



## CENSUS OF INDUSTRIAL PRODUCTION AND CONSTRUCTION REPORT 2018

Mining and Quarrying, Manufacturing, Electricity,  
gas, steam and air conditioning supply, Water supply;  
sewerage, waste management and remediation  
activities, and Construction

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## Foreword

The Kenya National Bureau of Statistics regularly undertakes censuses and sample surveys to update economic statistics. This is underpinned by the commitment to provide quality statistics that are relevant, timely and reliable. The last Census of Industrial Production (CIP) was conducted in 2010. It is cognizant that overtime, the structures of production change as a result of innovation, technological developments and changes on demand. To ensure up-to-date industrial statistics, KNBS undertook the Census of Industrial Production (CIP) and Construction in 2018 with an aim of updating the industrial structure last developed from the CIP 2010. The census also collected data on other characteristics of the industrial and construction sectors of the economy. These include sectors engaged in activities related to mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply, water supply; sewerage, waste management and remediation activities and construction. This categorization of sectors is based on the International Standards of Industrial Classifications of all Economic Activities (ISIC) Rev. 4. This report provides detailed results from the CIP 2018 as well as the methodologies employed.

The industrial and construction sectors are important sectors in the economy based on their contribution to GDP and employment creation. This report highlights key indicators in the industrial and construction sectors in 2017, which was the reference year for the CIP 2018. Some of the indicators presented in this report are employment, value of industrial production, work done in the construction sector, inputs and the level of capacity utilization. These indicators not only provide insight to the status and structure of the industrial and construction sectors, but also the potential for growth, and the challenges that cause underutilization. The values of outputs and inputs used by the industrials and construction sectors also provide key insights on the forward and backward linkages with other sectors of the economy. Notably, the manufacture of food products is a major consumer of inputs from crop and livestock production.

KNBS has endeavoured to meet the demand for statistical information of various stakeholders including the private sector, Ministries Departments and Agencies (MDAs), academia and researchers. The census findings provide the information required for policy formulation, implementation, monitoring and evaluation.

KNBS is grateful to all the enterprises which participated in the census by providing the required data and information which made the exercise a success. I also appreciate the support received from the World Bank under the Kenya Statistics Program for Results (KSPforR) through which this census was undertaken. Special thanks to all members of KNBS staff who gave valuable contributions in field data collection, data analysis and report preparation. Special thanks to Mr. Robert Nderitu, Mr. Isaac Ndegwa, Mr. Stephen Ngugi and Mr. Benson Karugu who spearheaded the development of this report. I also appreciate the peer reviewers of this report; Mr. Joshua Laichena and Mr. Victor Mose from the Kenya Institute for Public Policy Research and Analysis (KIPPRA).

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## Executive Summary

The main objective of the Census of Industrial Production (CIP) 2018 was to collect data on the structure and characteristics of the industrial and construction sectors of the economy. The data was used to update the industrial and construction sectors and to provide information required for revision and rebasing of National Accounts. The data also provides requisite inputs for the computation of the Index of Industrial Production (IIP), Construction Input Price Indices (CIPIs), Producer Price Indices (PPIs); and Export and Import Price Indices (XMPIs). In addition, the data will be used as a sampling frame for conducting industrial and construction surveys.

Data collection was done through face to face interviews using Computer Assisted Personal Interviews (CAPI) across all the 47 counties for a period of eighty (80) days from July to October 2018, with the reference year being 2017. Information on employment, labour costs, ownership of the establishments, production, installed capacity and utilization, expenditure on goods and services, goods and materials consumed, incomes, inventory, fixed assets, waste management, ICT usage and the general business environment was collected. This covered the activities of mining, quarrying, manufacturing, electricity, gas, steam and air conditioning supply, water supply, sewerage, waste management and remediation; and construction.

The census targeted formal (defined as medium to large) establishments/enterprises involved in industrial and construction activities spread over 47 counties. They comprised of private limited companies at 74.4 per cent, cooperatives at 10.3 per cent while 5.5 per cent operated as sole proprietors. The results of the census show that the share of manufacturing to total value of industrial output declined from 90.1 per cent in 2009 to 86.7 per cent in 2017, which is an indication of a slight change in the structure of the of industrial production.

The value of production output for all industrial sectors was KSh 1,426.2 billion in 2017. The manufacturing sector had the largest value of output at KSh 1,236.8 billion, representing a share of 86.7 per cent of the total industrial production. This was followed by electricity, gas, steam and air conditioning supply sector with a value of KSh 131.6 billion, translating to 9.2 per cent. Within the manufacturing sector, manufacture of food products sub-sector had the highest production value of KSh 513.1 billion representing 41.5 per cent of the total manufacturing output during the review period. The value of total construction work done in 2017 was KSh 652.6 billion with civil engineering works recording the highest value of KSh 329.6 billion representing 50.6 per cent.

Capacity utilization by industrial and construction establishments was estimated at 63.6 per cent in 2017. Key reasons sighted for under-utilization included high cost of materials, high cost of electricity and fuels, cost of credit, poor transport facilities, high cost of labour and competition from imports.

A total of 616,138 workers were engaged in the formal sectors of industrial and construction activities in 2017. The manufacturing sector engaged 353,968 employees while construction sector had 213,362 employees in 2017, accounting for 57.4 and 34.6 per cent, respectively. Out of the total employment, 53.3 per cent were permanent, 26.3 per cent were casuals, 18.9 per cent were on contract while the rest (1.5%) were either apprentices or unpaid family workers. Distribution of employment by sex revealed that across all industries, females were less than 20 per cent of total employees.

Overall, expenditure on materials and supplies for industrial establishments was KSh 796.5 billion in 2017. Manufacturing activities recorded the highest share in the purchase of materials and supplies at 91.3 per cent followed by electricity, gas, steam, and air conditioning at 7.2 per cent. Comparison across manufacturing activities indicated that the

bulk of expenditure on materials and supplies was mainly on the manufacture of food products at KSh 351.1 billion. Materials used in construction sector varied across the activities with cement, ballast and reinforcement steel taking the highest shares of 18.4, 16.9 and 16.8 per cent, respectively.

A total of KSh 84.4 billion was spent by industries in purchasing various utilities in 2017. Petroleum products and electricity jointly accounted for 79.7 per cent of total expenditure on utilities. Manufacturing sector had the highest expenditures on utilities at 62.9 per cent of the total, while mining and quarrying had the lowest. In the manufacturing sector, 52.9 per cent of expenditures on utilities went to electricity while 18.7 per cent went to petroleum products.

The census results show that total fixed assets worth KSh 1.2 trillion were attributed to the industrial and construction sectors by close of 2017. Assets used for processing/production accounted for 42.7 per cent of the total value of fixed assets in 2017. The total amount of solid waste generated by all sectors was 81.6 million tonnes. Out of this, 79.2 million tonnes was generated by the manufacturing sector.

Firms in Mining and Quarrying reported highest external funding in 2017 at 21.4 per cent followed by establishments involved in construction at 20.8 per cent. Manufacturing establishments sought only 18.0 per cent of their operational funding from outside the establishments. Most of the establishments/enterprises which acquired loans sourced them from commercial banks with a small proportion receiving from SACCOs and microfinance institutions.

The highest proportion of industries using computers were reported under Electricity, gas, steam and air conditioning sector at 100 per cent while Manufacturing reported the lowest usage at 85.3 per cent. The census further established that 81.9 per cent of the surveyed industries had internet in their premises. Electricity, Gas, Steam and Air conditioning sector was ranked highest for engaging in e-commerce at 42.9 per cent followed by manufacturing at 26.7 per cent.

## Abbreviations & Acronyms

CAPI	Computer Aided Personal Interview
CBR	Central Business Register
CIF	Container including Freight
CIP	Census of Industrial Production
CIPi	Construction Input Price Index
EAC	East African Community
EPZ	Export Processing Zone
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GFCF	Gross Fixed Capital Formation
GO	Gross Output
GVA	Gross Value Added
IC	Intermediate Consumption
ICT	Information Communication Technology
IIP	Index of Industrial Production
IRCS	International Recommendation for Construction Statistics
IRIS	International Recommendation of Industrial Statistics
ISIC	International Standards of Industrial Classifications of All Economic Activities
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KPHC	Kenya Population and Housing Census
KSPforR	Kenya Statistics Program for Result
MSIP	Monthly Survey of Industrial Production
NHIF	National Hospital Insurance Fund
NSSF	National Social Security Fund
PPI	Producer Price Index
RoW	Rest of the World
SAPs	Structural Adjustment Programmes
SDG's	Sustainable Development Goals (SDGs)
SNA	System of National Accounts
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
VAT	Value Added Tax
WASCO	Water Supply Company
NDE	New Digital Economy
R&D	Research and Development

## Table of Contents

<b>Foreword</b> .....	<b>iii</b>
<b>Executive Summary</b> .....	<b>iv</b>
<b>Abbreviations &amp; Acronyms</b> .....	<b>vi</b>
<b>List of Figures</b> .....	<b>xii</b>
<b>Chapter 1- Overview, Concepts and Methodology</b> .....	<b>13</b>
1.1 Overview.....	13
1.1.1 Scope of the CIP 2018 .....	14
1.1.2 Legal Mandate, Confidentiality .....	15
1.1.3 Unit of Enquiry.....	15
1.1.4 Period Covered by the Census.....	15
1.1.5 Data Collection .....	15
1.1.6 Questionnaire Sections .....	15
1.2 Concepts and definitions .....	16
<b>Chapter 2- Ownership Structure</b> .....	<b>19</b>
2.1 Type of ownership of Establishment/Enterprise .....	19
2.3 Challenges.....	19
<b>Chapter 3 - Employment and Hours Worked</b> .....	<b>21</b>
3.1 Introduction .....	21
3.2 Employee Terms of Engagement in the Industrial Sector .....	21
3.3 Distribution of employees by sex, industry and Size of Establishment.....	22
3.4 Hours Worked.....	26
<b>Chapter 4 - Industrial Production and Construction Work Done</b> .....	<b>28</b>
4.1 Introduction .....	28
4.2 Value of Industrial Production .....	28
4.2.1 Mining and Quarrying .....	29
4.2.2 Manufacturing .....	30
4.2.3 Production Values for the Food sub-sector .....	31
4.2.4 Electricity, gas, steam and air conditioning supply .....	32
4.2.5 Water supply; sewerage, waste management and remediation activities .....	32
4.3 Construction Sector's Value of Work Done .....	33

4.4	Capacity Utilization .....	34
<b>Chapter 5 - Inputs in Industrial Production and Construction Activities .....</b>		<b>38</b>
5.1	Introduction .....	38
5.2	Expenditure on raw materials .....	38
5.2.1	Manufacturing Sector.....	38
5.2.2	Textile industry .....	39
5.2.3	Food Processing .....	40
5.3	Construction Inputs.....	41
5.3.1	Construction Materials by Economic Activity.....	42
5.3.2	Cost of selected raw materials in the construction industry.....	43
5.4	Other Operating Expenses.....	47
5.5	Annual expenditures on utilities.....	48
<b>Chapter 6 - Marketing of Industrial Products and Business financing .....</b>		<b>54</b>
6.1	Sale of Industrial Products.....	54
6.2	Business Financing .....	55
<b>Chapter 7 - Industrial Investments.....</b>		<b>59</b>
7.1	Gross Fixed Capital Formation.....	59
7.2	Additions to Fixed Assets and Gross Fixed Capital Formation.....	59
<b>Chapter 8 - Water Abstraction, Waste Management and Disposal .....</b>		<b>62</b>
8.1	Introduction .....	62
8.2.	Water Use and Expenditure by Economic Activity .....	62
8.3	Waste Management and Disposal by Economic Activities.....	63
8.3.1	Solid waste.....	63
8.3.2	Hazardous waste.....	64
8.3.3	E-waste .....	64
8.3.4	Wastewater .....	65
8.4	Waste Management in the Water and Sewerage Sector.....	65
<b>Chapter 9 - Information and Communication Technology (ICT) in Industries.....</b>		<b>67</b>
9.1	Introduction.....	67
9.2	Methodology .....	67
9.3	Use of Computer .....	68
9.4	Availability of Internet Infrastructure .....	69
9.5	Type of Broadband connection.....	69

