended to develop linkages with schools and training institutes, conduct annual promotional campaign in schools, conduct and publish findings of periodical surveys of top 10 skills demanded in the Electrical and Electronics Components Manufacturing sector and organize industry forums annually for training institutions, students and prospective employees to share experiences with youth, and campaign for more training for skills demanded by the Electrical and Electronics Components Manufacturing industry.

9.6.3 Skills Issues in Exporting Electronics Industries

At the key informant interviews, the industrialists among whom majority were Electronics Component Manufacturers for export, keenly highlighted quality issues of skills. Major quantitative issue highlighted by them was the shortage of Production line Operators / Production Associates. However, this problem is mainly acute in IPZs and not in outstations. Some stated that only small percentage of line operators among the total recruits of line operators stay for a longer period of Three to Six (3 to- 6) years. Further, it was reported that there has been about 30 per cent labour turnover among operational staff in most free trade zones. The production line operation is a semi-skilled job with narrow range of skills for which a person could be trained within a short time. Employees in these semi-skilled jobs have no career orientation. In fact, it is a job and not a career. Therefore, skills acquired in line operation has no demand in outside labour

market and it is an issue that has affected the image of this occupation. This situation should be changed to recognize the industry as a sector with viable employment.

There may be many facets to this image issue. But, not having skills for a sustainable career is a major issue. Industries are happy if line operators stay in the job for six to ten years. As most of line operators come from outstation or remote districts, they will definitely leave the job after some time. Therefore, strategy should be to keep these employees for a longer period. They will stay in the job for a longer period if there are opportunities to acquire skills for subsequent jobs too.

Electronics Production line operators are well knowledgeable and skilled in electronics components and soldering process. Male production line operators could be well trained as Electronics appliance Repair Technicians and some Female Production Line Operators may be ready take up that type of hard skilled career. At the Focused Group Discussion with Electrical product, parts and Components Sales Companies, it was proposed to develop NVQ Qualification with a National Competency Standards (NCS) and Curricula for Technical Sales Assistants. Development of this NCS is listed in the training plan. Female Production line operators who do not like to embark on repairing career could be trained for the Technical Sale Assistant qualification enabling females to find a job in their home town. Skills Development Project had discussion with industrialists in Automobile and Electrical industry sectors to promote female employability and they expressed their preference for females due to their hand dexterity and as males do/prefer frequent changes of their employers.

Some BOI Industries have established training centres or they are going to establish training arms. It will be easy for them if they have a coordination arm from TVEC to get know – how on registration of training centres and accreditation of training courses. Therefore, it is proposed to develop links with Director Industrial Liaison with TVEC. At the key informant interviews BOI industries expressed both positive and negative experience with TVET institutions and therefore, it is necessary to explore how healthy and effective relationship between BOI industries and TVET Institutions.

9.7 Recommendations

i. A Proposal will be included in the Training Plan to establish training centres in zones with facilities to train production line operators for Electronics careers. When a training centre is established, it should have facilities to train other demanded occupations too. Most of Zone employees have 8-hour shift and they have free time to follow a training course as well.

ii. National Youth Service Council (NYSC) Sapugaskanda Training Centre is very close to Biyagama Industrial Zone. This training centre could immediately commence part time training courses to train employees in the Biyagama Industrial Zone. Funding Modalities need to be discussed and arranged.

iii. There are a large number of technical crafts persons in Electrical Component Manufacturing companies without appropriate national Qualification. The proposed training centres could organize NVQ Assessments through Recognition of Prior Learning (RPL) for them and if necessary, offer them short training to bridge the skills gaps. This will pave the way for them to transfer from informal learning to formal learning and thus pursue studies for higher qualifications.

These programmes will improve image of occupations and that will increase the attraction of workers for employment in Industrial zones and extend their retention in the jobs.

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Chapter 10: Skill Gaps and Training Needs

10.1 Introduction

The term “skills gap” describes a fundamental mismatch between the skills that employers rely upon in their employees, and the skills that job seekers possess usually provided by TVET System. This mismatch makes it difficult for individuals to find jobs and for employers to find appropriately trained workers. Training institutions identify this skills gap as training needs to bridge the gaps.

The skills gaps have two dimensions; quantitative difference between the number demanded and number supplied, and qualitative difference between skills demanded by employers and skills possessed by employees. Further Skills also have two parameters; hard or technical skills and soft skills. Hard skills are often included in the competencies like how to use a certain machine, software or another tool. Soft skills are personal habits and traits that shape how a person works alone and with others.

This chapter explores the skills gaps and training needs identified from Industry Survey, Key Informant interviews, Focused Group Discussions, Demand for Foreign Employment, Tracer Study and Training Supply.

10.2 Quantitative Skill Gaps

Table 3.16 of Chapter 3 has forecasts of recruitments in Electrical and Electronics occupations from 2021 to 2025. Table 7.8 of the Chapter 7 on training supply has listed training supply of electrical and electronics courses in 2019. In order to compare demand for skills and supply of skills, both tables are combined and presented in the Table 10.1 below. Table 3.6 has analyzed the availability of applicants for vacancies in respective occupations and in overall 65 per cent has responded saying no shortage of applicants. At key informant Interviews also, no shortage of skilled persons was reported in general. According to Table 10.1, in comparison of demand and supply also, no wide skills gaps are reflected. Criteria used for preparing the Table 10.1 on demand for and supply of skills and the demand and supply scenario in respect of occupations are briefly described in subsequent sections.

Table 10.1: Comparison of Forecast of Demand for Skills with Supply of Skills

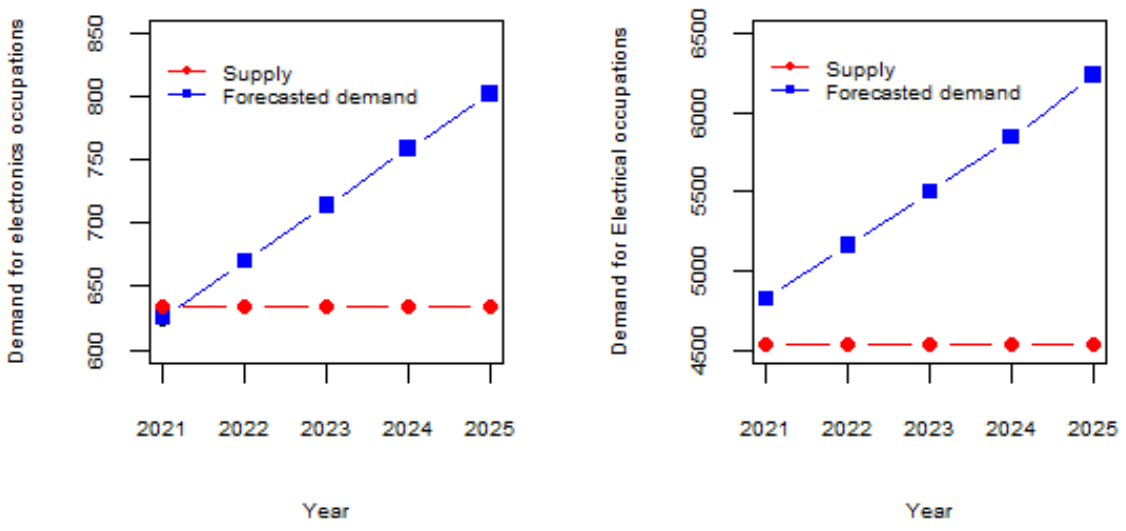
Demand Side from the Table 3.16									Supply Side from the Table 7.8	
Row No.	**Industry Occupations**	**95% Confidence Interval**	Waged Employed Electrical and Electronics workforce in 2020 (Estimated)	Forecast on Recruitment from 2021 to 2025 with Recruitment Ratio (5.76 +0.44 x Year)					**Training Supply in Full Time Course in 2019**	**Training Occupations**
				2021	**2022**	**2023**	**2024**	**2025**		
(i)	Electrical Supervisors	(10,004- 10,400)	10,202	633	677	722	767	812	320	NVQ 5 & 6 Electrical and Electronics Sector
	Electrical Occupations									
(ii)	Electricians	(36,420 - 37,172)	52,410	3,249	3,480	3,711	3,941	4,172	4,094	Electricians
(iii)	Technicians (Electrical)	(17,675-18,201)	17,938	1,112	1,191	1,270	1,349	1,428		
(iv)	Solar Photovoltaic Tech	(3,973- 4,223)	4,098	254	272	290	308	326		
(v)	Electrical Equipment Repairer	(1,068- 1,200)	1,134	70	75	80	85	90	149	Electrical Appliance Maintenance Technicians
(vi)	Electric Motor Winder	(2,045- 2,227)	2,136	132	142	151	161	221	295	Motor Winder
(vii)	Demand for the Electrical Occupations	--	77,716	4,817	5,160	5,502	5,844	6,237	4,537	Supply from the Electrical Courses
	Electronics Occupations									
(viii)	Electronics Craftsmen + Electronics App Repairer	(7,459 –7,801)	7,630	473	507	540	574	607	634	Industrial Electronics Craftsmen, Electronics Craftsmen /Electronics Appliance Repairer and Radio & TV Repairer and Mechatronics Technicians
(ix)	Technicians (Electronics)	(2,357- 2,551)	2,454	152	163	174	185	195		
(x)	Demand for the Electronics	--	10,084	625	670	714	759	802	634	Supply from the Electronics Courses at Certificate Levels

Demand Side from the Table 3.16									Supply Side from the Table 7.8	
Row No.	**Industry Occupations**	**95% Confidence Interval**	Waged Employed Electrical and Electronics workforce in 2020 (Estimated)	Forecast on Recruitment from 2021 to 2025 with Recruitment Ratio (5.76 +0.44 x Year)					**Training Supply in Full Time Course in 2019**	**Training Occupations**
				2021	**2022**	**2023**	**2024**	**2025**		
	Occupations at Craft Level									
(xi)	Electrical Draft Person	(3,973- 4,223)	4,098	254	272	290	308	326	-	Only General Draft Persons
(xii)	Production Line Operator / Production Associate	(10,110-10,508)	10,309	704	905	1,105	1,306	1,507	-	No courses in Training Institutions

Source: Worked out based on Table 3.16 of the Chapter 3, Table 7.5 of the Chapter 7 and Table 9.6 of Chapter 9

Figure 10.1: Demand and Supply for Electrical and Electronics Occupations at Craft Level from 2021 to 2025

A -Demand and supply for electronics occupations from 2021 to 2025	B -Demand and supply for electrical occupations from 2021 to 2025



10.2.1 Criteria Used and Related Issues on Preparation of the Table 10.1

a. Demand side of Table 10.1 has forecasts on recruitment in enterprises in next five years and that is the demand for the waged employments.
b. In supply side, only full-time courses are considered as almost all trainees in part time courses are already employed. Besides, most part time courses have short durations and mainly aim for skills upgrading.
c. In the demand side, total number of electricians; 52,410 is the addition of 36,796 numbers of electricians working in the electrical and electronics industry to the 15,614 numbers of electricians working in non-electrical and electronics Industry and services sectors. Here confidence interval is applicable only for 36,420, estimated number of electricians from the enterprise survey in the electrical and electronics industry.
d. Industrial Electronics Craftsman, Electronics Appliance Repair Technician, Radio and TV and Allied Equipment Repairer, and Industrial Mechatronics Technician were considered together as course segregation does not match with occupational segregation in electronics industry. For example, DTET conducts Industrial Electronics Craftsman course and industry has no occupation in the same name.

e. Clustering of Electrical occupations separately is also required as some occupations such as Solar Technician have no supply from directly relevant courses yet and passed outs in respective courses laterally move across occupations. Therefore, demand for and supply of skilled persons are compared for electrical and electronics occupational clusters separately and they are graphically presented in the Figure 10.1 A and B.

f. In addition to the demand for domestic waged employment, there is a demand for foreign employment too. According to Table 6.3 in Chapter 6, departures for electrical and electronics-related occupations for foreign employment in 2017, 2018, and 2019 were 832; 319; and 301 respectively. In the Industry survey, the number of resignations to go for foreign employment was asked and responses are analyzed and presented as a percentage of the workforce in the sector in Table 3.15 as 1.04 percent. According to Table 3.15, the total estimated number of Electrical and Electronics Employees at craft and supervisory levels in the sector is 102,579 and 1.04 percent of them is 1,066. That tallies with departure figure in 2017 and but in 2018 and 2019 numbers departed for foreign employment have declined. Industry representatives may have considered the number of departures for foreign employment in 2017 when responding to the survey. The forecasts given in Table 10.1 are based on the expected recruitment in the next five years and industry representatives would have considered resignation for foreign employment when they indicated the recruitment numbers for subsequent years.

10.2.2 Analyses Demand for and supply of Electrical occupations at Craft Level

Table 10.1 has given forecasts on recruitment and supply from courses relevant to following Electrical occupations.

i. Electrician
ii. Technician (Electrical)
iii. Solar Photovoltaic Technician
iv. Electrical Appliance Maintenance Technician
v. Electric Motor Winder

As Technician (Electrical) is an experienced and higher skilled position of an electrician, it has no training courses in TVET Institutions. When electricians are promoted to Technician positions, vacancies will be created for electricians. Solar Photovoltaic Technician's NCS and curriculum were introduced recently and no trainees have yet passed out from these courses and the demand for Solar Photovoltaic Technicians is also met by electricians.