9.6	E-commerce.....	71
9.7	Uptake of Online Purchases and Sales .....	72
9.8	Limitations of Online Selling .....	73
9.9	Online Crime Experienced by Industries .....	74
9.10	New Digital Economy .....	75
9.11	Uptake of the new technologies by type of industries .....	77
9.12	Adoption of New Technologies in the Future.....	78

## List of Tables

Table 2.1: Type of ownership of Establishment/Enterprise .....	19
Table 2.2: Type of Ownership structure by Economic Activity .....	19
Table 3.1: Distribution of Employees by Type and Industry .....	22
Table 3.2: Distribution of employees by Industry and Establishment size, 2017 .....	24
Table 3.3: Distribution of employees by Industry and Sex, 2017 .....	25
Table 4.1: Production Value by Industry, 2009 and 2017 .....	29
Table 4.2: Production in the Mining and Quarrying.....	29
Table 4.3: Manufacturing Sector Value of Production .....	31
Table 4.4: Production Values for Food sub-sector by Activity .....	32
Table 4.5: Electricity, gas, steam and air conditioning supply.....	32
Table 4.6: Water supply; sewerage, waste management and remediation activities.....	32
Table 4.7: Value of Construction Work Done by Type of Project.....	33
Table 4.8: Value of Construction Work Done by Activity .....	33
Table 4.9: Value of Construction by Project Owner .....	33
Table 4.10: Average Capacity Utilization by Activity .....	35
Table 4.11: Reasons for Capacity Underutilization.....	36
Table 5.1: Expenditure on Materials and Supplies by Economic Activity.....	38
Table 5.2: Annual Expenditure on Materials and Supplies by Activity .....	40
Table 5.3: Expenditure on Materials and Supplies on the Manufacture of Food Products .....	41
Table 5.4: Proportions of Construction Inputs in 2017 .....	41
Table 5.5. Value of Construction Materials by Economic Activity .....	42
Table 5.6: Value of Selected Raw Materials in Construction Industry, 2017.....	44
Table 5.7. Value of Selected Raw materials in Construction of Buildings and Specialized works .....	45
Table 5.8: Share of Selected Raw Materials in the Construction of Civil Engineering Works.....	46
Table 5.9: Other Operating Expenses, 2017 .....	47
Table 5.10: Expenditure on utilities by industry, 2017.....	48
Table 5.11: Value of utilities purchased by Economic Activity, 2017 .....	50
Table 5.12: Quantities of utilities purchased by Industry, 2017 .....	51
Table 5.13: Quantities of utilities purchased by Economic Activity.....	52

Table 5.14: Annual Water Expenditure by Economic Activity .....	53
Table 6.1: Value of Sales by Economic Activity in 2009 and 2017.....	54
Table 6.2: Value of Sales by Activity.....	55
Table 6.3: Proportion of Business Financing by source and activity ( Per cent) .....	56
Table 6.4: Distribution of external and internal financing by activity .....	57
Table 6.5: Proportion of Source of Loans by activity (Per cent).....	58
Table 7.1: Value of assets at the end of 2017 by Economic Activity .....	60
Table 8.1: Water Use and Expenditures by Economic activities .....	62
Table 8.2: Proportion of Quantity of water Used by Economic Activity .....	63
Table 8.3 Quantities of Solid Waste by Economic Activity, Tonnes .....	64
Table 8.4 Quantities of Hazardous Waste by Economic Activity, Kilograms .....	64
Table 8.5 Quantities of E-Waste by Economic Activity, Kilograms.....	65
Table 8.6 Quantities of Liquid waste/ Wastewater by Economic Activity, Cubic meters .....	65
Table 8.7 Quantities of Waste in the Water and Sewerage sector .....	66
Table 8.8 Expenditure on Waste Management in the Water and Sewerage sector, KSh Million .....	66
Table 9.1: Total number of Firms responding in ICT section.....	67
Table 9.2: List of ICT Indicators.....	68
Table 9.3: Proportion of Industries that Experienced Online Crime, by Economic Activity .....	75
Table 9.4: Proportion of industries using the 4 <sup>th</sup> Industrial revolution technologies, by type.....	77
Table 9.5: Use of New Technologies in the Future, by industry .....	79

## List of Figures

Figure 4.1: Percentage share of industrial Production, 2009 and 2017 .....	28
Figure 4.2: Production Value (% of the total) .....	30
Figure 4.3: Establishments in relation to reasons given for low capacity utilization .....	37
Figure 5.1. Comparisons of inputs in Buildings and Roads .....	43
Figure 5.2: Materials used in the construction of roads and railways .....	46
Figure 5.3: Utilities expenditure by Industry.....	49
Figure 6.1: Proportions of business financing by activity, 2017 .....	57
Figure 7.1: Proportion of assets stocks, 2017 .....	61
Figure 8.1: Proportions of Water from WASCO by Sectors .....	63
Figure 9.1: Proportion of Industries using Computers .....	68
Figure 9.2: Proportion of businesses with internet connection in their premises.....	69
Figure 9.3: Proportion of industries with broadband connection .....	70
Figure 9.4: Proportion of Industries with Broadband, by Type .....	71
Figure 9.5: Proportion of Industries engaged in e-commerce .....	71
Figure 9.6: Proportion of Industries engaged in e-commerce, by Industry.....	72
Figure 9.7: Proportion of industries engaged in online purchase and sales.....	73
Figure 9.8 Limitations of online selling.....	74
Figure 9.9: Proportion of Industries that experienced online crime, by type.....	75
Figure 9.10: Uptake of New Digital Economy .....	76
Figure 9.11: Uptake of the 4th Industrial revolution, by type of technology .....	77
Figure 9.12: Use of New Technologies in the Future .....	78

## Chapter 1- Overview, Concepts and Methodology

### 1.1 Overview

The Census of Industrial Production (CIP) and construction was carried out from July to October 2018. The census aimed at providing key statistics to be used for development of the structure of the industrial sector; rebasing of the producer price index, compilation of Supply and Use tables, Input-Output tables, Value Added and other National Accounts statistics and industrial exports and imports for the balance of payments statistics. Whereas, the last CIP was conducted in 2010 with 2009 as the reference year, the 2018 CIP reference year was 2017.

Data collected in the census included general particulars of establishments/enterprises, employment, labour costs, income, expenditure, goods and materials consumed, goods produced, fixed assets, imports, exports, waste management, ICT usage and the general business environment. The Census therefore sought to:

- i. Provide information for mining and quarrying, manufacturing, electricity and gas supply, water and sewerage, and construction sectors to be used in revision and rebasing of the National Accounts.
- ii. Form the basis for revisions and rebasing of key indices such as the Index of Industrial Production (IIP) and the Production Price Index (PPI).
- iii. Collect data to be used to update the sampling register for the annual Survey of Industrial Production, Monthly Survey of Industrial Production and rebasing of the Construction Input Price Index (CIPI).
- iv. Provide data for computing baseline export/import price indices for the industrial sector.
- v. Provide updated information to monitor the growth and the gains in fish processing, agro-Processing, leather and textiles sub-sectors which have been put on focus in realization of the Government increase of manufacturing contribution to GDP which is one of its big four action plans.

Specifically, the CIP 2018 set to;

- i. Provide benchmark data to update economic structure of the industrial sector from the CIP 2010 level,
  - To provide data on Industrial Structure;
  - Update the current frame which was last developed in 2009;
  - Improve quality of industrial data through broadening of statistical database to cater for changes that have taken place since 2009.
- ii. Establish an industrial database and update the register which will monitor and reflect changes in the structure of industry and provide a frame for industrial surveys.
- iii. Provide data for use in compilation of Supply and Use Tables, input-output tables and other national accounts statistics.
- iv. Provide data for industrial output, and capacity utilization.
- v. Provide measures of key statistics and the economic structure for the construction sector Provide data for computing baseline export/import price indices for the industrial sector.
- vi. Provide data for rebasing the Producer Price Index (PPI), the Index of Industrial Production (IIP) and the Construction Input Price Indices (CIPI)
- vii. Provide a basis for assessing trends in the economy and the contribution of industrial activities to the national economy.

### 1.1.1 Scope of the CIP 2018

The 2018 Census of Industrial Production (CIP) targeted formal establishments that were involved in Industrial production activities across all the 47 counties. The term “economic activity” as used in the 2018 CIP refers to a combination of actions carried out by a certain entity that uses labour, capital, goods and services to produce specific products (goods and services). An activity is characterized by: (a) an input of resources; (b) a production process; and (c) an output of products.

Following the International Standard of Industrial Classification (ISIC) rev 4, the scope of the Census extended to ISIC sections B, C, D, E and F, namely:

- Section B: Mining and quarrying
- Section C: Manufacturing
- Section D: Electricity, gas, steam and air conditioning Supply
- Section E: Water Supply; Sewerage, Waste management and remediation activities
- Section F: Construction

Detailed descriptions of these economic activities are;

**Mining and quarrying:** This includes the activities relating to extraction of minerals occurring naturally as solids (coal and ores), liquids (petroleum) or gases (natural gas). Extraction can be achieved by different methods such as underground or surface mining, well operation, seabed mining, etc. Also included are supplementary activities aimed at preparing the crude materials for marketing such as crushing, grinding, cleaning, drying, sorting, concentrating ores, liquefaction of natural gas and agglomeration of solid fuels. These operations are often carried out by the units that extracted the resource and/or others located nearby.

**Manufacturing:** This includes the physical or chemical transformation of materials, substances or components into new products. The materials, substances or components transformed are raw materials that are products of agriculture, forestry, fishing, mining or quarrying or products of other manufacturing activities. Some other activities considered to be manufacturing include Milk pasteurizing and bottling, Printing and related activities, ready-mixed concrete production, Leather converting, Wood preserving, Electroplating, plating, metal heat treating, and polishing, Rebuilding or remanufacturing of machinery, and re-treading of tyres.

**Electricity, gas, steam and air-conditioning supply:** Economic activities included under this section are the activity of providing electric power, natural gas, steam, hot water and the like through a permanent infrastructure (network) of lines, mains and pipes. Also included is the distribution of electricity, gas, steam, hot water and the like in industrial parks or residential buildings. This section excludes the operation of water and sewerage utilities and long distance transport of gas through pipelines.

**Water supply; sewerage, waste management and remediation activities:** This section includes activities related to the management (including collection, treatment and disposal) of various forms of waste, such as solid or non-solid industrial or household waste, as well as contaminated sites. The output of the waste or sewage treatment process can either be disposed of or become an input into other production processes. Activities of water supply are also grouped in this section, since they are often carried out in connection with, or by units also engaged in, the treatment of sewage.

**Construction:** Construction is defined as economic activity directed to the creation, renovation, repair or extension of fixed assets in the form of buildings, land improvements

of an engineering nature, and other engineering constructions such as roads, bridges, dams etc. The construction sector has a significant share of the total economic output of the country with corresponding demands for materials and labour, machinery and equipment inputs. While construction activity may be carried out by any enterprise, construction industry here is intended to restrict scope to those enterprises or units of enterprises classified to construction by the rules and conventions of ISIC Re.4.

### **1.1.2 Legal Mandate, Confidentiality**

The 2018 CIP data was collected under the authority of the Statistics Act, 2006 of the Laws of Kenya which empowers the Director General, Kenya National Bureau of Statistics to conduct surveys and Censuses to inform policy formulation. This Act stipulates that the completion of questionnaires issued under the Act is mandatory.

Under the provisions of the Statistics Act 2006, KNBS is prohibited from publishing or releasing, in any manner, any statistics which would divulge information obtained from respondents relating to any identifiable business without a previous written consent of those respondents. Data reported on the questionnaires would therefore be treated in strict confidence, be used for statistical purposes only, and be published in only aggregate form.

### **1.1.3 Unit of Enquiry**

The units of inquiry for which CIP data was collected were industrial establishments (factories, mills, works, plants, mines, quarries) and construction entities within the territorial boundaries of the country. Establishments were single-unit enterprises or parts of multi-unit enterprises.

### **1.1.4 Period Covered by the Census**

The CIP 2018 related in principle to the 2017 calendar year. As much as possible, respondents were encouraged to return figures nearest to the calendar year. Returns which covered a period of less than 12 months were accepted in cases where businesses had started or ceased trading during the year. Since employment is taken to be a stock variable, the details for 2017 relates to 30<sup>th</sup> June of 2017.

### **1.1.5 Data Collection**

Data collection was done through face to face interviews using Computer Assisted Personal Interviews (CAPI) across all the 47 counties for a period of eighty (80) days from July to October 2018. Research assistants were issued with tablets which were used for data collection and sending the data to the server immediately after completion of each interview. The research assistants were required to visit all the establishments to collect information being sought. At the same time, the researchers were instructed to validate most of the information collected by checking against the audited financial statements of the enterprises. Other available information at KNBS such as the Monthly Survey of Industrial Production (MSIP) data was used to validate the production data for manufacturing establishments.

### **1.1.6 Questionnaire Sections**

Data requested in the 2018 CIP was obtained from; the accounting records and financial statements of the business units; the production and cost reports; employment and payroll records; and other sources (e.g. plant or production). As shown in Appendix I, the main questionnaire had the following sections:

- i. General Particulars of the Establishments
- ii. Ownership
- iii. Employment, Hours worked and Compensation of Employees

- iv. Production and Installed Capacity
- v. Capacity utilization and Reasons for Underutilization of capacity
- vi. Raw Materials
- vii. Inventories
- viii. Expenditure on Goods and Services
- ix. Sales
- x. Other income
- xi. ICT
- xii. Fixed Assets
- xiii. Waste Management

## 1.2 Concepts and definitions

- i. **Establishment:** A production unit engaged in one kind, or predominantly one kind of economic activity at a fixed physical location.
- ii. **Persons engaged:** Total number of persons who work in or for the establishment. It includes employers, own account workers, unpaid family workers and employees.
- iii. **Employee:** A person who works in a paid employment job and receives remuneration as wages, salary, commissions, tips, piece rates, bonuses or payments in kind such as food and housing.
- iv. **Wages and Salaries:** Gross amount paid to employees before deduction of income tax, employees, contributions to social security. It includes the earnings of outside piece-workers.
- v. **Part-time workers:** Persons who worked less than half of the usual working hours.
- vi. **Regular Workers:** Regular workers refer to working owners/operators, fully paid employees, unpaid family members, and apprentices. For paid employees, regular workers are those (unlike casual workers) have stable contracts. For self-employed persons, regular workers are those who work in their own enterprises on a continuous basis.
- vii. **Unpaid family worker:** A person forming part of the workforce of any of the proprietors or related to them, who is actively engaged in the business, without any remuneration.
- viii. **Full-time Workers:** Persons who work for at least three-fourth (i.e., 75%) of the normal or customary working period measured in hours, days, weeks, etc., are considered full-time workers, except when on leave or otherwise officially away.
- ix. **Basic Price:** Amount receivable by the producer exclusive of taxes on products (e.g. excise duty and Value Added Tax) and inclusive of subsidies on products. The equivalent of imported products is the C.I.F value at the border of the importing country.
- x. **Purchasers' Price:** Amount payable by the purchaser exclusive of deductible taxes on products (e.g. deductible VAT).
- xi. **Turnover:** Amount (excluding VAT) invoiced to customers after deductions for trade and quantity discounts and allowances for returns but not cash discounts.
- xii. **Gross output Value:** on the market of goods and services produced, including work in progress and products for own use. Gross Output is valued at basic prices.
- xiii. **Intermediate consumption:** Covers non-durable goods and services used up in production, including repairs and maintenance of the capital stock.

- xiv. **Value added at basic prices:** Is the gross output at basic prices less the value of intermediate consumption at purchasers' prices.
- xv. **Gross Value Added:** (i.e. total turnover adjusted for changes in stocks and own-account capital assets) less intermediate consumption (i.e. total purchases adjusted for changes in stocks of materials and fuels).
- xvi. **Payments in kind:** Goods and services provided to employees free of charge or at markedly reduced costs, which are clearly of direct benefit to the employees as consumers. Examples are food, drinks, clothing, accommodation or other commodities.
- xvii. **Sole proprietorship:** Also known as the sole trader or simply a proprietorship is a type of enterprise that is owned and run by one natural person and in which there is no legal distinction between the owner and the business entity.
- xviii. **Partnership:** A partnership is a formal arrangement in which two or more parties cooperate to manage and operate a business. Various partnership arrangements are possible: all partners might share liabilities and profits equally, or some partners may have limited liability.
- xix. **Private Limited Company:** A private limited company is a type of privately held small business entity, in which owner liability is limited to their shares, the firm is limited to having 50 or fewer shareholders, and shares are prohibited from being publicly traded.
- xx. **Public Limited Company:** A *public limited company* is the legal designation of a limited liability company which has offered shares to the general public and has limited liability.
- xxi. **Cooperative:** an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise".
- xxii. **Parastatal;** a company, agency, or intergovernmental organization that possesses political clout and is separate from the government, but whose activities serve the state, either directly or indirectly.
- xxiii. **County Government:** The counties of Kenya are 47 geographical units created by the 2010 Constitution of Kenya as the units of devolved government with each county having its own semi-autonomous government.
- xxiv. **National Government:** The Government of the Republic of Kenya (GoK) is the national government of the republic of Kenya. It is composed of three arms: the legislature, the executive and the judiciary.
- xxv. **Land improvements** are the result of actions that lead to major improvements in the quality or productivity of land, or prevent its deterioration, and are also treated as fixed capital formation. Activities such as land clearance, land contouring, and creation of wells and watering holes that are integral to the land in question are to be treated as resulting in land improvements. The value of natural land before improvement is not included.
- xxvi. **Non-Residential Buildings** are buildings or designated parts of buildings that are used entirely or primarily as residences, including any associated structures, such as Garages and Extensions.
- xxvii. **Other Construction works refers** to the Value of Construction works in progress during the time of data collection.

- xxviii. ***Production/Processing Equipment*** refers to specialized equipment specific to unique Production processes.
- xxix. ***Transport Equipment*** consists of equipment for moving people and objects. This includes transport equipment, such as motor vehicles, trailers and semitrailers, ships, railway and locomotives; aircraft and spacecraft and motorcycles, bicycles, etc.
- xxx. ***The ICT equipment*** consists of devices using electronic controls and also the electronic components forming part of these devices. This limits the coverage of ICT equipment mostly to computer hardware and telecommunication equipment.
- xxxi. ***Research and experimental development*** (R&D) on own account consists of the value of expenditures on creative work undertaken on a systematic basis in order to devise new applications. By convention, output of own-account R&D production by enterprises is valued at the sum of costs, including the cost of unsuccessful R&D.
- xxxii. ***Entertainment, literary and artistic originals*** consist of the original films, sound recordings, manuscripts, tapes, models, etc., on which drama performances, radio and television programming, musical performances, sporting events, literary and artistic output, etc., are recorded or embodied.

## Chapter 2- Ownership Structure

### 2.1 Type of ownership of Establishment/Enterprise

The proportion of establishments/firms covered by type of ownership is reflected in Table 2.1. The establishments covered were composed of private limited companies at 74.4 per cent, cooperatives and sole proprietorship at 10.3 per cent and 5.5 per cent, respectively.

**Table 2.1: Type of ownership of Establishment/Enterprise**

TYPE OF OWNERSHIP	Percent
Sole Proprietorship	5.5
Partnership	4.2
Private Limited Company	74.4
Public Limited Company (Listed)	2.8
Cooperative	10.3
Parastatal	1.2
County Government	1.3
National Government	0.2
<b>Total</b>	<b>100</b>

Table 2.2 shows the type of ownership by economic activity as defined under ISIC Rev 4. The ownership is determined by majority shareholding with three categorizations; government, private or foreign ownership. Mining and quarrying as well as manufacturing and construction are mainly private sector driven with over 90 per cent of them being privately owned. Electricity, gas, steam and air condition supply sector is also private sector driven at 53.2 per cent, with government ownership at 41.5 per cent. Similar ownership pattern was observed with establishments that are engaged in water supply, sewerage, waste management and remediation activities.

**Table 2.2: Type of Ownership structure by Economic Activity**

ISIC	Per cent			
	Government	Private	Foreign	Total
Mining and quarrying	0	92.5	7.5	100
Manufacturing	1.48	94.2	4.32	100
Electricity gas, steam and air conditioning supply	41.47	53.2	5.33	100
Water supply; sewerage, waste management and remediation activities	46.9	51.4	1.7	100
Construction	0.44	97.64	1.93	100

### 2.3 Challenges

The 2018 Census of Industrial Production (CIP) was conducted using CAPI and hence data was available real time. However, the data collection faced a number of challenges which resulted in difficulties in completing some of the questionnaire. The overall response rate was also affected by refusal by some of enterprises to respond to the questionnaire as well as failure by enumerators to trace some of the establishments, having either closed down or moved out. To address this challenge, ancillary data available from other data sources like the Monthly Survey of Industrial Production (MSIP) and other administrative sources were

used to augment the data collected through the census. These limitations however did not adversely affect the quality of the 2018 CIP data at the broad ISIC level.

## Chapter 3 - Employment and Hours Worked

### 3.1 Introduction

The industrial sector in Kenya contributes significantly to total employment. Indeed, one key aspiration under the Governments' big four agenda, is to increase the manufacturing sector's contribution to GDP to 15 per cent by 2022. In order to realize the short term as well as the long-term goals under vision 2030 and the United Nations SDGs, it is important to upscale Kenya's global competitiveness especially as pertains to industrial production. One way of doing this is to increase the county's ability to create and to utilize her human resource base equipped with the requisite skills to match technological changes and needs of the industries.

The 2009 Kenya Population and Housing Census (KPHC) revealed Kenya's work force to have reached 20.5 million people, representing 63.2 per cent of the total population aged 5 and above. Based on the 2009 KPHC, the labour force was expected to have reached 24.5 million in 2015 and projected to increase to 28.5 million by 2020. In order to absorb this workforce, the economy needs to create more employment and income opportunities to match the ever-increasing population. The industrial production is key in provision of these much-needed employment opportunities.

The 2018 CIP therefore sought to gather employment indicators which includes number of employees, terms of engagement, hours worked among others in the industrial sector. This chapter discusses various characteristics of establishments in terms of these key indicators.

### 3.2 Employee Terms of Engagement in the Industrial Sector

The survey collected information on broad categories of employee terms of engagement; permanent, contract, casuals, unpaid family workers, apprentices, attachés or interns. Permanent employment is the most preferred by employees due to job stability and other benefits which include social security. Those on contract are normally engaged for a specific duration after which the contract lapses unless it is renewed or extended.

Table 3.1 reveals that in 2017, a total of 616,138 workers were engaged in the formal sectors working in activities of mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply, water supply; sewerage, waste management and remediation activities and construction. Permanent employees were 53.3 per cent, while 26.3 per cent were casuals, 18.9 per cent were on contract basis while the rest (1.5%) were either apprentices or unpaid family workers. The manufacturing sector had the highest number of employees engaged at 353,968 while construction sector followed with 213,362 employees. Within the construction sector, civil engineering activities had most of the employees.