Demand for and supply of Electrical Appliance Maintenance Technicians and Motor Winders are given in the rows (v) and (vi) of Table 10.1 and those two occupations also have higher

supply than demand for waged employment. Demand for waged employment may be lower in these two occupations as most formal industries outsourced motor winding and repairing of electrical equipment and therefore many from among the supply of Electrical Appliance Maintenance Technicians and Motor Winders apparently are taking up self-employment.

When all Electrical occupations are considered together row (vii) of Table 10.1, there is a higher demand than supply as depicted in Figure 10.1 B. There is a gap of 280 in 2021 in all electrical occupations as demand is 4, 817 and supply is 4,537 [row (vii) of Table 10.1]. When confidence interval of estimates is considered, the gap in 2021 may not be critical.

Table 10.2: Training Supply in Full Time Electrical Courses in 2019

Occupation/ Course	Institutional Training			Enterprise Based Training	
	Capacity	Enrolment	Completion	Enrolment	Completion
Electrician	4,716	5,380	3,884	185	210[6]
Electric Motor Winder	420	351	287	37	08
Electrical Appliances Maintenance Technician	545	204	131	29	18
Solar Photovoltaic System Technician	15	17	00	87	-

Source: Extracted from Table 7.8 in Chapter 7.

However, this gap will be expanding from 2022 onwards and training supply should be expanded accordingly. The priority should be given to increase the enrollment and completion to the full capacity of training in Electric Motor Winder and Electrical Appliance Maintenance Technician as those two courses perform much below the capacity as indicated in the Table 10.2.

10.2.3 Analyses of Demand for and Supply of Electronics Occupations at Craft Level

Table 10.1(Rows viii and ix) has given forecasts on recruitments and supply from courses relevant to following Electronics occupations.

i. Industrial Electronics Craftsman, Electronics Appliances Technician, Radio and TV and Allied Equipment Repairer and Industrial Mechatronics Technician
ii. Technicians (Electronics)

Reasons for taking all electronics craft courses together is explained in the section 10.2.1 (d).

[6] Completion is higher than enrollment due to trainees in previous years complete the courses in current year and there are courses with more than 1 year duration.

When all Electronics occupations are considered together (Row (x) of Table 10.1), demand and supply is marginally balanced in 2021 with over supply of nine from training. Demand and supply in electronics occupations are graphically presented in Figure 10.2 A and it shows expanding gaps from 2022 onwards.

Table 10.3: Training Supply in Full Time Electronics Courses in 2019

Occupation/ Course	Institutional Training			Enterprise Based Training	
	Capacity	Enrolment	Completion	Enrolment	Completion
Electronics Appliances Technician	750	485	340	09	05
Radio, TV and Allied Equipment Repairer	163	55	49	31	23
Industrial Electronics Craftsman	590	424	142	-	-
Industrial Mechatronics Technician	115	164	75	-	-

Source: Extracted from Table 7.8 in Chapter 7.

According to Table 10.3, all electronics courses perform well below their capacities and here too-priority should be given to increase the enrollment and completion to the capacity.

10.2.4 Demand for Supervisor (Electrical and Electronics) and Supply from Relevant NVQ Level 5 & 6 and Non-NVQ Diploma Courses

Based on the sample survey, estimated number of Supervisors (Electrical) is 10,202. Its estimation of recruitment from 2021 to 2025 and supply from NVQ Level 5 courses are given in the Row (i) of the Table 10.1. In 2021, demand for Supervisors (Electrical and Electronics) is 633 and it has supply of 320 from NVQ Level 5 & 6 courses. Accordingly, supply is much less than the demand and demand will be expanding continuously. Table 10.4 gives the capacity, enrolments and completions in Electrical Technology NVQ 5 & 6 and other diploma courses. Accordingly, number enrolled in Diploma courses in 2019 is 1,225 but completion is only 320. This poor performance needs to be addressed such that skill shortages at supervisory levels could easily be met by increasing the completions in Diploma courses.

Table 10.4: Training Supply in Supervisory Level (Electrical and Electronics) Courses in 2019[7]

Supervisory Level Courses	Capacity	Enrollment	Completion
Electrical Technology/Engineering NVQ 5/6	434	390	153
Mechatronics Technology NVQ 5/6	575	405	105
Electronics Technology /Engineering NVQ 5/6	615	430	62
	1,624	1,225	320

Source: Extract from Table 7.8 of Chapter 8

10.2.5 Other Occupations

i. Mechatronics Technicians

Though TVET institutions, including private sector training centres, conduct Industrial Mechatronic Technician courses with annual training supply of 64 completers, Sample Survey of enterprises has not identified any mechatronic technicians. At Key Informant Interviews, Mechatronic Engineers were met but nothing was reported about shortage of mechatronic technicians. When the need for maintenance technicians with skills in mechanical, electrical and electronics was highlighted at Key informant Interviews, mechatronics technicians were mentioned. But it was pointed out that mechatronics technicians lack electronics skills. Number of Mechatronics Technicians working in the industry is not significant but production line automation & innovations will make increasing demand for Mechatronics Technicians.

ii. Electrical Draught Person

It was found that Electrical and Electronics industry employs 4,098 Electrical Draught Persons. (95% confidence level (3,973- 4,223). TVET institutions train more than 1,000 draught persons annually and many of those courses have electrical and mechanical modules. At Key Informant Interviews and Focused Group Discussions, many participants opined that it is difficult to find draught persons specialized in Electrical drafting which is a lucrative job and many draught persons are employed to prepare and feed computer programs to CNC machines. In Draughts Person- General courses, trainees do not pay much attention to learn the optional; mechanical and electrical modules as they could get through the subjects from civil section. Therefore, it is recommended to introduce an electrical specialized stream in the Draughts Person –General courses.

[7] NVQ Level 5 & 6 courses are not delivered though Enterprise Base Training Mode

iii. Production Line Operator / Production Associate

This is the only female dominated occupation in Electrical and Electronics Industry Sector. Though some argued that it is not a technical occupation, many in key informant interviews pointed out that they need basic technical skills in soldering and electronics component identification. Further, they could contribute to preventive maintenance of machinery and equipment,if they have the skills to identify undue noises, vibration and wear & tear etc. Therefore, development of NCS and Curricula are recommended to be included in the Training plan.

10.3 Entrepreneurship in Electrical and Electronics works

Table 10.3 has worked out based on the Table 3.4 in Chapter 3. Their growth in next five years cannot be estimated based on recruitment rate used to forecast recruitment in next five years. It was not forecasted as economic growth is also not very clear under COVID-19 situation. But the Tracer study has found that 14.0 per cent of passed outs from Electrical and Electronics courses are in self-employment. Therefore, entrepreneurship development should be considered as an important subject in development of the Electrical and Electronics Sector.

At a KII, one senior industry representative pointed out that many electricians leave the job within a short period of experience, without developing good foundation skills as monthly income through daily wages are much higher than the monthly wages. He explained that some of them come back after one to two years due to;

i. Debt owing to poor financial management
ii. Bad Customer Experience
iii. Lack of sufficient skills

At the FGD with electricians, in which two very successful electrical entrepreneurs had participated, the same issues were highlighted.

Therefore, it is proposed to develop course specific entrepreneurship module for electrical sector and deliver it before trainees leave for OJT.

Table 10.5: Number of Small-Scale Enterprises identified in Industry Survey

Field of Entrepreneurship	Number in the Sample	Number in the Population (Projected)	A 95% Confidence interval
Small Scale Entrepreneurs in Electrical Works	117	5,101	(4385 - 5817)
Small Scale Entrepreneurs in Electronics works	58	2,529	(1946 - 3111)
Small Scale Entrepreneurs in Solar works	5	218	(29 - 407)
Small Scale Entrepreneurs in Motor Winding works	9	392	(140 - 645)

Source: Worked out from Table 3.4 in Chapter 3

10.4 Qualitative Dimensions of Skills Gaps

Gaps in technical skills were identified from the Industry Enterprise Survey, Key Informant Interviews, and Focused Group Discussions which are summarized below.

10.4.1 Skills Gaps Identified in Industry Enterprise Survey

Negative Attributes of TVET Passed out as commented by Employers Recruiting TVET Passed outs are shown in Table 3.9.

10.4.2 Skills Gaps Identified in Key Informant Interviews

Skills gaps identified in Key Informant Interviews are explained in the Section 4.4 in the Chapter 4 and their sub-titles are listed below.

a. 4.4.1 Gaps in Technical skills of Supervisors and Senior Officers
b. 4.4.2 Gaps in Soft skills of Supervisors and Senior Officers
c. 4.4.3 Gaps in Technical skills of Craft Occupations
d. 4.4.4 Gaps in Soft Skills of Electricians and other Craft Occupations

10.4.3 Skills Gaps Identified in Focused Group Discussions

Skills gaps identified in Focused Group Discussions are explained in the Section 5.10.1 of Chapter 5 under the sub-titles listed below.

i. PLC Programming
ii. Extra Low Voltage Applications
iii. Use of social media
iv. IEE regulation
v. Competency Level of Trainees at one NVQ Level is not Uniform

In addition, section 5.11: Recommendations are also considered.

10.5 Training Needs

Training required to bridge the skills gaps are the training needs. In addition, many training needs have been identified in the Industry Survey, Key Informant Interviews, Focused group Discussion and Tracer Study. As these have been explained in respective chapters and they will again be summarized in the next chapter on training plan.

10.6 Conclusion

This chapter has summarized skills gaps identified thorough studies in previous chapters and presented quantitatively and qualitatively. The Training Plan explained in the next chapter will be based on the skills gaps and training needs.

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Chapter 11: Training Plan to Bridge the Skills Gaps and Training Needs

11.1 Introduction

Training Plan is the most important section in the VET Plan as it explains the actions to be taken to bridge the skills gaps and training needs. The training plan first explains the actions to be taken and these are then compiled into a matrix with time frame and responsibilities. Titles of the actions proposed are listed below.

i. Promote NVQ
ii. Training Management
iii. Uniform Distribution of Electronics Courses in Districts
iv. Review and Revise NCS and Curricula for Electrical and Electronics Occupations
v. Develop New NCS and Curricula
vi. Address Skills Issues in Export Manufacturing Industry
vii. New NCS or Revision of NCS to promote Foreign Employment
viii. Use of Social Media for Skills Upgrading
ix. Entrepreneurship and Self Employment
x. NVQ through Recognition of Prior Learning
xi. Review 'On the Job Training 'to give OJT mindset to Trainees
xii. Research on Learning

Each of these titles are described in separate sections below.

11.2 Promote NVQ

i. Uniform Skills Levels for NVQ Levels based on discussion with Industry Representatives and Trainers

At Focused Group Discussions, Industry representatives have pointed out that NVQ Certificate holders certified at a given level do not have uniform skills level. TVET Trainers at FGD pointed out that non- uniform competency level happens because of non-uniform entry qualifications and non-uniform course durations. Competency levels acquired by the trainees will have an influence from competency level of trainers as well. Assessors judge the assessees against relevant NCS and Industry sees the passed out based on his/her performance. This is the reality but it has a negative impact on the image of TVET. This issue was discussed at the FGD with trainers as explained in the section 5.10 (v) of chapter and their suggestions on uniform entry criteria and uniform course duration are taken under the title training management in the training plan.

ii. Promote NVQ awareness of Industries

As per Section 3.13.1 and Figure 3.9 of the Chapter 3, NVQ awareness programmes should be conducted for industries especially in provinces outside the Western Province. At the inception, TVEC had a drive for NVQ. That drive has led NVQ to the Society but not to the Industry. As NVQ has reached non-reversible level, now there is more potential for industry to be more receptive to NVQ awareness. Promotion of NVQ among industries will have an effect on strengthening link between TVET Institutions and Industry.

iii. Skills Matrix

A few Companies have developed Skill Matrix for their roles.

According to the Website *https://www.cornerstoneondemand.com/glossary/skills-matrix/*, Skills Matrix is a visual tool that shows the tasks and skills required for specific roles and the current competency level of each employee for each task. It is a performance management tool and it could lead employees to reach proficiency and expertise levels. At proficiency level, an employee sees the work holistically and he/she works to acquire relevant skills and then skills gaps will be minimized. NVQ Framework may have better potential to develop tools to prepare Skills Matrix for organizations and that will be useful for NVQ framework to penetrate the industry.

11.3 Training Management

Training Needs Identified from Comparison of Forecast of Demand for Skills with Supply of Skills (Table 10.1) have not found any critical gaps between demand and supply at present years. But gaps will be created in coming years and that gap could be met by training management as describe below.

i. Increase enrollment to meet the capacity in all Electrical and Electronics Courses except Electrician course which has enrollment exceeding the Capacity
ii. Increase completion Rate in All Electrical and Electronics courses. Completion rate of electrician courses is at acceptable level.
iii. There are issues in delivery too. Some courses are well delivered and have best practices but many courses are poorly delivered. Therefore, the Trainers participating in FGD proposed to have periodic technical forum among trainers in respective courses separately to enable all trainers to understand the best practices.
iv. From 2022, gaps between supply of and demand for will be expanded and then actions should be taken to increase the supply from electrical and electronics courses.