**Table 3.1: Distribution of Employees by Type and Industry**

Industry	Permanent Employees	Contract Employees	Casual Employees	Apprentice, interns etc	Unpaid family workers	Total
<b>B - Mining and quarrying</b>						
06 - Extraction of crude petroleum and natural gas	20	-	-	-	-	20
07 - Mining of metal ores	768	125	-	-	-	893
08 - Other mining and quarrying	8,610	417	1,805	83	73	10,988
09 - Mining support service activities	195	12	-	-	-	207
<b>Total</b>	<b>9,593</b>	<b>554</b>	<b>1,805</b>	<b>83</b>	<b>73</b>	<b>12,108</b>
<b>C - Manufacturing</b>						
10 - Manufacture of food products	79,554	20,043	40,935	945	692	142,169
11 - Manufacture of beverages	6,417	2,103	1,893	63	24	10,500
12 - Manufacture of tobacco products	1,466	-	-	-	-	1,466
13 - Manufacture of textiles	8,106	8,474	1,065	27	32	17,705
14 - Manufacture of wearing apparel	25,973	23,506	4,000	16	35	53,531
15 - Manufacture of leather and related products	2,404	919	3,655	29	9	7,016
16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	7,182	495	1,570	33	32	9,312
17 - Manufacture of paper and paper products	5,753	2,335	1,176	15	36	9,315
18 - Printing and reproduction of recorded media	5,891	1,312	731	91	41	8,064
19 - Manufacture of coke and refined petroleum products	155	49	13	-	-	217
20 - Manufacture of chemicals and chemical products	10,596	3,457	1,653	85	52	15,843
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	3,144	1,415	1,045	108	1	5,714
22 - Manufacture of rubber and plastics products	9,992	6,547	4,025	29	27	20,621
23 - Manufacture of other non-metallic mineral products	6,444	1,658	1,424	22	10	9,558
24 - Manufacture of basic metals	6,249	2,914	2,759	79	10	12,010
25 - Manufacture of fabricated metal products, except machinery and equipment	6,630	2,199	1,644	79	38	10,590
26 - Manufacture of computer, electronic and optical products	41	16	107	8	-	173
27 - Manufacture of electrical equipment	1,346	356	388	26	4	2,120
28 - Manufacture of machinery and equipment n.e.c.	960	473	260	32	13	1,738
29 - Manufacture of motor vehicles, trailers and semi-trailers	3,823	922	668	63	12	5,489
30 - Manufacture of other transport equipment	134	6	21	2	3	166
31 - Manufacture of furniture	2,800	874	1,119	84	37	4,914
32 - Other manufacturing	1,229	1,111	929	386	-	3,656
33 - Repair and installation of machinery and equipment	1,685	279	62	33	22	2,081
<b>Total</b>	<b>197,974</b>	<b>81,463</b>	<b>71,142</b>	<b>2,255</b>	<b>1,130</b>	<b>353,968</b>
<b>D - Electricity, gas, steam and air conditioning supply</b>						
35 - Electricity, gas, steam and air conditioning supply	15,141	2,706	5,120	-	-	22,968
<b>Total</b>	<b>15,141</b>	<b>2,706</b>	<b>5,120</b>	<b>-</b>	<b>-</b>	<b>22,968</b>
<b>E - Water supply; sewerage, waste management and remediation activities</b>						
36 - Water collection, treatment and supply	7,758	1,530	658	191	41	10,178
37 - Sewerage	16	-	-	-	-	16
38 - Waste collection, treatment and disposal activities; materials recovery	1,370	1,128	511	35	18	3,062
39 - Remediation activities and other waste management services	182	171	117	1	5	476
<b>Total</b>	<b>9,310</b>	<b>2,829</b>	<b>1,286</b>	<b>227</b>	<b>64</b>	<b>13,732</b>
<b>F - Construction</b>						
41 - Construction of buildings	22,851	11,872	38,626	2,463	669	76,480
42 - Civil engineering	62,261	12,265	38,514	688	640	114,368
43 - Specialized construction activities	11,560	4,780	5,422	595	157	22,514
<b>Total</b>	<b>96,672</b>	<b>28,917</b>	<b>82,562</b>	<b>3,746</b>	<b>1,466</b>	<b>213,362</b>
<b>Total</b>	<b>328,690</b>	<b>116,469</b>	<b>161,915</b>	<b>6,311</b>	<b>2,733</b>	<b>616,138</b>

### 3.3 Distribution of employees by sex, industry and Size of Establishment

Table 3.2 shows the distribution of employees by establishment size across all industries. Overall, large establishments (1000+) engaged the highest number of persons accounting

for 41.2 per cent in all the industries. This underscores the labour intensive nature of the large industries in the industrial and construction sectors. It is worth noting that the census concentrated on formal (large to medium) establishments/enterprises.

Distribution of employees by sex and industry is presented in Table 3.3. Overall, less than 20 per cent of the employees were female, which shows that the industrial and construction sectors are dominated by men. Water supply; sewerage, waste management and remediation activities engaged the highest proportion of females at 30.9 per cent followed by manufacturing at 22.6 per cent. On the other hand, Construction and, Mining and quarrying industry had the least proportion of women at 12.2 and 5.5 per cent, respectively.

**Table 3.2: Distribution of employees by Industry and Establishment size, 2017**

Industry	Less					Large	Total
	than 10	10-49	50-99	100-499	500-999	(1000+)	
<b>B = Mining and quarrying</b>							
05 - Mining of coal and lignite	-	-	-	-	-	-	-
06 - Extraction of crude petroleum and natural gas	9	11	-	-	-	-	20
07 - Mining of metal ores	12	71	-	125	685	-	893
08 - Other mining and quarrying	55	587	1,444	3,748	2,754	2,400	10,988
09 - Mining support service activities	15	22	170	-	-	-	207
<b>Total</b>	<b>91</b>	<b>691</b>	<b>1,614</b>	<b>3,873</b>	<b>3,439</b>	<b>2,400</b>	<b>12,108</b>
<b>C = Manufacturing</b>							
10 - Manufacture of food products	1,406	7,578	6,974	36,585	19,421	70,205	142,169
11 - Manufacture of beverages	64	785	517	5,662	1,896	1,576	10,500
12 - Manufacture of tobacco products	-	-	-	470	996	-	1,466
13 - Manufacture of textiles	94	427	491	2,862	3,619	10,212	17,705
14 - Manufacture of wearing apparel	52	712	900	2,581	743	48,543	53,531
15 - Manufacture of leather and related products	38	414	558	1,451	971	3,584	7,016
16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	51	1,051	835	1,137	-	6,238	9,312
17 - Manufacture of paper and paper products	22	657	1,288	5,073	2,275	-	9,315
18 - Printing and reproduction of recorded media	221	1,229	1,263	3,386	1,965	-	8,064
19 - Manufacture of coke and refined petroleum products	18	199	-	-	-	-	217
20 - Manufacture of chemicals and chemical products	228	1,966	2,019	4,117	4,090	3,423	15,843
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	21	468	795	2,166	2,264	-	5,714
22 - Manufacture of rubber and plastics products	112	1,868	1,887	10,604	3,752	2,398	20,621
23 - Manufacture of other non-metallic mineral products	50	810	729	4,859	1,826	1,284	9,558
24 - Manufacture of basic metals	23	418	388	6,809	3,364	1,008	12,010
25 - Manufacture of fabricated metal products, except machinery and equipment	106	1,674	1,389	5,096	1,257	1,068	10,590
26 - Manufacture of computer, electronic and optical products	5	21	-	147	-	-	173
27 - Manufacture of electrical equipment	65	300	550	1,205	-	-	2,120
28 - Manufacture of machinery and equipment n.e.c.	61	250	488	939	-	-	1,738
29 - Manufacture of motor vehicles, trailers and semi-trailers	40	418	834	3,690	507	-	5,489
30 - Manufacture of other transport equipment	17	37	-	112	-	-	166
31 - Manufacture of furniture	133	854	1,325	2,058	544	-	4,914
32 - Other manufacturing	50	288	144	1,812	1,362	-	3,656
33 - Repair and installation of machinery and equipment	59	882	554	586	-	-	2,081
<b>Total</b>	<b>2,936</b>	<b>23,306</b>	<b>23,928</b>	<b>103,407</b>	<b>50,852</b>	<b>149,539</b>	<b>353,968</b>
<b>D = Electricity, gas, steam and air conditioning supply</b>							
35 - Electricity, gas, steam and air conditioning supply	20	274	386	557	500	21,231	22,968
<b>Total</b>	<b>20</b>	<b>274</b>	<b>386</b>	<b>557</b>	<b>500</b>	<b>21,231</b>	<b>22,968</b>
<b>E = Water supply; sewerage, waste management and remediation activities</b>							
36 - Water collection, treatment and supply	158	1,271	1,340	4,247	-	3,162	10,178
37 - Sewerage	16	-	-	-	-	-	16
38 - Waste collection, treatment and disposal activities; materials recovery	61	270	217	1,259	1,255	-	3,062
39 - Remediation activities and other waste management services	17	50	409	-	-	-	476
<b>Total</b>	<b>252</b>	<b>1,591</b>	<b>1,966</b>	<b>5,506</b>	<b>1,255</b>	<b>3,162</b>	<b>13,732</b>
<b>F = Construction</b>							
41 - Construction of buildings	5,374	17,418	9,862	20,469	4,531	18,826	76,480
42 - Civil engineering	3,256	10,135	7,733	19,493	16,235	57,516	114,368
43 - Specialized construction activities	2,239	5,574	3,772	8,120	1,576	1,233	22,514
<b>Total</b>	<b>10,869</b>	<b>33,127</b>	<b>21,367</b>	<b>48,082</b>	<b>22,342</b>	<b>77,575</b>	<b>213,362</b>
<b>Total</b>	<b>14,168</b>	<b>58,989</b>	<b>49,261</b>	<b>161,425</b>	<b>78,388</b>	<b>253,907</b>	<b>616,138</b>

**Table 3.3: Distribution of employees by Industry and Sex, 2017**

<b>Industry</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>B - Mining and quarrying</b>			
05 - Mining of coal and lignite	-	-	-
06 - Extraction of crude petroleum and natural gas	15	5	20
07 - Mining of metal ores	886	7	893
08 - Other mining and quarrying	10,388	600	10,988
09 - Mining support service activities	155	52	207
<b>Total</b>	<b>11,444</b>	<b>664</b>	<b>12,108</b>
<b>C - Manufacturing</b>			
10 - Manufacture of food products	103,243	38,926	142,169
11 - Manufacture of beverages	8,014	2,486	10,500
12 - Manufacture of tobacco products	1,466	-	1,466
13 - Manufacture of textiles	12,020	5,685	17,705
14 - Manufacture of wearing apparel	49,100	4,431	53,531
15 - Manufacture of leather and related products	5,367	1,649	7,016
16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	8,261	1,051	9,312
17 - Manufacture of paper and paper products	7,411	1,904	9,315
18 - Printing and reproduction of recorded media	6,114	1,950	8,064
19 - Manufacture of coke and refined petroleum products	182	35	217
20 - Manufacture of chemicals and chemical products	6,215	9,628	15,843
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	3,712	2,002	5,714
22 - Manufacture of rubber and plastics products	17,466	3,155	20,621
23 - Manufacture of other non-metallic mineral products	7,873	1,685	9,558
24 - Manufacture of basic metals	11,008	1,002	12,010
25 - Manufacture of fabricated metal products, except machinery and equipment	9,718	872	10,590
26 - Manufacture of computer, electronic and optical products	119	54	173
27 - Manufacture of electrical equipment	1,900	220	2,120
28 - Manufacture of machinery and equipment n.e.c.	1,509	229	1,738
29 - Manufacture of motor vehicles, trailers and semi-trailers	4,908	581	5,489
30 - Manufacture of other transport equipment	156	10	166
31 - Manufacture of furniture	4,153	761	4,914
32 - Other manufacturing	2,173	1,483	3,656
33 - Repair and installation of machinery and equipment	1,772	309	2,081
<b>Total</b>	<b>273,860</b>	<b>80,108</b>	<b>353,968</b>
<b>D - Electricity, gas, steam and air conditioning supply</b>			
35 - Electricity, gas, steam and air conditioning supply	17,921	5,047	22,968
<b>Total</b>	<b>17,921</b>	<b>5,047</b>	<b>22,968</b>
<b>E - Water supply; sewerage, waste management and remediation activities</b>			
36 - Water collection, treatment and supply	7,065	3,113	10,178
37 - Sewerage	16	-	16
38 - Waste collection, treatment and disposal activities; materials recovery	2,103	959	3,062
39 - Remediation activities and other waste management services	307	169	476
<b>Total</b>	<b>9,491</b>	<b>4,241</b>	<b>13,732</b>
<b>F - Construction</b>			
41 - Construction of buildings	66,521	9,959	76,480
42 - Civil engineering	101,657	12,711	114,368
43 - Specialized construction activities	19,182	3,332	22,514
<b>Total</b>	<b>187,360</b>	<b>26,002</b>	<b>213,362</b>
<b>Total</b>	<b>500,076</b>	<b>116,062</b>	<b>616,138</b>

### 3.4 Hours Worked

Hours of work are used to determine labour costs, time related under-employment, levels of labour productivity, working patterns and working conditions. Therefore, information on hours worked can be useful in monitoring the working conditions which impact on the health and wellbeing of workers. Following the principal of diminishing marginal returns, working for abnormally long hours could result in declining labour productivity. On the other hand, working for abnormally few hours is one form of labour underutilization or underemployment. Depending on the hours worked, persons are either engaged as full-time or part-time.

As shown in Table 3.4, casual employees worked for 44 hours per week on average while unpaid family workers worked for 41 hours per week in 2017. In the manufacturing sector, permanent and casual employees worked for 45 hours per week on average. However, major variances were reported between these categories of workers across all other sectors. Casual workers worked for more hours per week compared to permanent workers in both Water Supply and Sewerage, and Electricity, gas, steam and air conditioning supply.

Tables 3.4: Working hours by industry, and type of workers, 2017

Industry	Permanent Employees	Contract Employees	Casual Employees	Apprentice, interns etc	Unpaid family workers
<b>B = Mining and quarrying</b>					
06 - Extraction of crude petroleum and natural gas	40				
07 - Mining of metal ores	30	30			30
08 - Other mining and quarrying	45	45	45	40	40
09 - Mining support service activities	43	43			
<b>Total</b>	<b>45</b>	<b>43</b>	<b>45</b>	<b>40</b>	<b>40</b>
<b>C = Manufacturing</b>					
10 - Manufacture of food products	45	45	45	43	8
11 - Manufacture of beverages	45	45	45	40	40
12 - Manufacture of tobacco products	45	45	45	45	
13 - Manufacture of textiles	45	45	44	44	41
14 - Manufacture of wearing apparel	45	45	45	40	45
15 - Manufacture of leather and related products	45	46	45	32	40
16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	44	45	45	45	45
17 - Manufacture of paper and paper products	45	45	45	45	44
18 - Printing and reproduction of recorded media	45	45	44	45	45
19 - Manufacture of coke and refined petroleum products	43	45	45		8
20 - Manufacture of chemicals and chemical products	45	45	45	45	45
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	45	45	44	43	36
22 - Manufacture of rubber and plastics products	45	46	45	45	45
23 - Manufacture of other non-metallic mineral products	45	45	45	47	44
24 - Manufacture of basic metals	45	45	45	42	30
25 - Manufacture of fabricated metal products, except machinery and equipment	45	45	45	45	45
26 - Manufacture of computer, electronic and optical products	48	30	48	48	
27 - Manufacture of electrical equipment	45	45	47	45	45
28 - Manufacture of machinery and equipment n.e.c.	45	45	45	40	40
29 - Manufacture of motor vehicles, trailers and semi-trailers	45	44	45	44	45
30 - Manufacture of other transport equipment	44	45	44	44	47
31 - Manufacture of furniture	45	44	45	44	45
32 - Other manufacturing	45	45	45		44
33 - Repair and installation of machinery and equipment	45	45	45	40	45
<b>Total</b>	<b>45</b>	<b>45</b>	<b>45</b>	<b>44</b>	<b>42</b>
<b>D = Electricity, gas, steam and air conditioning supply</b>					
35 - Electricity, gas, steam and air conditioning supply	40	40	43	-	-
<b>Total</b>	<b>40</b>	<b>40</b>	<b>43</b>	<b>-</b>	<b>-</b>
<b>E = water supply, sewerage, waste management and remediation activities</b>					
36 - Water collection, treatment and supply	40	40	40	40	40
37 - Sewerage	40				
38 - Waste collection, treatment and disposal activities; materials recovery	40	40	40	40	45
39 - Remediation activities and other waste management services	45	46	51		20
<b>Total</b>	<b>40</b>	<b>40</b>	<b>42</b>	<b>40</b>	<b>40</b>
<b>F = Construction</b>					
41 - Construction of buildings	45	45	45	44	40
42 - Civil engineering	45	45	45	41	43
43 - Specialized construction activities	45	45	45	44	40
<b>Total</b>	<b>45</b>	<b>45</b>	<b>45</b>	<b>44</b>	<b>40</b>
<b>Total</b>	<b>43</b>	<b>43</b>	<b>44</b>	<b>42</b>	<b>41</b>

## Chapter 4 ~ Industrial Production and Construction Work Done

### 4.1 Introduction

Industrial production and construction work done are very important indicators of the performance of an enterprise / establishment engaged in manufacturing; mining and quarrying; electricity, gas, steam and air conditioning supply; and water supply, sewerage, waste management and remediation activities and construction. These indicators are useful in monitoring changes in the structure of the sectors as well as in the revision and rebasing of National Accounts aggregates. In addition, the data are used in development of macroeconomic Output Tables, developing weights for Producer Price Indices (PPI), Index of Industrial Production (IIP) and Construction Indices.

### 4.2 Value of Industrial Production

The changes in the structure of industries occur through increased or decreased activities mainly due to new establishments which have opened, closure of others, and an expansion /contraction in the production lines. These changes necessitate the updating of the industrial sectors frame. The frame was last updated using the 2009 CIP production data, and has been revised using the CIP 2018 production data.

As shown in Figure 4.1, the share of manufacturing to total value of industrial output declined from 90.1 per cent in 2009 to 86.7 per cent in 2017, indicating a slight change in the structure of the of industrial production. This may partly be attributed to key manufacturing establishments closing down during this period such as the Kenya Petroleum Refineries Limited. Water supply and sewerage sector recorded the largest increase in share by 1.3 percentage points to 1.7 per cent in 2017.

Figure 4.1: Percentage share of industrial Production, 2009 and 2017

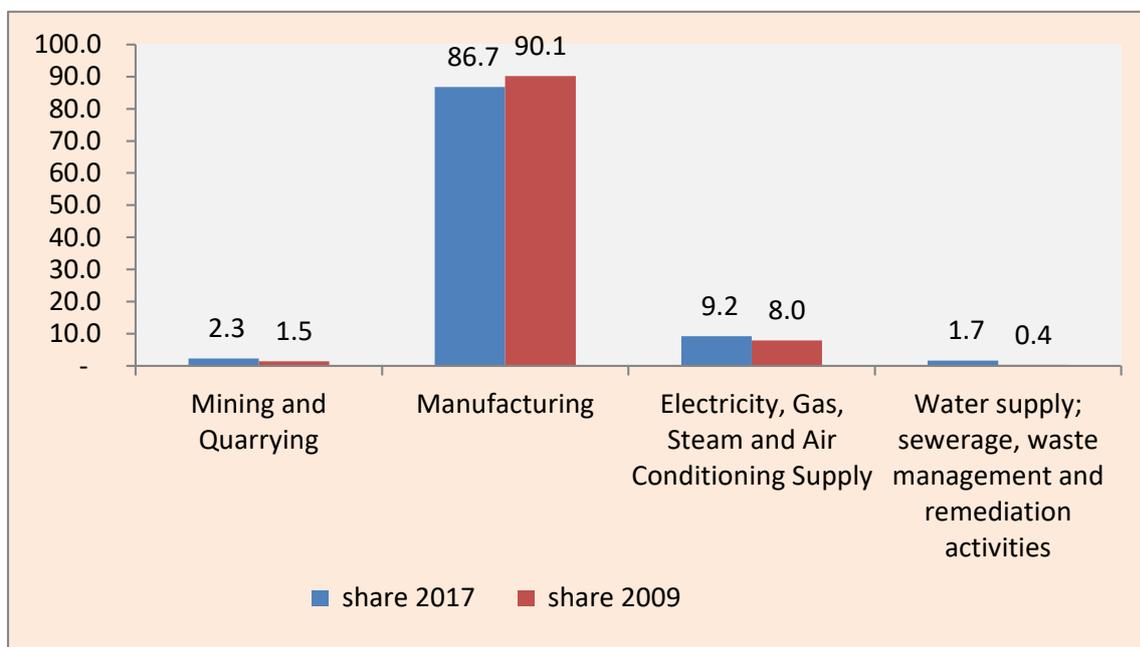


Table 4.1 shows a comparison of the nominal production value of all industrial sectors based on the CIP data collected for 2009 and 2017 reference years. The value of output at market prices for all industrial sectors increased by 42.8 per cent from KSh 998.5 billion in 2009 to KSh 1,426.2 billion in 2017. Manufacturing sector had the largest value of output at KSh 1,236.8 billion in 2017, representing a share of 86.7 per cent of the total industrial

production. This was followed by Electricity, gas, steam and air conditioning supply sector with a value of KSh 131.6 billion.

**Table 4.1: Production Value by Industry, 2009 and 2017**

Activity	2017		2009	
	Value (KSh Mn)	Percentage share	Value (KSh Mn)	Percentage share
Mining and Quarrying	33,201	2.3	14,747	1.5
Manufacturing	1,236,765	86.7	900,127	90.1
Electricity, Gas, Steam and Air Conditioning Supply	131,622	9.2	79,427	8.0
Water supply; sewerage, waste management and remediation activities	24,591	1.7	4,241	0.4
<b>Total</b>	<b>1,426,179</b>		<b>998,543</b>	

#### 4.2.1 Mining and Quarrying

Mining and Quarrying includes the extraction of minerals occurring naturally as solids, liquids, or gases. It also includes supplementary activities aimed at preparing the crude materials for market.

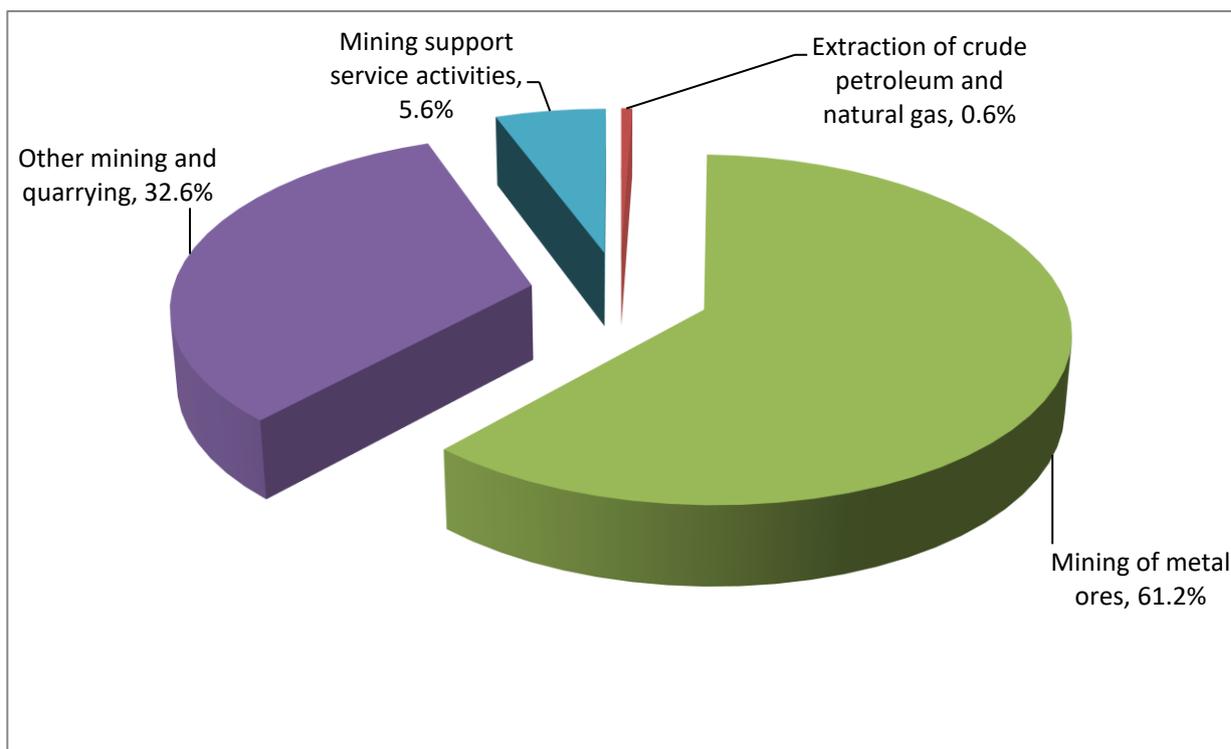
Table 4.2 shows the distribution of production value under the mining and quarrying activities based on ISIC Rev. 4 divisions. The total value of production by the mining and quarrying sector recorded was KSh 33.2 billion. Mining of metal ores recorded the highest production value at KSh 20.3 billion followed by the other mining and quarrying activities, which entails mining of chemical and fertilizer minerals.

**Table 4.2: Production in the Mining and Quarrying**

Economic Activity	Production Value (KSh Mn)
Extraction of crude petroleum and natural gas	187.79
Mining of metal ores	20,317.01
Other mining and quarrying	10,823.22
Mining support service activities	1,872.98
<b>Total</b>	<b>33,201.00</b>

Production with regard to mining and quarrying has been classified into five categories according to the ISIC Division under mining and quarrying activity. Mining of metal ores, which includes mining of metallic ores and non-ferrous metal ores, recorded the largest production value accounting for 61.2 per cent of the total production value in mining and quarrying sector. Other mining and quarrying activities, which includes quarrying of stone, sand and clay recorded 32.6 per cent share of the production value in the sector. Industries under the mining support activities contributed 5.6 per cent of the production value in the sector.