11.4 Uniform Distribution of Electronics Courses in Districts

Table 7.1 B and Table 7.2 B give the distribution of Electrical and Electronics courses by district respectively. Accordingly, Electrical Courses have comparatively high uniformity among districts. But Electronics course distribution among districts needs improvement as three districts; Mannar, Mullaitivu and Trincomalee have none. In another five districts; Anuradhapura, Polonnaruwa, Puttalam, Moneragala and Vavunia, there is only one electronics course in each district. Therefore, youth in these districts have no accessibility for electronics courses and therefore, it is proposed to establish at least two electronics courses in each of these districts.

11.5 Review and Revise NCS and Curricula for Electrical and Electronics Occupations

i. Add a Module of Quality Assurance and Productivity improvement to all Electrical and Electronics NCS and Curricula.
ii. Add a module on Gender sensitivity which is a way to reduce barriers to personal and economic development created by sexism. **Gender sensitivity** helps to generate respect for the individual regardless of sex.
iii. Revise Drafting NCS and Curricula to give specialization for MEP (Mechanical, Electrical and Plumbing).
iv. Add a competency unit on Hotel Equipment Maintenance to NCS and a module to curricula of Building Service Technician.

    Hotel technicians are multi skilled persons with skills in electrical +electronics +air conditioning + audio systems. This module will be useful to facilitate skills upgrading of Hotel Technicians.

v. Stand-alone Competency Units and Modules for **Skills Upgrading and Multi-skilling**

At the Focused Group Discussion with trainers, it was proposed to add skills upgrading or multi-skilling needs as stand-alone Competency units to NCSs and Curricula for Electricians and Electronics occupations as the non-availability of curricula is a constraint to start any part time courses for skills upgrading

Skills Upgrading and Multi-skilling modules identified in KIIs and FGDs are listed below.

a. Building Management System
b. Bio – Medical Equipment
c. Electrification of High-rise Buildings

d. Solar Panel Installations
e. Internet of Things
f. Smart Buildings Concept
g. Extra Low Voltage Applications (CCTV, Fire alarm, smoke sensors etc)
h. Green Buildings Concept
i. Repairs of Industrial Electronics Equipment (To Electronics Appliance Technicians)
j. Power Plant Operation
k. Testing and Measurement
l. Control Room Operations
m. GPS Technology

Foreign Employment needs

a. Elevator
b. Cables
c. Field Service
d. Machine Maintenance
e. Electro - Mechanics

11.6 Develop New NCS and Curricula

It is proposed to develop New National Competency Standards and Curricula for following occupations/ operations or incorporate them to existing relevant NCS and Curricula.

i. Transformer Technician

Lanka Transformers Company requested to develop a National Competency Standards for Transformer Technicians as transformer works are not fully covered by NVQ for Electricians and Machines Operators.

ii. System Integrator

Electricians are trained on low voltage works. In future there will be extra-low voltage works such as CCTV, Security system smart house etc. Houses need one person to handle all these works. He is the system integrator. This term is widely used in IT industry. But in future housing units there will be a need for such a person. This is not an entry level qualification but with experience, technicians acquire these skills and there should be a qualification to recognize them.

iii. Basic Technical operations (for Production Line Operator / Production Associate and Machine Operators)

In manufacturing industries, there are many Machine Operators and Production Associates such as assembly line operators, electronics soldering line operators and production associates. They are given short term training of one to three weeks on those operations. It was proposed to give some training on Basic Mechanical and Electrical Practices to enable them to identify noise and vibration that indicate the needs for repairs of machineries before their breakdown.

This will be foundation skills for youth to commence Vocational Training and obtain employment such as Machine Operator or Production Line Operator. That may be useful for helpers in maintenance work and will also be useful to learn any technical trade fast in the workplace. Therefore, another qualification probably at NVQ Level 2 could be added to NCS on Basic competency to work and those skills could be given to students in 13th Year education for all progarmmes and trainees in Youth Corp.

iv. Powder Coating Technicians

No NVQ is available for powder coating technicians. It was suggested to develop a NVQ or include a module on powder coating in NCS and Curricula for Painting occupations

v. Production Associate (Electronics)

A large number of Production Associate / Production Line Operators are working in the export electronics component manufacturing industry and retention period of these employees are comparatively short. This plan proposes to develop a NVQ for them to recognize their competencies which will motivate them to stay in the job for longer period. It will facilitate their mobility with opening of opportunities for foreign employment.

vi. Tower Erection Technician

Electrical Tower Erection is a specialized job which could be recognized as an occupation. A company wanted to start a training programme and establish a qualification to recognize their skills.

vii. Sale Assistant (Electrical and Electronics)

Development of a NCS and Curriculum for Sale Assistant (Electrical and Electronics) was proposed at the Focused Group Discussions with participants from Electrical and Electronics Component Sales hops and these could also be used to train production

Line operators of electronics manufacturing industry for long term employment after they leave the jobs in zones.

viii. Develop a new NCS and Curricula by combining two NCS; Electrical Appliances Repair Technician and Electronics Appliances Repair Technician and add a unit on 'Repair business appliances' too. That will increase the enrollment in these courses and increase employability too.

11.7 Skills Issues in Electronics Component Manufacturing Industry for Export

Under the Section 11.6 above, development of number of new National Competency Standards and Curricula has been proposed for export industry. But as explained in the Chapter 9, major skills issue in Electronics Component Manufacturing Industry for Export is the non-availability of Production Line Operators. This issue is well explained in the Chapter 9 and it is proposed to train semi-skilled employees in Investment Promotion Zones to prepare for skilled employment when they leave the jobs in the zones. This will improve the image of employment in IPZs zones as well and increase attraction for those employments. For that purpose, chapter 9 has proposed to establish training centres in Investment Promotion Zones.

Further, it is proposed to Promote NVQ assessment and certification though Recognition of Prior Learning (RPL) among employees in IPZs. It is also suggested that NYSC -Sapugaskanda Training centre could immediately start training programmes for employees in the Biyagama Investment Promotion Zones.

11.8 New NCS or Revision of NCS to promote Foreign Employment

Key Informant Interviews and Focused Group Discussions have identified following NCS and Curricula to promote foreign employments and it is hoped that they could be implemented in cooperation with Foreign Employment Bureau of Sri Lanka

i. Revise 20 Occupations related National Competency Standards and / or develop stand-alone units as specified in the Table 6.4 to meet the skills needs of foreign employments.
ii. Add learning of Wiring regulations in other countries (Ex: Australia) to NCS and Curricula for Electricians as Electricians have potential for employment in Australia and help them to get License to work in labour migration countries.
iii. Add learning of grid Code Regulations of Middle Eastern Countries to NCS and Curricula of Solar Photovoltaic Technician as they have potential for employment in Middle east.

iv. Develop a New NCS on Mini Hydro Power Plant Operation as they have potential for employment in African Countries.

v. Develop a new NCS for Panel Makers as they have employment opportunities in Singapore and Malaysia. This is not for training but to recognize people in the industry.

11.9. Use of Social Media for Skills Upgrading

i. Develop Facebook Group on Electrical and Electronics Practitioners to share new experiences and find solutions to problems encountered.

ii. Develop a YouTube Channel and develop short videos on advanced skills to facilitate skills upgrading of trainees and practitioners.

11.10 Entrepreneurship and Self Employment

i. All trainees in electrical and electronics occupations have a dream of starting their own workshop and to be in self-employment or to have their own businesses. Therefore, it is proposed to develop an occupation Specific Module on Entrepreneurship to prepare students for self-employment and to enable them take informed decisions with self- knowledge. This is only to facilitate decision, but after decision, for preparation, they have to follow a General Entrepreneurship programme.

ii. Promote Electric Motor Winding among girls as that could be practiced as a self-employment activity from home.

11.11 NVQ through Recognition of Prior Learning

The Public Utility Commission at the Key Informant Interview has shared a list 22,105 Electricians working in the community (Named as Community Electricians) who need NVQ Certificates for Licensing purposes. This list is given in the Table A 1 - 8 in Appendix 1. According to Engineering Council, Sri Lanka Act No 4 of 2017, License is compulsory for electrical and Electronics Technicians to practice in Sri Lanka and NVQ Level 4 is the pre-condition for Licensing. Therefore, if they are not given NVQ Level 4, they will be unemployed. In fact, this is a national need as specified in the Vistas of Prosperity.

It is proposed to take following actions to promote RPL among community / freelance electricians.

i. Develop a training module to bridge the skills gaps of electricians without formal training. This should not be delivered as crash courses to prepare applicants for assessments as knowledge acquired through crash courses remains in the short-term

memory which are soon lost after the assessment. Eventually assessees who get through assessment will not be competent.

ii. Organize Training on bridging module probably in training centres.

iii. Assessments of community electricians. This may need revision in assessment procedures as pre-assessment could be conducted during the bridging module.

iv. Liaisons with Electricians Clubs organized by leading electrical and Wire Manufacturing Companies to award NVQ for those electricians and capture drop out from the programmes for skills upgrading.

11.12 Strengthen 'On the Job Training' by changing Mindset of Trainees and taking BOI and Large Industries for OJT Programmes

i. Mindset to see OJT as an opportunity for learning and fine tune the skills and work beyond course boundaries,

ii. To get cooperation of all BOI and Large Industries for OJT Programme.

11.13 Research

At a Focused Group Discussion, it was pointed out that trainees from private training centres are more committed to learn and work. This needs a research study to learn on trainees' commitment for Learning and working.

11.14 Training Plan

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
11.2	**Promote NVQ**								
(i)	Uniform Skills for NVQ Levels with uniform course duration and entry level	NVQ Certificate holder of one level to have uniform competency level	Improved Image of TVET and satisfied industry						TVEC and Training Institutions
(ii)	Promote NVQ awareness of Industries	To launch 2nd wave of drive to promote NVQ among Industries in outstation provinces	Increased demand of NVQ Certificate Holders and strengthen link between TVET and Industry						TVEC and Training Institutions
(iii)	Skill Matrix	Explore potential of NVQ Framework to develop performance Management tool.	Skills Gaps of Industry Employees will be minimized and NVQ will be well sought by the industry						TVEC
11.3	**Training Management**								
(i)	Increase enrollment as per capacity in all Electrical and Electronics Courses								Training Agencies

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
(ii)	Increase completion Rate in All Electrical and Electronics courses except Electrician courses	Increase output of Courses	Meet the skills gaps in 2024 and 2025		—	—	—	—	Training Agencies
(iii)	Have periodic Technical forum among trainers in respective courses separately to enable all trainers to understand the best practices.	Best Practices in courses will be shared	Trainees with Uniform Skill Levels	—	—	—	—	—	TVEC
(iv)	Increase supply from electrical and electronics courses to meet expanding demand from 2022.	To meet the expanding demand from 2022	Deamd for and supply of will be balaced			—	—	—	Training Agencies
11.4	**Uniform Distribution of Electronics Courses in Districts**								
(i)	Electronics courses in districts having none or with only one Electronics Course Establish.	To increase the uniformity in distribution of electronics courses in district	Improve Accessibility to Electronics Courses	—	—	—	—	—	TVEC and Leading Training Providers
11.5	**Review and Revise NCS and Curricula for Electrical and Electronics Occupations**								
(i)	Add a Module of Quality Assurance and Productivity improvement to all NCS and	To quality and Productivity concepts and practices to courses	To have quality and Productivity conscious passed outs	—	—				TVEC & NAITA and other NCS Developers

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
	Curricula of Electrical and Electronics Sector								
(ii)	Add a module on Gender sensitivity and appreciation to all curricula	To enable trainers and trainees to teach and learn about gender sensitivity.	All genders will be respected and comfortable in the workplace						TVEC & NAITA and other NCS Developers
(iii)	Revise Drafting NCS and Curricula to give specialization for Mechanical, Electrical and plumbing	To make available Draft person with different specialization	Increase employability in drafting courses and meet skills needs of the Industry						TVEC & NAITA and other NCS Developers
(iv)	To add 'Maintenance of Hotel Equipment' Module to NCS and Curricula of Building Service Technicians	To enable Technicians / Electricians in Hotel to have skills upgrading course	Multi skilled Technicians in Hotels						
(iv)	Develop Stand-alone Competency Units and Modules for Skills Upgrading and Multi-skilling	To facilitate training centres to have curricula and assessment and to issue Record of Achievement (NVQ Unit Certificate) for skill upgrading	Multi-skills workforce in Electrical and Electronics Sector						TVEC & NAITA and other NCS Developers
11.6	**Develop New NCS and Curricula**								
(i)	Transformer Technician	Have a qualification to cover all competencies of people working on manufacture of transformers	Well competent workforce for manufacture of transformer - competent technicians						TVEC & NAITA and other NCS Developers

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
(ii)	System Integrator	To have qualification for electricians to work with low and extra low voltage.	Customers will have one person to attend both low and extra low voltage equipment						TVEC & NAITA and other NCS Developers
(iii)	Foundation Skills for Semi – skilled Technical Occupations	To prepare youth for large number of semi- skills jobs	More productive workforce for jobs like production line /machine operations in Export Manufacturing Industries						TVEC & NAITA and other NCS Developers
(vi)	Powder Coating Technicians	To recognize all competencies of surface treatment technologies	Panel making industry will have certified surface treaters						TVEC & NAITA and other NCS Developers
(v)	Production Associate (Electronics)	To give recognition for skills of large number of Electronics Line Operators	Increase their retention period and motivation to learn, facilitate mobility and foreign employment						TVEC & NAITA and other NCS Developers
(vi)	Tower Erection Technician	Tower erection to have trained certified technicians	Quality tower erection and a new set of competent people						TVEC & NAITA and other NCS Developers
(vii)	Sale Assistant (Electrical and Electronics)	To give training and competency certification for Electrical and electronics Salesforce	Electrical and Electronics Sales have competent workforce. Production line						TVEC & NAITA and other NCS Developers

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
			operators in Electronics industry when leave the job could follow this course and find a job in their home town.						
(vii)	Combine two NCS; Electrical Appliances Repair Technician and Electronics Appliances Repair Technician and add a unit on 'Repair business appliances'	To have wider certification for appliance repairers	Higher enrollment for courses and higher employability for certified repairers						TVEC & NAITA and other NCS Developers
11.7	Address Skills Issues in Export Manufacturing Industry								
(i)	Establish Vocational training centre in Each Investment Promotion Zone (IPZ)	To enable youth, especially females to follow training courses during their free time to find employment when they leave the job.	Higher image of Zone Jobs and increase retention rate of its employees						TVEC, VTA , EDB and BOI
(ii)	Promote NVQ Certification through RPL among employees in IPZs	To enable employees in Export Promotion Zones to have NVQ certificates	To give career orientation and opportunity to follow higher level courses to EPZ employees						TVEC and EDB

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
(iii)	Obtain Services of NYSC, Sapugaskanda Training centre to train employees in Biyagama IPZ	To enable employee in Biyagama Investment Promotion Zone to follow training courses during their free time to find employment when they leave the job.	Operate as a model to promote TVET involvement in Investment Promotion Zones						TVEC and NYSC and EDB
11.8	**New NCS or Revision of NCS to promote Foreign Employment**								
(i)	Revise 20 Occupations related National Competency Standards and / or develop stand-alone units as specified in the Table 6.4 to meet the skills needs of foreign employments.	Increase departures in foreign employment for Electrical and electronics job by 300%	Increase remittance for foreign currency and increase attraction for electrical and electronics jobs and facilitate technology transfer						TVEC, SLFEB and NAITA
(ii)	Add learning Wiring regulations in other countries (Australia) to NCS and Curricula for Electricians	To enable electricians to work in other countries	To explore new territories for foreign employment opportunities						TVEC & NAITA
(iii)	Add Learning of grid Code Regulations of Middle Eastern Countries to NCS and Curricula of Solar Photovoltaic Technician	To prepare Photovoltaic Technicians for foreign employment	To explore new territories for foreign employment opportunities						TVEC & NAITA
(iii)	Develop a New NCS on Mini Hydro Power Plant Operation	To explore employment opportunities in African Countries	Increase remittance from foreign employment						- Do -

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
(iv)	Develop a new NCS for Panel Makers	To explore employment opportunities in Singapore and Malaysia	Increase remittance from foreign employment			—			- Do -
11.9	**Use of Social Media for Skills Upgrading**								
(i)	Develop Facebook/ Social Media Group of Electrical and Electronics Practitioners	Facilitate skills upgrading through sharing new experiences and find solution to problem encountered.	Skill Upgrading culture at low cost and skilled workforce	—					Lead by CGTTI
(ii)	Develop YouTube Chanel and develop short videos on advanced skills (Ref : Chapter 9)	To disseminate know – how on skills upgrading	Skill Upgrading culture at low cost and skilled workforce	—					Lead CGTTI
11.10	**Entrepreneurship and Self Employment**								
(i)	Develop an occupation Specific Module on Entrepreneurship	To prepare students for self-employment	To commence self-employment with confidence	—					TVEC, NAITA, VTA, DTET
(ii)	Promote Electric Motor Winding among girls	To have more female motor winders as contractors working from home	Increase female participation in the Labour force	—					Career Guidance Officers of All Training Agencies

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
11.11	**NVQ through Recognition of Prior Learning**								
(i)	Develop a training module to bridge the skills gaps of electricians without formal training	To give required theoretical knowledge to electricians without formal training	To remove myth of Incompetency from NVQ-RPL Certificate holders						TVEC NAITA
(ii)	Organize Training (Bridging) and assessments of community electricians	To certify all community Electricians with NVQ Level 4	Certify all as per Vistas of Prosperity						TVEC, NAITA PUC
(iii)	Liaisons with Electricians Club organized by leading electrical and Wire Manufacturing Companies to award NVQ for those electricians	To link with leading industrialist to promote NVQ Assessment through RPL	NVQ Certificate for all Electricians						TVEC, NAITA and relevant industries
10.12	**Strengthen On the Job Training by changing Mindset of Trainees and taking BOI and Large Industries for OJT Programmes**								
(i)	Inculcate OJT Mindset among trainees	For Trainees to have Mindset to see OJT as an opportunity for learning and fine tune the skills and work beyond course boundaries	Increase success rate at NVQ Assessment and Increase demand for OJT						NAITA and TVEC
(ii)	To get cooperation of all BOI and Large Industries for OJT Programmes	To get cooperation of large industries for OJT	Trainees with advanced skills						-do -

Reference Section as Above	Activity	Objective	Impact	2021	2022	2023	2024	2025	Responsibility
10.13	**Research**								
	Comparison of commitment to learning and working by trainees from Private and public training centres	To test the hypothesis that the trainees from private training centres are more committed to learn and work.	Impact on Policy formulations						TVEC

11.15 Conclusion

This chapter has explained activities considered for training plan under 12 subtitles and those activities are presented in the Training Plan. Next Chapter will discuss the mechanism for implementation of this plan.

Chapter 12: Mechanism for Coordination and Monitoring of the Implementation

12.1 Introduction

This VET Plan has been prepared by taking industry inputs through different sources. The preparation started with literature review on socio-economic aspects of Electrical and Electronics industry and continued by collecting primary data from industry through a sample survey of enterprises, Key Informant Interviews (KII) and Focused Group Discussion (FGD). However, most findings at KIIs were verified at FGDs and then these were matched with the findings from the enterprise survey of industries too. The skills gaps were identified by comparing skills demand and training supply from training institutions and those skills gaps and skills issues in electrical and electronics industry are well addressed in the training plan. These efforts become meaningful only if training plan is timely implemented.

This chapter suggests a mechanism for coordinating and monitoring of the implementation of the VET plan and concludes with a section indicating the new areas covered and Improvements made in this revised and updated VET Plan (2020) in comparison to the VET plan published in 2012.

12.2 Mechanism for Coordination and Monitoring

This VET plan developed outlines the direction for training supply to meet the skills required in Electrical and Electronics Industry Sector for the period from 2021 -2025.

There is a large number of training providers operating in the TVET Sector in Sri Lanka. These are the leading training providers under the Ministry of Skills Development and Vocational Training, many public sector training providers under different Ministries and Provincial Councils, and Private sector and NGO operated training providers. These different training providers, need to collaborate to implement the proposed activities in the VET plan. This plan has well identified the skills issues and training Plan has prepared to address those issues. Implementation of this VET Plan make significant impact on TVET sector. Therefore, it explains the need for a mechanism for coordination and monitoring of the implementation of this VET plan.

For this purpose, it is recommended to establish a Steering Committee or Committee on **Technical and Vocational Training Plan** comprised with representatives of both Public Training Institutions and relevant industry /Industry Sector Associations for a coordinated approach in monitoring the delivery of training programmes of TVET institutions. This committee shall meet every three months.

12.3 Term of Reference of Steering Committee / Committee for Electrical and Electronics Industry Sector

a. Identify activities of the VET Plan to be included in annual implementation plans of respective Training Providers
b. Quarterly review the training in the occupations and occupational areas in the Electrical, Electronics Industry Sector and the implementation of activities of VET Plan included in annual plans of individual training providers. Hence, the committee has to pay attention to the following activities.
c. Make all Electrical and Electronics Industry Sector courses active
d. NCSs and Curricula development, their revision and implementation in training centres, apprenticeship, and training purchase model
e. In Revision of curricula, arrange to include stand-alone modules on smart technologies in automation, digitization and such emerging areas
f. Train instructors on advanced technologies introduced in new NCS and Curricula
g. Development of Training material and preparation of CDs and their distribution
h. Skills Upgrading of industry employees
i. Identification of skills needs for foreign employment and capturing them into NCSs, curricula and courses
j. Part-time training at NVQ 5 Levels for up-skilling of those employed recognizing their skills acquired in prior learning and current learning occurring in the jobs at workplaces and work experience
k. Development of Social Media Groups and YOUTUBE Channels
l. And any other Relevant activities proposed in the VET plan

12.4 Output of the Steering Committee/Committee

a. Committee will agree on a training plan indicating the Annual Training outputs for each trade/occupation from each training institution based on analyses of present and intended future training capacities of each of them to meet the demand stipulated in the VET plan
b. Each individual TVET provider/institution shall then in agreement with the institutional heads draw up an annual training plan for each TVET agency.
c. Committee will prepare a report on the annual training demands and possible individual institutional plans to TVEC/Ministry in charge of SDV for further actions (endorsement by both TVEC and validated by relevant ISSCs if in operation)

12.5 Improvements in the VET Plan for Electrical and Electronics Sector-2020

This is the 1st revision of the VET Plan for Electrical and Electronics Sector done in 2012.

The VET Plan for Electrical and Electronics Industry Sector – 2012 has 5 chapters as listed below.

i. Chapter 1: Introduction
ii. Chapter 2: Economic Environment of the Industry
iii. Chapter 3: Human Resource Profile
iv. Chapter 4: Current Training Profile
v. Chapter 5: Training Plan for the Short Term and Medium Term (2011 – 2015)
vi. Chapter 6: Mechanism for Coordination, Monitoring of the Implementation

The previous VET Plan had been prepared based on two analyses; analyses of Human Resource Profile with an industry survey and analyses of Training Profile. This did not have any forecast on demand for skills and no comparison of demand for skills and supply of skills.

This Revised and Updated plan has been prepared based on the following analyses.

a) Economic Environment of the Industry.
b) Industry Survey and analyses Demand for Skills quantitatively and qualitatively.
c) Key Informant Interview of 27 Leading Enterprises to identify skills issues
d) Focused Group Discussion with 8 industry Groups and a group of Trainers / Instructors
e) Demand for Foreign Employment
f) Tracer Study of NVQ Certificate holders in Electrical and Electronics Occupations
g) Training Supply from TVET Institutions

The Revised and Updated VET Plan has the following Chapters.

i. Chapter 1: Introduction
ii. Chapter 2: Economic Environment of the Industry
iii. Chapter 3: Demand for Skills identified thorough Industry Enterprise Survey
iv. Chapter 4: Key Informant Interviews
v. Chapter 5: Focused Group Discussion
vi. Chapter 6: Demand for Foreign Employment
vii. Chapter 7: Tracer Study of NVQ Certificate Holders
viii. Chapter 8: Training Supply
ix. Chapter 9: Export
x. Chapter 10: Skills Gaps and Training Needs
xi. Chapter 11: Training Plan
xii. Chapter 12: Mechanism for Coordination, and Monitoring Plan

It is a pleasing achievement to be able to complete the development of this VET plan with the participation of a large number of enterprises and TVET officials in data collection during the

short/ narrow period between two – Pandemic waves. This VET plan has identified the skills issues well and Chapter 11 on Training Plan has prepared to address those issues. Implementation of this VET Plan will make significant impact on TVET sector and therefore, it needs effective coordination and monitoring.

12.6 Conclusion

This VET Plan consisting of 12 chapters has been prepared with the cooperation of many industries including leading industrialists of Electrical and Electronics Sector and TVET Officials and Trainers. Same level of cooperation is solicited from them for implementation of the Plan. It is hoped that implementation of this VET Plan will address most skills issues in the Electrical and Electronics industry. This will enable the Electrical and Electronics sector to move forward as an industry of excellence with the contribution from competent and productive workforce resulting from this VET Plan implementation.

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+Appendix 1

Additional Information used for Analyses of Industry Enterprise Survey in Chapter 3

Appropriateness of the Sample Size

The appropriateness of the sample size was tested based on the following formula. It was decided to fix the confidence level to 95per cent ($z = 1.96$). Hence, it is expected that the true value to lie with the confidence of 95per cent . Since no information regarding the population proportion, it was set to 0.5 ($\hat{p} = 0.5$) and this is the proportion where the maximum sample is attained for all the possible values of population proportion between 0 and 1.

$$n = \frac{\frac{z^2 \hat{p}(1-\hat{p})}{e^2}}{1 + \frac{z^2 \hat{p}(1-\hat{p})}{e^2 N}}$$

Where

z is the z score
e is the margin of error
N is population size
$\hat{p}$ is the estimated population proportion

Based on the above formula and selecting 300 EE enterprises from the population, the maximum margin of error attained from our sample is 5.59per cent. This is a desirable number for large scale studies.

Based on the sample, inferences about the population parameters mainly, proportion and mean, were drawn. Hence, the reader can get an idea about the plausible values that unknown true parameter can have with some confidence. Following two formulae were used to compute the 95 per cent confidence interval for true population proportion and true population average, respectively:

A 95 per cent confidence interval for population proportion is given by

$$\left[\hat{p} \pm 1.96 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right]$$

A 95per cent confidence interval for population mean is given by

$\left[\bar{x} \pm 1.96 \frac{s}{\sqrt{n}}\right]$ where s and $\bar{x}$ are sample standard deviation and sample average of the variable, respectively.