**Figure 4.2: Production Value (% of the total)**



#### **4.2.2 Manufacturing**

Data on manufacturing sector production values and shares by sub-sectors for 2017 is as shown in Table 4.3. Results indicate that manufacture of food products sub-sector had the highest production value at KSh 513.1 billion representing 41.5 per cent of the total manufacturing output value in 2017. Over the years, agro-processing has been contributing highly to manufacturing output mainly due to availability of domestic raw materials.

Manufacture of basic metals and, chemical and chemical products had substantial shares of 7.8 per cent and 7.1 per cent, respectively. Processing of other non-metallic mineral products, which mainly includes production of cement, had a share of 6.6 per cent. Manufacture of coke and refined petroleum products was a key activity in 2009 but had a small share in 2017 as a result of the closure of Kenya Petroleum Refineries Limited (KPRL). Manufacture of computer, electronic and optical products had the smallest share to the overall sector's production value.

**Table 4.3: Manufacturing Sector Value of Production**

<b>Division</b>	<b>Production Value (KSh Mn)</b>	<b>Percentage Share</b>
10 - Manufacture of food products	513,136.3	41.5
24 - Manufacture of basic metals	96,192.3	7.8
20 - Manufacture of chemicals and chemical products	88,199.6	7.1
23 - Manufacture of other non-metallic mineral products	81,260.3	6.6
11 - Manufacture of beverages	77,245.9	6.2
22 - Manufacture of rubber and plastics products	60,632.8	4.9
17 - Manufacture of paper and paper products	51,427.9	4.2
18 - Printing and reproduction of recorded media	36,290.0	2.9
14 - Manufacture of wearing apparel	33,963.3	2.7
25 - Manufacture of fabricated metal products, except machinery and equipment	27,730.2	2.2
29 - Manufacture of motor vehicles, trailers and semi-trailers	26,445.4	2.1
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	20,968.9	1.7
13 - Manufacture of textiles	18,487.7	1.5
27 - Manufacture of electrical equipment	17,940.3	1.5
15 - Manufacture of leather and related products	15,157.4	1.2
16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	14,044.1	1.1
12 - Manufacture of tobacco products	13,931.9	1.1
31 - Manufacture of furniture	11,865.9	1.0
33 - Repair and installation of machinery and equipment	10,168.2	0.8
32 - Other manufacturing	8,567.2	0.7
28 - Manufacture of machinery and equipment n.e.c.	6,078.8	0.5
30 - Manufacture of other transport equipment	4,738.4	0.4
19 - Manufacture of coke and refined petroleum products	1,485.7	0.1
26 - Manufacture of computer, electronic and optical products	806.3	0.1
<b>Total</b>	<b>1,236,764.8</b>	

#### 4.2.3 Production Values for the Food sub-sector

Table 4.4 shows production data for the food sub-sector at the four-digit ISIC class. The manufacture of other food products not elsewhere classified (n.e.c) which mainly includes processing of tea, coffee and salt contributed 25.8 per cent of the total food processing sub-sector. The processing of grain mill products which mainly constitutes of milling of rice, maize and wheat flour contributed 25.2 per cent of the total food production. Manufacture of vegetable and animal oils and fats followed with a share of 10.8 per cent. On the other hand, manufacture of starches and starch products had the smallest share of the food sub-sector at 0.3 per cent

**Table 4.4: Production Values for Food sub-sector by Activity**

Activity	Production Value (Ksh Mn)	Percentage Share
1079 = Manufacture of other food products n.e.c.	132,790.9	25.8
1061 = Manufacture of grain mill products	129,608.9	25.2
1040 = Manufacture of vegetable and animal oils and fats	55,618.9	10.8
1050 = Manufacture of dairy products	43,820.5	8.5
1072 = Manufacture of sugar	37,897.3	7.4
1071 = Manufacture of bakery products	36,377.1	7.1
1080 = Manufacture of prepared animal feeds	22,769.5	4.4
1030 = Processing and preserving of fruit and vegetables	19,213.6	3.7
1073 = Manufacture of cocoa, chocolate and sugar confectionery	15,405.7	3.0
1010 = Processing and preserving of meat	12,909.4	2.5
1020 = Processing and preserving of fish, crustaceans and molluscs	3,398.9	0.7
1075 = Manufacture of prepared meals and dishes	2,655.6	0.5
1062 = Manufacture of starches and starch products	1,539.4	0.3
	<b>514,005.7</b>	<b>100.0</b>

#### 4.2.4 Electricity, gas, steam and air conditioning supply

This sector provides data for activities related to provision of electric power, natural gas, steam, hot water and the like through a permanent infrastructure of lines, mains and pipes. In 2017, electricity, gas, steam and air conditioning supply, sector had a production value of KSh 131.6 billion in 2017. This sector's output was mainly from electricity generation, transmission and distribution as shown in Table 4.5. The transmission of gas through main pipes to establishments is not a common activity in the country. This section excludes the operation of water and sewerage utilities and long distance transport through pipelines.

**Table 4.5: Electricity, gas, steam and air conditioning supply**

Division	Production Value (KSh Mn)	Percentage Share
Electricity, gas, steam and air conditioning supply	131,622	100.0
<b>Total</b>	<b>131,622</b>	<b>100.0</b>

#### 4.2.5 Water supply; sewerage, waste management and remediation activities

Table 4.6 shows the production values for activities relating to water supply; sewerage, waste management and remediation activities. Total production value for this sector was KSh 24.6 billion in 2017. The water collection, treatment and supply sub-sector contributed 99.6 per cent of the total production value of the sector. It is important to note that most of the establishments whose primary activity is water collection, treatment and supply also engage in sewerage as a secondary activity.

**Table 4.6: Water supply; sewerage, waste management and remediation activities**

Division	Production Value (KSh Mn)	Percentage Share
Water collection, treatment and supply	24,486	99.6
Sewerage	3	0.0
Waste collection, treatment and disposal activities; materials recovery	92	0.4
Remediation activities and other waste management services	9	0.0
<b>Total</b>	<b>24,591</b>	<b>100.0</b>

### 4.3 Construction Sector's Value of Work Done

The value of construction work done by type of project is shown in Table 4.7. The value of the total construction work done in 2017 was KSh 652.6 billion. Civil engineering works recorded the highest value of construction work done at KSh 329.6 billion. The value for work done in the residential buildings was KSh 170.6 billion while non-residential buildings was KSh 84.6 billion.

**Table 4.7: Value of Construction Work Done by Type of Project**

Type of Project	Value of Work done (KSh Million)	% of Value of Work Done
Civil works	329,559.6	50.5
Residential Buildings	170,604.9	26.1
Non-Residential Buildings	84,595.5	13.0
Specialised Construction Works	67,837.6	10.4
<b>Total</b>	<b>652,597.6</b>	<b>100</b>

Table 4.8 shows the value of construction work in 2017 and the corresponding proportions by construction activities using ISIC Rev 4. The construction of roads and railways contributed the highest value with 40.3 per cent of total value of work done. This was followed by construction of buildings and electrical installation with proportions of 39.5 and 6.2 per cent, respectively.

**Table 4.8: Value of Construction Work Done by Activity**

Construction Activity	Value in (KSh Million)	% of Total Value
Construction of roads and railways	263,234.8	40.34
Construction of buildings	257,838.0	39.51
Electrical installation	40,309.8	6.18
Construction of other civil engineering projects	36,722.5	5.63
Construction of utility projects	20,055.2	3.07
Building completion and finishing	15,241.4	2.34
Other specialized construction activities	10,108.8	1.55
Plumbing, heat and air-conditioning installation	6,860.3	1.05
Site preparation	1,355.1	0.21
Other construction installation	835.5	0.13
Demolition	36.2	0.01
<b>Total</b>	<b>652,597.6</b>	<b>100</b>

The value of construction work done continued to be dominated by the public sector, which recorded KSh 437.9 billion and accounted for 67.1 per cent of the total value of works done in 2017. This is attributable to the higher construction value of works on civil engineering projects; which includes works on roads and rails. The private sector construction work done was KSh 212.3 billion in 2017 as shown in Table 4.9.

**Table 4.9: Value of Construction by Project Owner**

Type of Client	Value of Works (KSh Mn)	% of total
Public Sector	437,867.0	67.10
Private Sector	212,301.2	32.53
Foreign	2,429.4	0.37
<b>Total</b>	<b>652,597.60</b>	<b>100</b>

#### **4.4 Capacity Utilization**

Capacity utilization is a statistical ratio of the actual output against the maximum expected output for a specific period. In CIP 2018, establishments were asked to gauge their level of capacity utilization which was checked against the actual and maximum production as reported for year 2017.

The average level of capacity utilization for all industrial and construction establishments was 63.6 per cent. Activities relating to mining of metal ores and, extraction of crude petroleum and natural gas reported highest levels of utilization at 72.5 and 75.0 per cent, respectively. However, manufacture of transport equipment and, electricity, gas, steam and air conditioning supply recorded low levels of utilization at 36.3 and 37.5 percent, respectively in 2017.

**Table 4.10: Average Capacity Utilization by Activity**

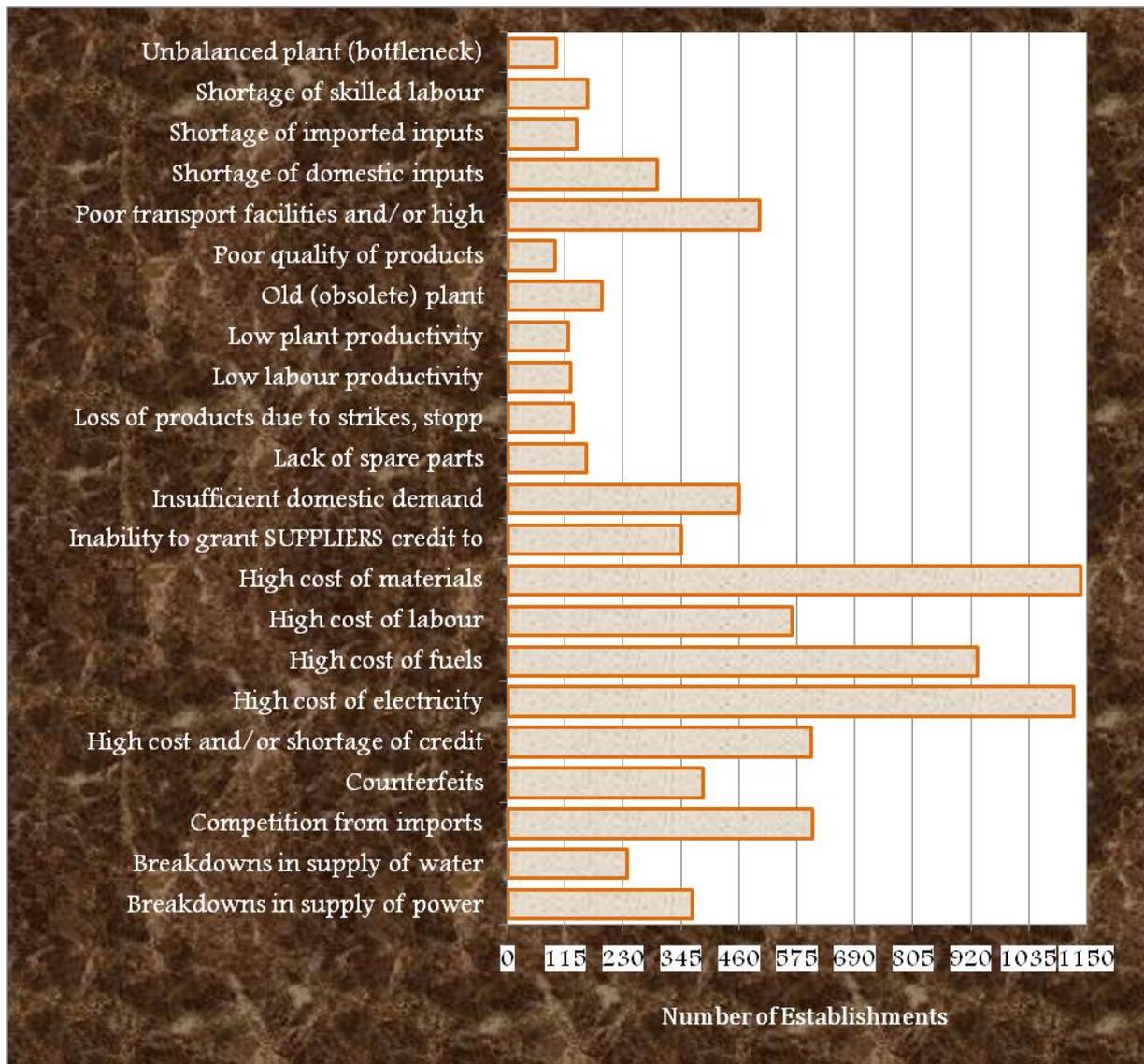
<b>Activity</b>	<b>Utilization percent</b>
Extraction of crude petroleum and natural gas	75.0
Mining of metal ores	72.5
Other mining and quarrying	68.9
Manufacture of food products	68.0
Manufacture of beverages	56.0
Manufacture of textiles	60.9
Manufacture of wearing apparel	67.4
Manufacture of leather and related products	72.2
Manufacture of wood and of products of wood and cork, except furniture manufacture of articles of straw and plaiting mat	63.2
Manufacture of paper and paper products	67.4
Printing and reproduction of recorded media	61.7
Manufacture of coke and refined petroleum products	61.0
Manufacture of chemicals and chemical products	64.3
Manufacture of basic pharmaceutical products and pharmaceutical preparations	62.0
Manufacture of rubber and plastics products	63.4
Manufacture of other non-metallic mineral products	64.0
Manufacture of basic metals	66.4
Manufacture of fabricated metal products, except machinery and equipment	60.0
Manufacture of computer, electronic and optical products	70.0
Manufacture of electrical equipment	68.2
Manufacture of machinery and equipment nec	54.8
Manufacture of motor vehicles, trailers and semi-trailers	53.1
Manufacture of other transport equipment	36.3
Manufacture of furniture	58.2
Other manufacturing	54.6
Repair and installation of machinery and equipment	64.2
Electricity, gas, steam and air conditioning supply	37.5
Water collection, treatment and supply	68.3
Waste collection, treatment and disposal activities materials recovery	70.2
Remediation activities and other waste management services	68.0
Construction of buildings	58.5
Civil engineering	59.9
Specialized construction activities	65.7
<b>Total</b>	<b>63.6</b>