1. Formula used to find Confidence Interval of the Sample Frame

Table A1-1: Distribution of Enterprises among Provinces

Province	Number of Enterprises	% of Total Number
Central	38	13.0
Eastern	25	8.5
North-Central	21	7.2
Northern	16	5.5
North-Western	24	8.2
Sabaragamuwa	31	10.6
Southern	38	13.0
Uva	9	3.1
Western	91	31.1
National	293	100.0

Table A1-2: Distribution of Enterprises based on number of employees

Number of employees	Number of Enterprises	% of Total Number
1	28	9.6
2	51	17.4
3 – 5	95	32.4
6 – 10	30	10.2
11 – 15	13	4.4
16 – 20	9	3.1
21 – 30	10	3.4
31 – 50	11	3.8
51 – 75	7	2.4
76 – 100	5	1.7
101 and Above	34	11.6
Total	293	100.0

Source: Industry Survey of Electrical and Electronics Industries for VET Plan – 2020

Table A1-2: Distribution of Enterprises by district by Scale with Horizontal Percentages

Province	District	Number of enterprises by number of employees						Number of enterprises
		Less than 10 Small Scale		10 – 99 Medium Scale		100 and above Large Scale		
		Count	%	Count	%	Count	%	
Central	Kandy	15	71.43	4	19.05	2	9.52	21
	Matale	10	90.91	1	9.09	0	0.00	11
	Nuwaraeliya	5	83.33	1	16.67	0	0.00	6
	Total	30	78.95	6	15.79	2	5.26	38
Eastern	Ampara	6	75.00	2	25.00	0	0.00	8
	Batticaloa	10	100.00	0	0.00	0	0.00	10
	Trincomalee	7	100.00	0	0.00	0	0.00	7
	Total	23	92.00	2	8.00	0	0.00	25
North-Central	Anuradhapura	11	100.00	0	0.00	0	0.00	11
	Polonnaruwa	8	80.00	2	20.00	0	0.00	10
	Total	19	90.48	2	9.52	0	0.00	21
Northern	Jaffna	10	100.00	0	0.00	0	0.00	10
	Kilinochchi	2	100.00	0	0.00	0	0.00	2
	Mullaitivu	1	100.00	0	0.00	0	0.00	1
	Vavuniya	3	100.00	0	0.00	0	0.00	3
	Total	16	100.00	0	0.00	0	0.00	16
North-Western	Kurunegala	14	70.00	4	20.00	2	10.00	20
	Puttalam	1	25.00	0	0.00	3	75.00	4
	Total	15	62.50	4	16.67	5	20.83	24
Sabaragamuwa	Kegalle	17	100.00	0	0.00	0	0.00	17
	Ratnapura	13	92.86	1	7.14	0	0.00	14
	Total	30	96.77	1	3.23	0	0.00	31
Southern	Galle	13	86.67	2	13.33	0	0.00	15
	Hambantota	5	71.43	2	28.57	0	0.00	7
	Matara	15	93.75	1	6.25	0	0.00	16
	Total	33	86.84	5	13.16	0	0.00	38
Uva	Badulla	3	75.00	1	25.00	0	0.00	4
	Monaragala	4	80.00	0	0.00	1	20.00	5
	Total	7	77.78	1	11.11	1	11.11	9
Western	Colombo	5	10.42	27	56.25	16	33.33	48
	Gampaha	5	26.32	4	21.05	10	52.63	19
	Kalutara	19	79.17	5	20.83	0	0.00	24
	Total	29	31.87	36	39.56	26	28.57	91
National		**202**	**68.94**	**57**	**19.45**	**34**	**11.60**	**293**

Source: Industry Survey of Electrical and Electronics Enterprises for VET Plan – 2020

Table A1-3: Province Wise Distribution of Enterprises by Type of Ownership

Province	Government		Private (Single owner)		Private Partnership		BOI	
	Count	%	Count	%	Count	%	Count	%
Central	0	0	32	13.97	2	5.26	4	18.18
Eastern	0	0	24	10.48	0	0.00	1	4.55
North-Central	0	0	21	9.17	0	0.00	0	0.00
Northern	0	0	15	6.55	1	2.63	0	0.00
North-Western	0	0	18	7.86	4	10.53	2	9.09
Sabaragamuwa	0	0	30	13.10	1	2.63	0	0.00
Southern	0	0	34	14.85	4	10.53	0	0.00
Uva	1	25	8	3.49	0	0.00	0	0.00
Western	3	75	47	20.52	26	68.42	15	68.18
National	**4**	**100**	**229**	**100.00**	**38**	**100.00**	**22**	**100.00**

Source: Industry Survey of Electrical and Electronics Enterprises for VET Plan – 2020

Table A1-4: Scope of Enterprises in operation

Scope of Operations	Number of Enterprises (multiple Entries)
1 Electrical Energy Generation	14.33 % (42)
2 Electrical Product Manufacturing for Local Market	4.10 % (12)
3 Electrical Product Manufacturing for Export	23.55 % (69)
4 Make Electrical Assembling	40.27 % (118)
5 Provide Electrical Services for local Market	68.60 % (201)
6 Provide Electrical Services for Export	12.29 % (36)
7 Electronics Product Manufacturing for Local Market	3.75 % (11)
8 Electronics Product/ Parts Manufacturing for Export	12.97 % (38)
9 Make Electronics Assembling	32.42 % (95)
10 Provide Electronics Services for local Market	6.14 % (18)
11 Provide Electronics Services for Export	24.23 % (71)

Source: Industry Survey of Electrical and Electronics Enterprises for VET Plan – 2020

Table A1. 6: Number of in Non- Electrical Establishments in Economic sections of Construction, Trade and Services Activities

Economic Section	Range of Employees	Number of Establishment
Wholesale and Retail Trade, Repair of Motor Vehicles	35 -99	725
	100 and above	171
Transportation and Storage	75 -199	31
	200 & above	22
Accommodation and Food service activities	75 -199	82
	200 & above	68
Information and Communication	75 -199	55
	200 & above	23
Financial and insurance Activities	75 -199	69
	200 & above	76
Real Estate Activities	75 -199	9
	200 & above	4
Professional, Scientific and Technical Activities	75 -199	76
	200 & above	25
Administrative and Support Service activities	75 -199	47
	200 & above	61
Education	75 -199	78
	200 & above	26
Human Health and Social Work Activities	75 -199	40
	200 & above	16
Art, entertainment and recreation	75 -199	5
	200 & above	5
Other Service Activities	75 -199	9
	200 & above	4
Construction of Roads and Railways	100 and above	28
Construction of Utility Projects	100 and above	3
Construction of Other Civil Engineering Projects	100 and above	1
Total		

Source: Table 5.4- Economic Census 2013 / 14 Construction, Trade and Services (Formal Sector)

Table A1-7: Number of Non- Electrical Establishments Industry Sectors

Industry Sector	Range of Employees	Number of Establishment	X no of Electricians / Technicians	Estimate of Number of Technicians
Mining and Quarrying	40 -99	103	1	103
	100 and above	10	2	20
Manufacturing	40 -99	2,956	2	5,912
	100 and above	2,107	3	6,321
Water Supply, and Remediation Activities	40 -99	8	2	16
	100 and above	2	3	6

Industry Sector	Range of Employees	Number of Establishment	X no of Electricians / Technicians	Estimate of Number of Technicians
Total				**12,378**
Grand Total of Two Tables				**14,210**

Source: Tables 5.8 & 5.10 -Annual Survey of Industries - 2018

Table A1.8: Data on Practicing Electricians collected through District Secretariats/Police Stations by Public Utility Commission

	District	Total number of Practicing Electricians	Number with NVQ	Number to be Assessed and Qualify by Training institutes
1	Colombo	1120		1120
2	Gampaha	2200		2200
3	Kalutara	1469		1469
4	Kandy	1465		1465
5	Matale	685		685
6	Nuwara Eliya	554		554
7	Galle	1331		1331
8	Matara	1099		1099
9	Hambantota	495		495
10	Jaffna	690	158	532
11	Mannar	275		275
12	Vavuniya	350		350
13	Mullaitive	377		377
14	Kilinochchi	350	08	342
15	Batticaloa	905		905
16	Ampara	587		587
17	Trincomalee	624		624
18	Kurunegala	1700	129	1571
19	Puttalam	277	03	274
20	Anuradhapura	1400		1400
21	Polonnaruwa	1109		1109
22	Badulla	751		751
23	Monaragala	672		672
24	Ratnapura	989		989
25	Kegalle	929		929
	Total	**22,403**	**298**	**22,105**

Source: Public Utility Commission - 2020

Appendix 2

List of Enterprises with Key Informant Interviews

	Name of the organization/Person	Operations and activities
1	Ceylon Electricity Board Training Centre, Piliyandala	Power Generation, transmission and distribution, Installation of Air conditioners and lifts/elevators
2	Lanka Electricity Company (Pvt) Ltd (LECO)	Power distributions
3	NIKINI Automation System (Pvt) Ltd	Industrial automation, panel Manufacturing and training
4	Schneider Electric Lanka (Pvt) ltd	Product promotion, consultancy and training for partners in manufacturing and services
5	Solex Engineering (Pvt) Ltd	Manufacture and fabrication of water pumps, heavy machineries and electric motors
6	Venora International (Pvt) Ltd	Electrical installation in high-rise buildings and Panel Manufacturing
7	Dankotuwa Porcelain PLC	Manufacture of ceramic ware (and a large consumer of electricity)
8	Public Utility Commission of Sri Lanka	Standards setter and Regulator
9	Sri Lanka Sustainable Energy Authority	Development and promotion of Renewable energy sources
10	Chief Engineer, Kingsbury Hotel	Installation and maintenance of electrical systems in the hotel
11	Illukkumbura Industrial Automation (Pvt) Limited	Design and development, supply, installation, manufacturing, trading, and related services in the field of electrical engineering,
12	Prof. Keerthi Liyanage	Professor in Electrical Engineering, University of Peradeniya
13	Associated Battery Manufactures Ceylon Ltd.	Exide Lead /Acid Batteries Lucas Seal type Lead /Acid Batteries
14	Cable Solution (Pvt) Ltd.	Manufacture of Cables and Cable Connectors and Accessories for instrumentations
15	GPV Lanka (Pvt) Ltd	EDMS-services to customers worldwide. SMD/THT Assemblies, Inductive Components, Cable Assemblies & Box-Build
16	Hitec Solutions Pvt Ltd	Industrial Automation and system design
17	Kelani Cable PLC	Manufacture of power cables and transformer wires and Trading in electrical products
18	Lanka Harness (Pvt) Ltd	Manufacture of Auto Harnesses, Auto Switches, Auto Safety Sensors and Sun wiser arms for export
19	Lanka Transformers	Manufacture of Transformers; Oil Cooled and Dry Type – Air Cooled
20	Melwire Rolling (Pvt.) Limited	Steel Rolling Products for local market and export
21	Nippon Maruchi Lanka Electronics (Pvt) Ltd	Manufacture of Tele communication, Medical & Auto mobile parts, Sound sensors, Smoke sensers, Antenna and antenna products
22	Oral Corporation Pvt Ltd (Orange)	Manufacture of Electrical products and Panel Boards, Lightings
23	St. Theresa Industries, STI Holdings	Power Distribution and Transmission products Street Lighting systems and Steel Fabrications
24	T & G Lanka (Pvt) Ltd. / Lanka HIQU	Manufacture of Fiber Optical cable systems and solutions Lanka HIQU: Cable harnesses, Electromagnetic and precision Mechanical Components
25	TOS Lanka Pvt Ltd	Manufacture of Electronics Components and assembly, High Tech - Surface Mounted Technology, Harness – Wire Harnesses for Automobiles
26	Variosystems (Pvt.) Ltd. (Telephone interview after Emailed report)	Product design for electronics assemblies, devices or systems with cable solutions
27	VEROX LAB (PVT) LTD	Research & Development

	Name of the organization/Person	Operations and activities
	HITEC Sensor Developments (Pvt.) Ltd. (Telephone interview after Emailed report)	Electro-mechanical Sensors for Aerospace Industry

Enterprises, Entrepreneurs and Trainers Participated in FGDs

1	Fentons Limited	Sierra Construction	Thudawe Engineering
2	Illukkumbura Automation	Maga Engineering	Sanken Engineering
3	International Construction Consortium (ICC)		
4	Alpha Solar	Genso Solar	Wisdom Solar (PVt) Ltd
5	E-Base Technological (Pvt) Ltd		
6	Anuhas Electrics, Kurunegala	Sunith Electronics, Kurunegala	Didala Mobile
7	Sigma Electronics	I-Tec Electronics Kurunegala (Singer Service Centre)	Nadeera Electronics
8	Nadeera Electronics	Nuwan Electronics	E-Zone Green Energy
9	Electricians in Galle		
10	Mr.K.G. Eshan Lakshitha Bope – Poddala	Mr.V.G.Haritha Chasindu Akmeemana	Mr.P.W.Tharindu Sahan Akmeemana
11	Mr.P.Shan Pramoda Baddegama	Mr.Gihan Chamara Dangamuwa Akmeemana	Mr.D.L.Nuwan Eranda Akmeemana
12	MrK.W.Mahesh Randika Niyagama	Mr.W.A.Indika Pradeep Niyagama	
13	Mr.D.G.Ruwan Prasad Abesekara Imaduwa		
14	N.R. Tools & Paints. Moratuwa	Audissey AV (Audio & Video) Moratuwa	Nishan Electronics Moratuwa
15	Gamage Electrical Moratuwa	Moratuwa Electricals	
16	John Keels Office Automation	Hemals Electricals	Aloka Electricals (Pvt) Ltd
17	Master Work (Pvt) Lrd	ABANS Electrical PLC	Airflow system (Pvt) Ltd
18	Orel Cooperation (Orange)	Venora Lanka-Power Panels Pvt Ltd-Biyagama	AP Lanka-PVt Ltd Panagoda
19	EMP Holdings, Panagoda	Electro Power -Switch Board Hendala	Pubudu Engineering Homagama
20	Aklan International Nugegoda		
21	3 S Fabrications (Pvt) Ltd Pannala	K.I.K. Lanka (Pvt) Ltd FTZ Katunayake	Rinstrun (Pvt) Ltd Rinstrun (Pvt) Ltd, FTZ Katunayake
22	Everest Lanka (Pvt) Ltd Katunayake	Institute of Electrical Technology (IET), Katunayake	
23	Mr.Upali Ranasinghe, Principal CGTTI	Mr.W.P.P Welikala Snr Instructor, CGTTI	Mr.Namal Edirisinghe Snr Instructor, CGTTI
24	Mr.R.J.Kulathunga Instructor, CGTTI	Mr.M.K.I.Sampath Instructor VTA	Mr.M.P.N.Vithanage Snr Instructor, VTA
25	Mr.H.M.P.S. Herath Lecturer UC, Rathmalana	Ms.U.S.C. Rodrigo Instructoress, IETI, Moratuwa	Mr.W.A.S.R.Wiyathunga Instructor, IETI, Moratuwa
26	Mr.W.B.S.De Silva Instructor, DTET	Mr.G.H.S.Wijewardane Instructor, DTET	

Appendix 3 - Additional Data of Training Supply in Chapter 7

Table A3.1: Training Capacity and Training Performance by TVET Institutes Registered at TVEC in Electrical Occupations and Occupational Areas in 2019, through Full Time Courses

Occupation Trade	TVET Agency	Number of Programmes Registered with TVEC as in TVET Guide	* No of Active Programmes in 2019 reported to TVEC	Duration	Annual Training Capacity in active programmes	Training Performance in 2019	
						Number Enrolled	Number Completed
Electrician	**VTA**	149	108	6-12 M	2,005	2,615	2,234
	CGTTI	01	01	42 M	50	49	48
	DTET	46	49	6-12-24 M	1,440	1,569	702
	NAITA	11	11	6 -12-18-24 M	310	270	361
	NYSC	20	29	6 -12 M	648	531	357
	Other Gov.	01	01	18 M	30	27	00
	Private	38	10	3-6-12-18 M	233	319	182
	Sub-Total	266	209		4,716	5,380	3,884
CEB Electrical* Temporary Partnership	**VTA**		12	12 M	290	228	06
	DTET		14	12 M	420	320	319
	Sub-Total		26		710	548	325
Electric Motor Winder	**VTA**	23	20	6-12 M	340	345	277
	NAITA	01	01	18 M	20	06	10
	Private	04	-	6 M	60	-	-
	Sub-Total	28	**21**		**420**	**351**	**287**
Electrical Appliance Maintenance Technician	**VTA**	**03**	**02**	**3- 12 M**	**35**	**25**	**19**
	DTET	12	06	6 M	440	159	107
	NAITA	01	01	24 M	20	12	00
	Private	02	01	6-24 M	50	08	05
	Sub-Total	**18**	**10**		**545**	**204**	**131**
Diploma in Electrical Technology/ Engineering	VTA	-	01	18 M	40	19	00
	DTET	01	03	18 -36 M	90	41	00
	NAITA	02	02	18 M- 48 M	80	73	65
	UC	02	02	24M	120	177	13
	Other Gov	01	01	40 M	19	12	08
	Private		02	24 M	85	68	67
	Sub-Total	06	11		434	390	153
Solar Photovoltaic System Technician	VTA	02	-	6 M	-	-	-
	Private	01	01	7 M	15	17	00
	Sub-Total	03	01		15	17	00
	***Grand Total**	**321****	**252****		**6,130**	**6,342**	**4,455**

Table A3.2: Training Supply through Full Time Courses in Electricals Occupations and Occupational Areas by District

District	Training Provider	Electrician	Linesman Electrical	Electric Motor Winder	Electrical Appliance Maintenance Technician	Electrical Technology	Solar Photovoltaic System Technician	Total
Colombo	**VTA**	**10**				**01**		**11**
	CGTTI	01						01
	DTET	05						05
	NAITA	02						02
	NYSC	04						04
	UC					01		01
	Other Gov	02	01					03
	Private					02	01	03
	Sub-Total	24	01			04	01	30
Gampaha	VTA	06		01	01			08
	DTET	01				01		02
	NAITA					01		01
	NYSC	02						02
	Private	07		02		01		10
	Sub-Total	16		03	01	03		23
Kalutara	VTA	07		01				08
	DTET	03						03
	NAITA							00
	NYSC	02						02
	Private	06						06
	Sub-Total	18		01	00	00	00	19
Galle	VTA	07		04			02	13
	DTET	03						03
	NAITA	01			01			02
	Sub-Total	11		04	01	00	02	18
Matara	VTA	08		01				09
	DTET	01						01
	Sub-Total	09		01				10
Hambantota	VTA	08		02				10
	DTET	01						01
	NAITA	01						01
	Sub-Total	10		04				14
Ratnapura	VTA	04		01				05
	DTET	03						03
	Sub-Total	07		01				08
Kegalle	VTA	07			01			08
	DTET	02		-				02
	Sub-Total	09		-	01			10
Kandy	VTA	07						07
	DTET	06			02			08
	NYSC	02						02

District	Training Provider	Electrician	Linesman Electrical	Electric Motor Winder	Electrical Appliance Maintenance Technician	Electrical Technology	Solar Photovoltaic System Technician	Total
	Private	03				01		04
	Sub-Total	18		-	02	01	-	21
Matale	VTA	04						04
	DTET	03						03
	Sub-Total	07						07
Nuwara Eliya	VTA	07						07
	DTET	01			02			03
	NAITA	02						02
	Private	02			02			04
	Sub-Total	12		-	04	-		16
Kurunegala	VTA	03						03
	DTET	03						03
	NAITA	01		01				02
	NYSC	01						01
	Private	04			01			05
	Sub-Total	12		01	01			14
Puttalam	VTA	04		01				06
	DTET	02			02			04
	Private	06						13
	Sub-Total	12		01	02			23
Badulla	VTA	09		01				10
	DTET	04						04
	NYSC	01						01
	Sub-Total	14		01				15
Monaragala	VTA	06		02	01			09
	DTET	01						01
	NYSC	01						01
	Private	02						02
	Sub-Total	10		02	01			13
Anuradhapura	VTA	05		02				07
	DTET	01						01
	NYSC	05						05
	Private	02						02
	Sub-Total	13		02		02		17
Polonnaruwa	VTA	03						03
	DTET	01			02			03
	Sub-Total	04			02			06
Ampara	VTA	11		03				14
	DTET	03			02			05
	NYSC	02						02
	Sub-Total	16		03	02			21
Trincomalee	VTA	08		02				10
	DTET				02			02
	Private	02						02
	Sub-Total	10		02	02			14
Batticaloa	VTA	05		02				07
	DTET	01						01
	Private	04						04
	Sub-Total	10		02				12
Vavuniya	VTA	02						02
	DTET	01						01

District	Training Provider	Electrician	Linesman Electrical	Electric Motor Winder	Electrical Appliance Maintenance Technician	Electrical Technology	Solar Photovoltaic System Technician	Total
	Sub-Total	03						03
Mannar	VTA	02						02
	Sub-Total	02						02
Mullaitive	VTA	03						03
	Sub-Total	03						03
Kilinochchi	VTA	03						03
	NAITA	02				01		03
	Sub-Total	05				01		06
Jaffna	VTA	07						07
	DTET	01						01
	Private	02						02
	Sub-Total	10						10
	Grand Total	**265**	**1**	**28**	**19**	**11**	**03**	**327**

Source: IS-D TVEC

Table A3.3: Training Supply through Full Time Courses in Electronics/Mechatronics Occupations and Occupational Areas by District

District		Electronics Appliances Technician	Radio, TV and Allied Equipment Repairer	Industrial Electronics Craftsman	Industrial Mechatronics Technician	Mechatronic Technology NVQ 5,6,7	Electronics Technology NVQ 5	Total
Colombo	VTA	02				01		03
	CGTTI				01	01		02
	DTET			03		02		05
	NAITA			02			01	03
	NYSC		03					03
	UOVT					01		01
	Total	**02**	**03**	**05**	**01**	**05**	01	**17**
Gampaha	VTA	02						02
	DTET	01				01	01	03
	NAITA						01	01
	Private		10		03			13
	Total	03	10	00	03	01	02	19
Kalutara	VTA	01						01

District		Electronics Appliances Technician	Radio, TV and Allied Equipment Repairer	Industrial Electronics Craftsman	Industrial Mechatronics Technician	Mechatronic Technology NVQ 5,6,7	Electronics Technology NVQ 5	Total
	DTET			01				01
	Private		05					05
	Total	01	05	01	00	00	00	07
Galle	VTA	04						04
	DTET			01		02		03
	NAITA	02						02
	NYSC		01					01
	Total	06	01	01	00	02	00	10
Matara	VTA	01						01
	DTET			01				01
	Total	01		01				02
Hambantota	VTA	02						02
	DTET			01				01
	NAITA		01					01
	Total	02	01	01				04
Ratnapura	VTA	01						01
	DTET			01				01
	Total	01		01				02
Kegalle	VTA	01						01
	DTET			02				02
	Total	01	-	02				03
Kandy	VTA	01						01
	DTET			01				01
	NAITA		01					01
	Total	01	01	01				03
Matale	VTA	01						01
	NYSC		01					01
	Total	01	01					02

District		Electronics Appliances Technician	Radio, TV and Allied Equipment Repairer	Industrial Electronics Craftsman	Industrial Mechatronics Technician	Mechatronic Technology NVQ 5,6,7	Electronics Technology NVQ 5	Total
Nuwara Eliya	VTA	01						01
	Private		04					04
	Total	01	04	-	-	-	-	05
Kurunegala	VTA	01						01
	DTET			01				01
	NAITA		01					01
	Total	01	01	01				03
Puttalam	VTA	01						01
	DTET							
	Private							
	Total	01						01
Badulla	VTA	01						01
	DTET			02				02
	Total	01		02				03
Monaragala	VTA	01						01
	Total	01						01
Anuradhapura	VTA	01						01
	Total	01						01
Polonnaruwa	DTET			01				01
	Total	00		01				01
Ampara	VTA	02						02
	NYSC		01					01
	Total	02	01					03
Trincomalee	Total	00	00	00	00	00	00	00
Batticaloa	VTA	01						01
	NYSC		01					01
	Total	01	01					02
Vavuniya	DTET	01						01

District		Electronics Appliances Technician	Radio, TV and Allied Equipment Repairer	Industrial Electronics Craftsman	Industrial Mechatronics Technician	Mechatronic Technology NVQ 5,6,7	Electronics Technology NVQ 5	Total
	Total	01						01
Mannar	Total	00						00
Mullative	Total	00	00	00	00	00	00	00
Kilinochchi	NAITA		01	01		01		03
	Total	00	01	01		01		03
Jaffna	DTET			01				01
	UC					02		02
	Total	00		01		02	00	03
Grand Total		29	30	19	04	11	03	96

Source: IS-D TVEC

Table A3.4: Part time Courses offered by Both Public and Private Sector Training Institutes (as given in TVET Guide -2020) and Performance of Training Providers in 2019

TVET Agency	Name of the Course	Duration	NVQ Level	Number of Centres	Number of Programmes	Training Capacity	2019	
							Enrolled	Completed
DTET	NC in Technology - Electrical Engineering	36 M	5	17	17	850		121
	Diploma in Mechatronics Technology	12 M	5	02	02	90		17
VTA	Electrician (Part time)	3 M	-	04		40	54	24
	Electric Motor Control System	100hrs	NA	02	04	40	1113	00
	Electrical Motor Winding	3 M		01	01	10	15	15
	Electrical Wiring – Industrial	100 hrs		03	05	55	76	31
	Domestic Wiring -Single Phase	100 hrs		17	28 (02*)	280	34	24
	Practical Course for A/L Tech. Stream - Electri. & Electro.	30 hrs		13	20	200	Not reported	
	Basic Electronics	80 hrs		03	05	50	22	11