The key reasons for capacity under-utilization include high cost of materials, high oil prices, and high cost of electricity, fuels, labour, counterfeits, poor transport facilities, competition from imports and shortage of skilled labour among others.

**Table 4.11: Reasons for Capacity Underutilization**

Reasons for underutilization by economic activity	High	Moderate	Low	N/A	Total
Breakdowns in supply of power	15.4	24	36.5	24.1	100
Breakdowns in supply of water	9.9	15.5	39.3	35.3	100
Competition from imports	25.3	15	17.5	42.1	100
Counterfeits	16.2	13.3	22.4	48.1	100
High cost and/or shortage of credit	25.3	20.8	27.2	26.8	100
High cost of electricity	47.1	25.1	14.5	13.3	100
High cost of fuels	39.1	28.1	16.2	16.7	100
High cost of labor	23.7	38.4	25.4	12.6	100
High cost of materials	47.7	27.6	12.1	12.5	100
Inability to grant SUPPLIERS credit to	14.4	18.7	32	34.9	100
Insufficient domestic demand	19.3	23.1	30	27.6	100
Lack of spare parts	6.5	17	36.2	40.3	100
Loss of products due to strikes, stoppages, etcetera	5.4	8.1	34.7	51.8	100
Low labor productivity	5.2	19	42.5	33.3	100
Low plant productivity	5.1	16.3	37.1	41.5	100
Old (obsolete) plant	7.8	14.8	30.7	46.7	100
Poor quality of products	3.9	11.7	36	48.3	100
Poor transport facilities and/or high	20.9	23.8	29.4	25.9	100
Shortage of domestic inputs	12.4	21.4	33.5	32.6	100
Shortage of imported inputs	5.7	13.7	28.5	52.1	100
Shortage of skilled labor	6.6	18.8	41.5	33.1	100
Unbalanced plant (bottleneck)	4	13.7	31.1	51.2	100
Any other reason	71.5	8.61	2.21	17.7	100

Figure 4.3: Establishments in relation to reasons given for low capacity utilization



## Chapter 5 - Inputs in Industrial Production and Construction Activities

### 5.1 Introduction

Total production cost includes the costs of all resources put into production (direct materials, direct labour and overhead applied). This chapter reviews one of the components of production, that is the expenditure or costs incurred in the purchase of materials and supplies which were used in the production process and excludes those materials purchased for resale without further processing. Materials and supplies consist of goods and/or services that may either be transformed or used up in the production processes. They are critical primary factors which form part of the final product or become significantly transformed during the production process.

The materials and supplies in this section cover the economic activities of Mining and Quarrying, Manufacturing, Water Supply, Sewerage, Waste management and remediation activities, and Electricity, Gas, Steam, air conditioning supply. It analyses expenditure on materials and supplies at economic activity level to ascertain what went into the purchase of industrial establishments' raw materials. In addition, inputs to the construction sector are highlighted.

### 5.2 Expenditure on raw materials

Annual expenditure on materials and supplies by economic activity at broad categories is highlighted in Table 5.1. Overall, expenditure on materials and supplies for industrial establishments in 2017 increased by 39.7 per cent from KSh 570.1 billion in 2009 to KSh 796.5 billion. Manufacturing activities recorded the highest share in the purchase of materials and supplies at 91.3 per cent followed by electricity, gas, steam, air conditioning at 7.2 per cent. Mining and quarrying activities, and water supply, sewerage, waste management and remediation activities recorded expenditure shares of below 1.0 per cent each.

In the last 9 years, there has been increased investment in the electricity, gas, steam and air conditioning sector, as reflected in the amount spent in the purchase of the sector's materials and supplies. During the period, the sector's expenditure on materials and supplies more than doubled from KSh 18.7 billion in 2009 to KSh 57.5 billion in 2017. The government had initiated the Rural Electrification Programme which has witnessed increased activity that is geared towards accelerating rural electrification.

**Table 5.1: Expenditure on Materials and Supplies by Economic Activity**

Economic Activity	KSh Million		
	2009	2017	Change %
Mining and Quarrying	1,804.3	4,404.6	144.1
Manufacturing	548,177.0	727,351.9	32.7
Electricity, Gas, Steam, air conditioning	18,735.4	57,463.5	206.7
Water Supply, Sewerage, Waste management and remediation activities	1,424.7	7,315.4	413.5
<b>Total</b>	<b>570,141.4</b>	<b>796,535.4</b>	<b>39.7</b>

#### 5.2.1 Manufacturing Sector

The country's development blueprint, Kenya Vision 2030 identified manufacturing sector as a key driver of economic growth and development. The second Medium Term Plan 2013-2017 in the implementation of the Vision aimed at achieving a robust, diversified

and competitive manufacturing sector in Kenya while the third Medium Term Plan 2018-2022 plans to expand the manufacturing sector by increasing its contribution to GDP from 9.2 per cent in 2017 to 15 per cent and increasing agro-processing to at least 50 per cent of total agricultural production. Indicators that monitor progress towards the realization of these development goals include not only production, but also expenditure on inputs. Expenditure on materials in the manufacturing sector has increased significantly from the last CIP of 2010. The bulk of expenditure on materials and supplies in the industrial establishments was incurred in the manufacturing sector at KSh 727.4 billion. This was an increase of 32.7 per cent from KSh 548.2 billion reported in 2009, mainly driven by the manufacture of food products sub-sector.

Table 5.2 presents annual expenditure on materials and supplies at 2-digit ISIC level. Comparison across manufacturing activities indicated that the bulk of expenditure on materials and supplies was mainly on the manufacture of food products at KSh 351.1 billion followed by the manufacture of basic metals, manufacture of beverages, and the manufacture of chemical and chemical products at KSh 52.8, 44.4, and 38.2 billion, respectively. Expenditure on materials and supplies in the manufacture of food products increased by 73.1 per cent from KSh 202.9 billion in 2010 to KSh 351.1 billion in 2017. The other notable increases in the purchase of materials were recorded in the manufacture of other non-metallic mineral products, wearing apparel, manufacture of motor vehicles, trailers and semi-trailers, manufacture of electrical equipment, manufacture of basic metals and the manufacture of tobacco products. The activities of water collection, treatment and supply also recorded significant increases from KSh 1.1 billion in 2009 to KSh 7.0 billion in 2017.

### **5.2.2 Textile industry**

The share of annual expenditures on materials and supplies by the Manufacture of textiles and wearing apparel was 3.4 per cent of the total cost of materials and supplies to the industrial establishments. The two sub-sectors recorded a marginal increase in materials purchased from KSh 25.0 billion in 2009 to KSh 27.5 billion in 2017. There has been an inadequate supply of locally produced raw materials for the textile industry in the country. Wool industry is relatively small and most of the synthetic materials are imported.

**Table 5.2: Annual Expenditure on Materials and Supplies by Activity**

Activity	KSh Million		
	2009	2017	Percentage Share 2017
Extraction of crude petroleum and natural gas	0.0	146.4	0.0
Mining of metal ores	186.3	1,828.9	0.2
Other mining and quarrying	1,612.4	2,223.3	0.3
Mining support service activities	5.6	206.1	0.0
Manufacture of food products	202,869.1	351,090.0	44.1
Manufacture of beverages	26,586.6	44,375.5	5.6
Manufacture of tobacco products	7,472.4	15,268.7	1.9
Manufacture of textiles	17,792.1	11,456.1	1.4
Manufacture of wearing apparel	7,165.6	16,045.8	2.0
Manufacture of leather and related products	6,136.9	6,199.6	0.8
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	13,499.9	6,807.5	0.9
Manufacture of paper and paper products	14,412.2	29,443.9	3.7
Printing and reproduction of recorded media	22,300.0	13,225.9	1.7
Manufacture of coke and refined petroleum products	55,626.9	1,091.2	0.1
Manufacture of chemicals and chemical products	29,997.7	38,160.8	4.8
Manufacture of basic pharmaceutical products and pharmaceutical preparations	4,841.3	7,765.8	1.0
Manufacture of rubber and plastics products	31,156.1	32,170.9	4.0
Manufacture of other non-metallic mineral products	19,895.1	37,931.0	4.8
Manufacture of basic metals	24,473.0	52,789.7	6.6
Manufacture of fabricated metal products, except machinery and equipment	23,746.0	14,447.0	1.8
Manufacture of computer, electronic and optical products	648.4	352.0	0.0
Manufacture of electrical equipment	5,452.1	11,954.4	1.5
Manufacture of machinery and equipment n.e.c.	8,947.1	2,709.5	0.3
Manufacture of motor vehicles, trailers and semi-trailers	6,014.1	16,701.9	2.1
Manufacture of other transport equipment	586.6	2,181.9	0.3
Manufacture of furniture	10,840.0	7,503.3	0.9
Other manufacturing	4,886.6	3,731.5	0.5
Repair and installation of machinery and equipment	2,831.2	3,948.0	0.5
Electricity, gas, steam and air conditioning supply	18,735.4	57,463.5	7.2
Water collection, treatment and supply	1,146.3	7,007.6	0.9
Sewerage	1.1	0.6	0.0
Waste collection, treatment and disposal activities; materials recovery	277.3	154.4	0.0
Remediation activities and other waste management services	0.0	152.7	0.0
<b>Grand Total</b>	<b>570,141.4</b>	<b>796,535.4</b>	<b>100.0</b>

### 5.2.3 Food Processing

Table 5.3 highlights the expenditures on materials and supplies on the manufacture of food products. The bulk of expenditures on materials and supplies in the manufacturing sector were mainly due to expenditures to the manufacture of food products sub-sector. The sub-sector recorded a cost of KSh 351.1 billion in the purchase of materials and supplies, representing 48.3 per cent of the total cost incurred in the manufacturing sector. Under the manufacture of food products, the categories that recorded the highest expenditure in the

purchase of materials and supplies were the manufacture of grain mill products and the manufacture of other food products n.e.c. at KSh 100.4 billion and KSh 90.5 billion, respectively. The food processing is a relatively large sub-sector based on the output and is also likely to consume more inputs. Grain milling in Kenya has been robust and the raw materials are readily available and can be sourced locally. Manufacture of other food products n.e.c mainly comprise of processing of tea and coffee.