TVET Agency	Name of the Course	Duration	NVQ Level	Number of Centres	Number of Programmes	Training Capacity	2019	
							Enrolled	Completed
	CCTV/NVR Installation & Configuration (FNF)	50 hrs		01	01	10	-	-
CGTTI	Electrical Maintenance – EM	150 hrs	NA	01	01	80		
	Electrical Wiring - E5	150 hrs	NA	01	01	80		
	Electronics - E2	150 hrs		01	01	80		
	Industrial Automation – PLC	150 hrs		01	01	30		
	Dip. in Mechatronic Technology	12 M		01	01	40		
NYSC	Electrician	6M		05	10	320	189	150
	Motor Rewinding	6 M		02	04	90	50	38
	Power Electricals	6M		03	06	210	-	-
	Motor Controlling	6 M		02	04	100	33	26
	Electronics	6 M		04	12	200	126	108
	Electronics Engineering	6 M		01	02	70		
	Micro Controller Circuit Design	6 M	-	01	02	200	24	13
	Radio, TV & Allied Equipment Repairer	6 M		03	04	140	21	14
Other Gov.	Motor Control Circuits	3 M		01		40	80	80
	Motor Control Circuits & Basic PLC	3 M		01		40	14	14
	Programmable Logic Controller	3 M		01		40	36	36
	Wireman Upgrading	3 M		01		40	40	40
	Electronics for Electricians	3 M		01		40	12	12
	Certificate for Electrician	6 M		01		15	23	14
	Certificate for Electronics Appliances Technician	6 M		01		15	20	10
	Cert in IOT	4 M	-	01	02	50	38	24
UOVT	B.Tech. in Mechatronics Technology	52M PT-W	7	01	01	40		
Private	Certificate for Electrician (Basic Vocational Skills)	6 M	-	01	01	15	12	08
	Industrial Mechatronics Technician	18M	4	01	01	20		

** *Source: TVET Guide -2020 & IS-TVEC*

Table A3.5: EBT in Craft level in Electrical, Electronics and Mechatronics Trades by NAITA in 2019

Craft Occupation	NVQ				Non-NVQ			
	District Having Relevant Training	Duration	Enrollment	Completion	Districts Having Relevant Training	Duration	Enrollment	Completion
Electrician	25	(12-18-24-30-48) M	163	106	08	42 M	12	00
Electric Motor Winder	09	12-15-18-24 M	30	08	05	36M	03	02
Electrical Wireman/ Line man	07	--	29	21	07	36 M	29	21
Household Electrical Appliance Repairer	13	9-12-24 M	25	11				
Electronic Equipment Mechanic					02	36 M	02	00
Radio, TV and Allied Equipment Repairer	06	18 M	12	0	15	18 M	19	23
Electronics Equipment Assembler					04	12 M	07	05
Security and surveillance system technician	01	06 M	13	12				
Solar Photovoltaic System Technician	05	18 M	87	00				

Craft Occupation	NVQ				Non-NVQ			
	District Having Relevant Training	Duration	Enrollment	Completion	Districts Having Relevant Training	Duration	Enrollment	Completion
			315	135	41		72	51

Source: IS- Division-TVEC

Table A3.6: EBT in Situational & Village Levels in Electrical, Electronics and Mechatronics Trades by NAITA in 2019

	Number of Districts	Duration	Enrollment	Completion
Situational Craft Training -Non NVQ				
Electrical Circuit Assembler	03	12	21	12
Electrician	01	12	01	01
Electrician (Domestic)	01	6	00	36
Electrician (Panel Board)	01	18	00	03
Armature Winder	01	12	02	00
Electrical /Electronics Equipment Repairer	02	12	04	06
Electronics System Installer /Serviceman (Security)	01	12	02	00
Total	**10**		**30**	**58**
Village Level Craft Training --Non NVQ				
	Number of Districts	Duration	Enrollment	Completion
Electrical Winder	01	12 M	05	00
House Wiring	02	12 M	00	06
Total	**03**		**05**	**06**

Source: IS Division-TVEC

Table A3.7: Approved Cadre positions and Existing Training Staff in Training Providers under the Ministry

Institute	Approved Cadre	Existing Staff			Total Permanent & Contract Staff		Vacancies	Vacancy Ratio %
		Permanent	Contract	Visiting Industry base	Male	Female		
DTET	1345	662	8	122	488	182	675	50.2%
NAITA	677	382	18	0	205	195	277	40.9%

Institute	Approved Cadre	Existing Staff			Total Permanent & Contract Staff		Vacancies	Vacancy Ratio %
		Permanent	Contract	Visiting Industry base	Male	Female		
UNIVOTEC	56	36	3	0	21	18	17	30.4%
CGTTI	202	151	20	0	166	5	31	15.3%
SLGTI	50	19	8	0	19	8	23	46.0%
Ocean University	82	41	24	0	40	25	17	20.7%
VTA	1730	861	396	0	808	449	473	27.3%
NYSC	161	71	60	0	87	45	30	18.6%
SLIOP	7	6	0	0	5	1	1	14.3%
Total	**2965**	**1567**	**529**	**0**	**1351**	**746**	**869**	**29.3%**

Source: HRD section -SSDD as at 31st September,2020

Table A3.8: Availability of Assessors required for NVQ Assessment by Occupation and District

District	Electrician	Electrical Appliance Maintenance Technician	Electric Motor Winder	Linesman (Electrical)	Electrician (Domestic)	Solar Photovoltaic Systems Technician	Radio, TV and Allied Equipment Repairer	Industrial Electronics Craftsman	Electronics Appliances Technician	Industrial Mechatronics Technician	Electronics Technology	Mechatronic Technology	Electrical Technology	Total
Colombo	30	14	05	00	00	00	08	06	03	03	02	05	03	**79**
Gampaha	18	00	03	00	00	01	07	01	01	00	00	06	01	**38**
Kalutara	14	07	04	01	01	00	06	02	01	00	00	01	01	**38**
Galle	15	04	04	00	01	00	04	02	01	00	00	02	00	**33**
Matara	06	03	04	01	00	00	03	00	00	00	00	00	00	**17**
Hambantota	03	00	02	00	00	00	00	00	00	00	00	00	00	**05**
Ratnapura	01	00	03	00	00	00	01	00	00	00	00	00	00	**05**
Kegalle	06	01	02	00	00	00	03	01	00	00	00	00	00	**13**
Kandy	09	03	03	00	02	00	13	03	01	00	00	00	00	**34**
Matale	01	00	02	00	00	00	00	00	00	00	00	00	00	**03**
NuwaraEliya	04	00	02	00	01	00	01	00	00	00	00	00	00	**08**
Kurunegala	07	06	03	00	01	00	03	02	00	00	00	01	00	**23**
Puttalum	03	01	03	00	00	00	00	00	00	00	00	01	00	**08**
Badulla	06	03	04	00	00	00	02	00	01	00	01	00	01	**18**
Monaragala	00	01	02	00	00	00	01	00	00	00	00	00	00	**04**
Anuradhapura	01	00	02	00	00	00	00	00	00	00	00	00	00	**03**
Polonnaruwa	00	00	02	00	00	00	00	00	00	00	00	00	00	**02**
Ampara	08	03	02	01	00	00	05	02	03	00	00	00	00	**24**
Trincomalee	02	01	02	00	00	00	00	00	00	00	00	01	00	**06**
Batticaloa	02	00	02	00	00	00	00	00	00	00	00	00	00	**04**
Vavuniya	03	01	02	00	00	00	01	00	00	00	00	00	00	**07**
Mannar	00	00	02	00	00	00	00	00	00	00	00	00	00	**02**
Mulative	00	00	02	00	00	00	00	00	00	00	00	00	00	**02**
Kilinochchi	00	00	02	00	00	00	00	00	00	00	00	00	00	**02**
Jaffna	05	01	02	00	00	00	04	01	00	00	00	01	00	**14**
Total	**144**	**49**	**66**	**03**	**06**	**01**	**62**	**20**	**11**	**03**	**03**	**18**	**06**	**392**

Source: Assessment Division-TVEC as at 6th August, 2020

Appendix 4

Table: A4.1: No of Foreign Job Orders Received & No of Departures of Workers Industry in Workers Electrical and Electrical Related Occupations in Years 2017, 2018 & 2019

Job Category	2017		2018		2019	
	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures
Professional						
Engineer – Electrical	66	9	59	8	41	2
Engineer - Instrumentation	5	0	0	0		
Chief Engineer - Electrical / Mechanical	0	0	3	0		
Engineer - M.E. P	0	0	22	0		
Sub-Total	**71**	**9**	**84**	**8**	**41**	**2**
Middle Level						
Draughtsman – Electrical	3	3	0	0		
Foreman – Electrical	19	0	21	1	20	0
Supervisor – M.E. P	82	3	25	3		
Electrician - General	0	0	10	0		
Electrician – Machine	0	1	0	0		
Technician - Electrical Wiring	1	0	0	0		
Technician - Electrical Control Equipment	0	0	4	0		
Electrician – Installation	0	1	0	0		
Assist. Technician Instrument	0	0	12	0	0	3
Electrician -Machines Maintenance	0	0	10	0		
Technician – Motor	2	0	0	0	10	0
Technician - Electromechanical	1	3	20	0	20	0
Technician – SCADA	8	0	0	0		
Electrical Inspector	2	1	0	0		
Supervisor – Electrical	52	56	56	0	1	1
Operator - Auto Cad	6	0	0	0		
Operator - Alarm System	15	0	0	0		
Wireman	0	0	10	0		
Sub-Total	**191**	**68**	**168**	**4**	**51**	**4**
Technician – Electrical	275	56	579	73	183	50
Technician – Instrument	42	0	10	0	04	0

Job Category	2017		2018		2019	
	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures
Technician – CCTV	30	0	20	0	71	0
Operator – CCTV					10	0
Technician – Control					05	0
Electrical Jointer	20	0	0	0		
Operator CCTV	50	0	19	0		
Electrician – Generator	19	0	0	0		
Electrician – Higher Voltage					11	0
Technician – Generator	0	0	5	0	02	0
Electrician Heavy Equipment	5	0	0	0		
Technician - Home Appliance	0	0	150	0		
Senior Electronics Technician	0	0	9	0		
Electrician – Plumbers	0	0	1	0		
Electrical Technician – Senior	0	0	50	0		
Technician –TV	0	0	10	0		
Electrical Assembler	10	0	0	2		
Technician Electrician	2	0	150	2	25	0
Technician - Industrial Electrical	3	0	0	0		
Technician – Cable Installation					7	5
Technician – BMS					18	0
Operator-BMS					18	0
Electrician - Domestic –Male	0	0	50	0	0	4
Technician -Security system					110	0
Technician - Fire Alarm	24	2	78	0	88	0
Installer – Electrical	0	0	103	0	90	0
Motor Winder	7	2	16	1		
Electrician – General	2016	619	1491	196	1764	127
Electrician – Building	61	2	23	9	76	7
Electrician – Industrial	35	3	86	10	221	10
Electrician – Cable	3	3	0	0	7	4
Electrician – Elevator	2	2	20	0	22	3
Electrician – Maintenance	78	3	60	0	3	0
Electrician - A/C	0	2	0	0		
Electrician – Plant	0	20	0	0		
Mechanic – Electro	0	1	400	0	1335	58
Mechanic – Generator	110	1	20	1		
Mechanic -Power House					00	01

Job Category	2017		2018		2019	
	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures	No. of Vacancies	No. of Departures
Technician - Power Generation Services	4	0	0	0	5	0
Technician - Field Service (Electronics & TVs)	2	0	0	0	2	0
Technician- Electronics	28	15	96	9	161	23
Cable Jointer - High Voltage	16	0	0	0		
Winder man	1	0	0	0		
Electrical rewinders/ Winder Man/ rewinder- Motor/Motor winder	8	2	31	1	12	1
Power Generator Mechanic Lead	0	0	5	3		
Sub-Total	**2,851**	**733**	**3,482**	**307**	**4,250**	**293**
Semi-Skilled						
Assistant – Electrician	69	10	0	0	0	0
Sub-Total	**69**	**10**	**0**	**0**	**0**	**0**
Unskilled						
Electricians Technical	2	2	0	0		
Helper – Electrical	18	10	60	0	5	2
Sub- Total	**20**	**12**	**60**	**0**	**5**	**2**
Excluding the Category of Professionals **Total**	**3,131**	**823**	**3,710**	**311**	**4,306**	**299**
		26.3%		**8.4%**		**6.9%**
Including the Category of Professionals **Total**	**3,202**	**832**	**3,794**	**319**	**4,347**	**301**
		26.0%		**8.4%**		**6.9%**
Total in all Occupation	**328,641**	**68,319**	**377,075**	**66,924**	**495,405**	**69,379**
		20.8%		**17.7%**		**14.0%**

Source: IS Division-TVEC *provisional

Acceptance of Electrical and Plumbing National Competency Standards of Electrical and Plumbing as 80% Matching with Saudi National Occupational Competency Standards

From: Abdulkarim AlShiha <A.AlShiha@takamol.com.sa>

Sent: Sunday, February 2, 2020 4:15 PM

To: Manjula <manjula@tvec.gov.lk>

Cc: SVS-Team <SVS-Team@takamol.com.sa>; Janaka Jayalath <jayalath@tvec.gov.lk>;randeniya.mangala@yahoo.com <randeniya.mangala@yahoo.com>

Subject: RE: SVP pilot - Sri Lanka

Dear Mr. Manjula,

Hope this email finds you well.

Referring to the below email, I want to inform you that We have compared the Sri Lankan NOSS for the first two professions (electrician, plumber) and they are within the acceptance percentage "80% and higher" of the Saudi NOSS.

Can we schedule a meeting to seek further cooperation?

Please share with us your availability this week or next week.

Best Regards,

Abdulkarim alshihah

Business Analyst

Government Enablement

Mobile: (+966) 580585450

www.takamolholding.com

Appendix 5

Tertiary and Vocational Education Commission & Export Development Board

Revision and Updating of Vocational Education and Training (VET) Plan Electrical and Sector

Questionnaire for Survey of Industries

Please read the instructions to Enumerators. If you have further doubt, please contacts the consultants whose telephone numbers are given below.

B.H.S. Suraweera	Gamini Gunasinghe	L. Gurusinghe
0773170861	0718150259	0718151093

(Write the answer or mark with √ as applicable)

Section 1 : Information of the Respondent

1.1 Name of the Respondent				
1.2 Gender	Female		Male	
1.3 Designation				
1.4 Telephone	Residence			
	Mobile			

Section 2 : General Information about the Establishment

2.1 Company Name							
2.2 Address							
2.3 Location	District						
	Divisional Secretariat						
2.4 Ownership /legal status of the Establishment							
Public	Semi Govt	Private	Private	BOI	NGO	Cooperative	Other

		(single Owner)	Partnership				

2.5 Locations of Branches			

2.6 Areas of operations	Mark with √ in relevant box	Write Specific products and services
1 Electrical Energy Generation		
2 Electrical Product Manufacturing for Local Market		
2 Electrical Product Manufacturing for Export		
4 Make Electrical Assembling		
5 Provide Electrical Services for local Market		
6 Provide Electrical Services for Export		

2.6 Areas of operations (Cont….)	Mark with √ in relevant box	Write Specific products and services
7 Electronics Product Manufacturing for Local Market		
8 Electronics Product/ Parts Manufacturing for Export		
9 Make Electronics Assembling		
10 Provide Electronics Services for local Market		
11 Provide Electronics Services for Export		
Any other (Specify)		

Section 3 : Human Resource Profile and Skill Gaps

3.1 Details of Senior Officials, Managers and Professionals etc

Occupations	Number of Staff		Number of Unfilled Vacancies	Skills Gaps / Training Needs
	Male	Female		
Total Number of Senior Officials				

3.2 Details of Technical Officers, Technicians and Crafts Persons

Occupations	Number of Staff		Monthly (Rs) Remuneration	Number of Unfilled Vacancies	Skills Gaps / Training Needs
	Male	Female			
Total number of					

Technicians and craft persons					

3.3 Details of Clerical and Supporting Staff

Occupations	Number of Staff		Number of Unfilled Vacancies	Skills Gaps / Training Needs
	Male	Female		
Clerical and Supporting staff				

3.4. Number of technical employees by age groups

(19- 30) Yrs	(31-40) Yrs	(41-50) Yrs	(51-55) Yrs	> 55 Yrs

3.5 Number of technical employees by their experience

less than 1-year experience	1-5 years' experience	6-10 years' experience	11-20 years' experience	over 20 years'
				1

3.6 Past and Future Recruitment , Retirement and Resignation Technical Occupations

Recruitment of Youth / New Entrants in last three years			Retirement in last three years			Resignations to go abroad in last three Years			Future Recruitments Envisaged in next 5 years				
19	18	17	19	18	17	19	18	17	21	22	23	24	25

3.7 Indicate whether each occupation has more or less applicants

Occupations (Mark relevant box with √)	More than sufficient applicants	Sufficient applicants	No sufficient applicants	Sufficient applicants but no required skills	Less applicants and they even do not have sufficient skills	Any other comment (Please Specify)

Section 4: Training

4.1 Application of NVQ

Are you aware of NVQ? (Mark √ in the relevant box)		
Facts	Yes	No
Do you know about NVQ?		
Do you recruit NVQ Certificate holders?		
Do you have NVQ certificate holders in your company		

4.2 What are the occupations you consider NVQ for Recruitment

4.3 Have you recruited any pass outs from TVET centers during the recent past?

Yes		No	

4.4 If 'yes' to above question, do they have sufficient skills and attitude to work satisfactorily

Yes		No	

4.5 What are positive features and Negative features of TVET passed out recruited to your company?

itive factors of staff recruited from training centres	gative factors staff recruited from training centres

4.6 If you do not recruit any pass outs from TVET centres, please give reasons

_____
_____
_

4.7...Does your company/establishment provide apprenticeship training and On the Job training for trainees of training centres?	Yes		No	

4.8 If 'Yes' above question, What are average number of training provided per year

NAITA Apprentices			Diploma Trainees	
OJT for VT Trainees			Under graduates Trainees	

4.9 .Does your company/establishment provide skill upgrading training for your staff?	Yes		No	

4.10 If 'yes' to above question, in what subjects , training is provided?

_____

_____

_____

4. 11 How staff training is arranged?	(multiple choice)
i Done in external organizations	
ii In house and firm-based training carried out by external resource persons	
iii In house and firm-based training carried out by own staff	
iv Other (Specify)	

4.12.Have you contacted or visited any training organization in 2019?	Yes		No	

If 'Yes" provide following information

Name of the Training Centre/Institution	Purpose of Contacting or visiting

Section 5: Expansion and/or Downsizing expected in Next 5 Years

5.1 What is your expectation of further development or downsizing of your operation in next 5 years:

_____
_____
__

5.2 What are the new technologies expected in Electrical and Electronics industry in next 5 years?

_____
_____
_____

5.3 What are the new occupations that may be emerging in Electrical and Electronics industry in next 5 years ?

_____
_____
_____

5.4 How do you dispose the E-waste of your company?
_____

_____

5.5 Do you consider employing disables? (cut the irrelevant answer) Yes / No

If yes; please explain what types of disability, you could accept/ employed?

_____

_____

5.6 What are the effect of Covid 19 on your company?

5.7 Are there any national policies that affect negatively on Electrical and Electronics Industry?

_____
_____
_____
_____

5.8 Any other comment not covered by above questions.

Name and Signature of the Enumerator

Date:

Appendix 6: Used Sinhala and Tamil Copies to Collect Data)

Revisions & Updating of Vocational Education and Training (VET) Plan for Electrical/Electronics Sector

Feedback from NVQ Certificate Holders

Dear- NVQ Certificate holder

The Tertiary and Vocational Education Commission (TVEC) being the apex level policy making body for Technical and Vocational Education and Training (TVET) sector of Sri Lanka expects to revise and update the VET Plan for Electrical/Electronics sector which is considered as an important industry where many are employed at different levels of employment. In this respect, TVEC is interested in getting a feedback from NVQ certificate holders in various occupations in the Electrical/Electronics sector across the country.

Therefore, we kindly request you to spare your valuable time to respond to this questionnaire and all responses given by you will be strictly treated with confidentiality. The information /data collected from you will be used for identifying gaps in the training given and take improvement measures in the future training delivery in Electrical/Electronics Sector in Sri Lanka.

For official use

Reference Number			

Coordinator		Date	
Data Entry Operator		Date	

Section A: Personal Information

1. Name of the Certificate Holder				
2. NIC Number				
3. Gender	Female		Male	
4. Age (Years)				
5. Permanent Address				
6. Divisional Secretariat				
7. District				
8. Telephone	Residence (if available)			
	Mobile			

Section B: Academic Qualifications

1. No Formal Schooling
2. Primary(Grade 1-5)
3. Secondary(Grade 6- Grade 9)

4. Up to G.C.E.(O/L)
5. Passed G.C.E.(O/L)
6. Up to G.C.E.(A/L)
7. Passed G.C.E.(A/L)
8. Degree or Above

Section C: Vocational Training

1. Through which route were you awarded NVQ	A. Recognition of Prior Learning (RPL)		B. Competency Based Training (CBT)	
2. Name of Course/Training program followed				
3. Year(s) the course/training followed	From :		To :	
4. Type of Course	Full Time		Part Time	
5. Duration of the Course (months)				
6. In which Institution did you receive training	1. VTA		2. DTET/ TC	
	3. NAITA		4. NYSC	
	5. Private Training Center		6. NGO	

	7. CGTTI			
7. District in which the training Centre is located In case of NAITA apprenticeship, indicate the district of the Enterprise				
8. Result obtained at the end of the course	Pass			
	Referred			
	Failed			
9. Have you undergone OJT relevant to your course? (Not relevant for enterprise based Apprentices of NAITA)	Yes		No		Not Relevant	
10. If Yes, what is the OJT duration?	Months			
11. Name the District where this establishment (OJT provided) is located?				
12. Did you follow any other training courses	Yes		No (Go to section D)	

If yes, Please answer Questions No.13 & 14

	Course	**If it is a NVQ course at what**	**Duration**	**Year of Completion**	**Institution (NAITA, VTA, DTET, NYSC, Other)**	**Location-District**	**Result Passed or Fa**
13.							

		Level					**ile d**

14. Other Occupations/ Occupational Areas for which you got your NVQs

Occupation/Occupational Area	NVQ Level				
	3	4	5	6	7
i					
ii					
iii					

Section D: Information on Employment

1. Are you currently employed? If "**Yes"** proceed to **Q 2, if No** go to **Section E**	Yes		No /go to **Section E**	
2.				
i Permanent, monthly paid Full-time Employment				
ii Part-time Job				
iii Casual-but Monthly paid (Permanent Place)				

iv Daily paid Job / (Day to day work in different places)				
v Self-employed **(Please proceed to Question Q 9 in Section D)**				
3. How long did it take to get your first job after completion of the course and OJT? (Months)				
4. What is the nature of the organization you work for? (Select only One Answer?)	Government			
	Semi-Government			
	Private			
	NGO			
	BOI Company			
	Foreign Employment			
5. What is the Title/Designation of your current job?				
6. Did you have to undergo any training at the workplace after your joining the enterprise?	Yes		No	
7. If Yes, Indicate the technical training areas/subjects you got training				
8. If Yes, Indicate the soft skills and Language training areas/subjects you got training				
To be filled by self-employed persons/own account workers				
After completion of training, before getting self-employed, did you do a	Yes		No (If no go to Q 12 direct)	

paid job? (waged employment)				
. If yes, How long did it take to get your first job after completion of the course & OJT)? Months				
. For how many months did you do this Job? (Months)				
. How long did it take for you to get self-employed after the course and OJT? (Months)				
. What are your products or services?	Products	Services		
To be filled by all Employed including Self employed				
14. How much is your monthly salary or income in LKR? (Select only one answer)	less than 10,000			
	10,001 - 20,000			
	20,001 - 30,000			
	30,001 - 40,000			
	40,001 - 50,000			
	Over 50,000			
15. Is the job or field you are employed or self-employed relevant to the occupation you got your training and NVQ? (Select only one answer)	Yes			
	Little relevance			
	No relevance			
16. Is the Level of skills you received in the training was sufficient for the job and self-employment? (Select	Job requires higher level skill			
	Skill appropriate for job			

only one)	Job requires lower level skill			
	Skills not applicable			
17. What are the skills that are essential for the job but not covered in the course?				
18. What are your suggestions to improve training?				
19. Do you need further training to improve your work at the job?	Yes		No	
20. If Yes, Indicate the training areas/subjects you intend to get further training relevant to your present job?				

21. What are your future employment expectations ? ?(Multiple Answers)	
i Continue in the current job for a few years	
ii Look for other employment	
iii Get additional training in the same field/sector	
iv Get training in a new field/sector for multi- skills	
v To pursue study in NVQ 5, 6 level	
vi Already follow NVQ 5,6 course	
vii To get a degree NVQ level 7 certificate	
viii Start business	
ix Going abroad for skill work in the trained sector	

x Other (Specify).....	

Section E: Information on Unemployment

To be filled by Currently unemployed person only				
1. Did you refuse any type of job offers after completion of the course?	Yes		No (Go to Section E/Q3)	
2. If Yes, indicate the important reason or reasons as per the priority/ies				
i Job offer not relevant to the certificate				
ii Distance from home				
iii Unsatisfactory working conditions				
iv Not enough salary/remuneration				
v Job functions not attractive				
vi Other				
3. During the past 4 weeks have you tried to find a job?	Yes		No (Go to Q5)	
4. What is the reason for your unemployment? (Select only one answer)				
i Job scarcity/ Very few vacancies in the occupation undergone training				
ii Training undergone not enough for a job/ Mismatch of training with present labour market needs				
iii Lack of work experience				
iv Not receiving information on jobs available				
v No skills to search Internet				
vi Lack of known employers/networks/No links with social leaders				

vii Lack of resources for self-employment	
viii Involved in further studies/ Student/pupil	
ix Family responsibilities / Restrictions from the family	
x Poor ability in English knowledge. /speaking	
xi Not getting an expected job opportunity	
xii Health Issue	
xiii Any other reason	
5. If "No "What is the main reason for not looking for a job in past 4 week? (Select only one)	
i Doing studies	
ii Frustration due to continuous failure to find employment	
iii Family commitment (e.g. Housewife)	
iv Handicapped	
v Family Business	
vi Do not want to work	
vii Starting job/ self-employment soon/ Have already found a job which will start later	
viii Planning to go abroad	
ix Any Other.....	

Thank you very much for your response.

Supervisor