**Table 5.3: Expenditure on Materials and Supplies on the Manufacture of Food Products**

<b>Economic Activity</b>	<b>Total Cost (Mn KSh)</b>	<b>Percent Contribution</b>
Processing and preserving of meat	4,279.12	1.2
Processing and preserving of fish, crustaceans and molluscs	1,904.69	0.5
Processing and preserving of fruit and vegetables	7,272.58	2.1
Manufacture of vegetable and animal oils and fats	35,880.18	10.2
Manufacture of dairy products	28,047.18	8.0
Manufacture of grain mill products	100,432.50	28.6
Manufacture of starches and starch products	402.86	0.1
Manufacture of bakery products	24,798.64	7.1
Manufacture of sugar	21,888.09	6.2
Manufacture of cocoa, chocolate and sugar confectionery	10,579.46	3.0
Manufacture of prepared meals and dishes	4,345.18	1.2
Manufacture of other food products n.e.c.	90,525.41	25.8
Manufacture of prepared animal feeds	20,734.13	5.9
<b>Total</b>	<b>351,090.01</b>	<b>100.0</b>

### 5.3 Construction Inputs

Construction industry's activity requires several inputs into the process. These include materials, equipment, labour and transport costs. The results of the census show that most of the expenses incurred were on materials at an average of 48.5 per cent followed by labour costs at 19.8 per cent.

In the construction of buildings, 51.9 per cent is spent on materials while 20.3 per cent went to labour. Expenses on equipment and transport costs in buildings was 14.0 per cent and 9.1 per cent, respectively. In the completion of buildings and finishing components, 58.8 per cent of the costs went to materials while only 7.2 per cent went to transport costs.

**Table 5.4: Proportions of Construction Inputs in 2017**

<b>Type of Activity</b>	<b>Materials and Products</b>	<b>Equipment</b>	<b>Labour</b>	<b>Transport Cost</b>	<b>Other inputs</b>	<b>Total</b>
Construction of Buildings	51.9	14.0	20.3	9.1	4.7	100
Construction of roads and railways	43.8	23.7	15.9	12.0	4.7	100
Construction of utility projects	43.5	18.3	19.0	11.0	8.2	100
Construction of other civil engineering projects	45.9	16.9	18.2	9.2	9.8	100
Electrical installation activities	50.1	13.8	22.9	9.9	3.3	100
Building completion/components and finishing	58.8	13.2	18.4	7.2	2.4	100
Other specialized construction activities	45.6	8.9	23.9	7.7	13.9	100
<b>Average</b>	<b>48.5</b>	<b>15.5</b>	<b>19.8</b>	<b>9.4</b>	<b>6.7</b>	<b>100</b>

### 5.3.1 Construction Materials by Economic Activity

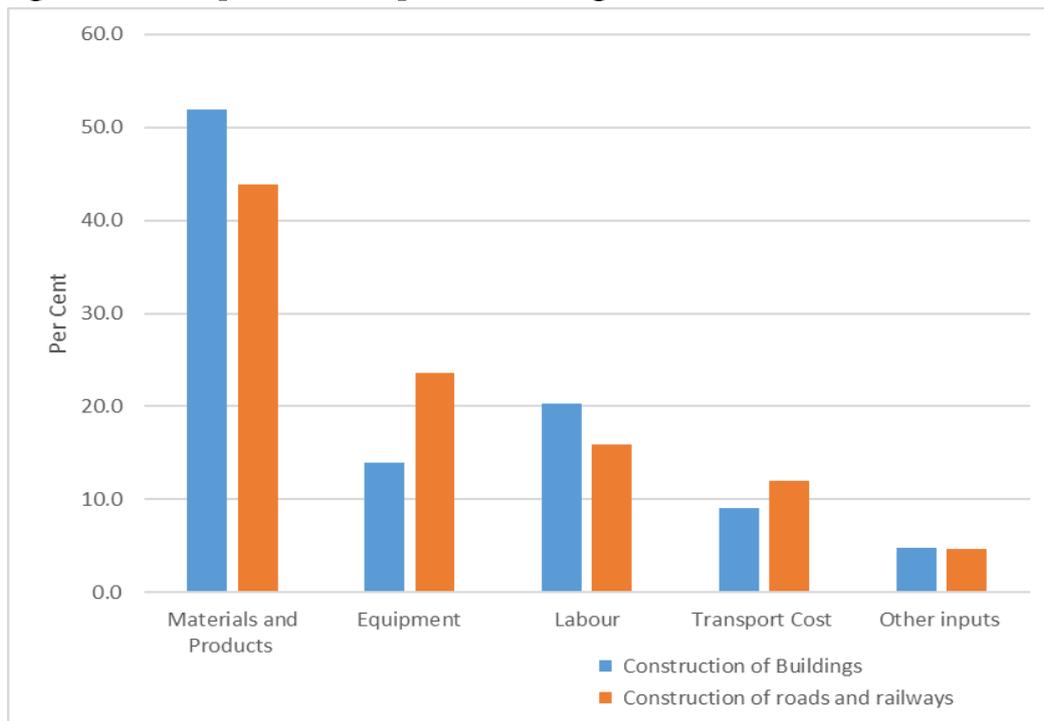
The total amount of construction materials used in 2017 was KSh 312.2 billion with 39.1 per cent having been used in the construction of buildings. Materials used in construction of roads and railways accounted for 42.4 per cent with electrical installation activities contributing 2.4 per cent. Overall, materials for civil works accounted for 56.4 per cent while materials for construction of buildings accounted for 43.6 per cent.

**Table 5.5. Value of Construction Materials by Economic Activity**

<b>Activity</b>	<b>Amount (KSh Million)</b>	<b>Percentage</b>
Construction of roads and railways	132,361	42
Construction of Buildings	122,046	39
Construction of utility projects	16,858	5
Plumbing, heat and air conditioning installation	13,132	4
Building completion/components and finishing	12,036	4
Construction of other civil engineering projects	8,342	3
Electrical installation activities	7,385	2
<b>Total</b>	<b>312,160</b>	<b>100</b>

Figure 5.1 shows comparisons of inputs in building and roads. The expenses on materials and products in construction of buildings were more than those on roads and railways. However, the expenses on equipment in roads were more than those in construction of buildings. The labour costs were more in construction of buildings than in construction of roads.

**Figure 5.1. Comparisons of inputs in Buildings and Roads**



### 5.3.2 Cost of selected raw materials in the construction industry

Table 5.6 shows the cost of selected raw materials in the construction industry in 2017. The amount spent on cement in the construction industry was KSh 40.2 billion followed by reinforced bars at 22.2 billion and bitumen at KSh 20.0 billion accounting for 12.9, 7.1 and 6.4 per cent, respectively.

**Table 5.6: Value of Selected Raw Materials in Construction Industry, 2017**

<b>Raw material</b>	<b>Cost (KSh Million)</b>	<b>Percentage share</b>
Cement	40,250.3	12.9
reinforced bars	22,192.1	7.1
Bitumen	20,037.8	6.4
Dense Bitumen Macadam	19,530.4	6.3
sand	16,916.3	5.4
Ballast	16,910.9	5.4
Stone dust	14,686.6	4.7
Hardcore	14,527.5	4.7
Murram	11,791.8	3.8
Hire of machinery	11,229.9	3.6
Machine-Cut Stones	10,466.9	3.4
Diesel	10,373.7	3.3
Electricity Cables	8,197.9	2.6
Tiles	6,346.9	2.0
Paints	6,172.5	2.0
Gravel	4,489.8	1.4
Quarry Waste	3,746.1	1.2
PVC & Plastic Pipes	3,385.9	1.1
Sawn Timber	3,199.4	1.0
Roofing sheets	3,144.1	1.0
Ceiling boards & Gypsum	3,105.4	1.0
Water pipes & Fittings	3,068.0	1.0
Generator	2,562.5	0.8
Glass	2,538.4	0.8
K1-60	2,503.7	0.8
Other construction materials	2,467.1	0.8
Water storage tanks	2,448.4	0.8
Doors	2,382.3	0.8
Petrol	2,373.3	0.8
Paving Blocks & Slubs	2,193.2	0.7
Block boards & MDF	2,154.0	0.7
Windows	2,117.9	0.7
Sanitary Fittings	2,115.4	0.7
Switches	1,951.4	0.6
Steel Beams & Sections	1,871.8	0.6
Locks	1,710.8	0.5
Hollow section	1,575.9	0.5
Nails & Screws	1,424.3	0.5
Extra over uPVC pipe	1,420.1	0.5
Graded Crushed Stones	1,305.2	0.4
Conduits	1,280.4	0.4
Culverts	1,237.1	0.4
Electricity	1,192.6	0.4
Binding Wire	1,155.5	0.4
solar panels	1,059.1	0.3
<b>Total</b>	<b>312,160.5</b>	<b>100.0</b>

Selected raw materials in the construction of buildings is shown in Table 5.7 In the construction of buildings and specialized works, the raw materials that consumed large amounts of money were cement, ballast, reinforced bars, machine cut stones and sand. In 2017, the share of cement and ballast was 11.9 per cent and 10.9 per cent in the construction of buildings and specialized works respectively.

**Table 5.7. Value of Selected Raw materials in Construction of Buildings and Specialized works**

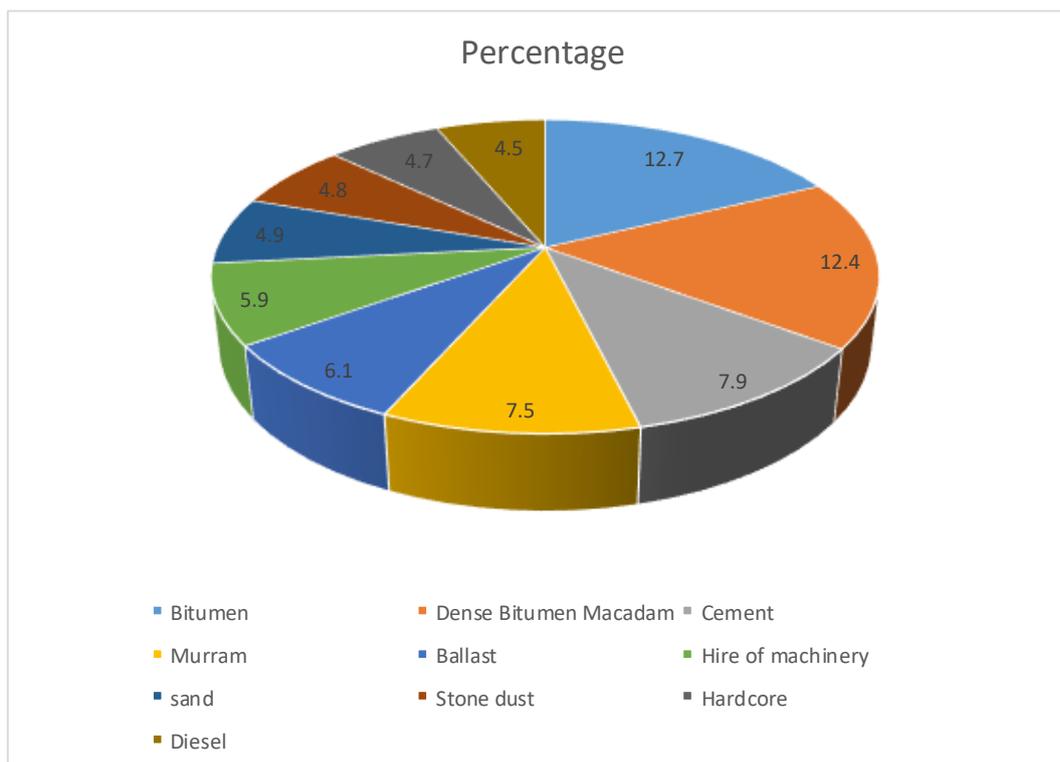
<b>Raw Materials</b>	<b>Amount (KSh Million)</b>	<b>Percentage</b>
Cement	18,359.5	11.9
Ballast	16,871.3	10.9
Reinforced bars	16,804.9	10.9
Machine-Cut Stones	9,891.5	6.4
SAND	9,120.1	5.9
Electricity Cables	7,835.8	5.1
Hardcore	7,112.9	4.6
Stone dust	7,051.9	4.6
Tiles	5,743.0	3.7
Paints	5,495.1	3.6
Diesel	3,265.8	2.1
Sawn Timber	2,872.1	1.9
Ceiling boards & Gypsum	2,831.9	1.8
Roofing sheets	2,830.1	1.8
PVC & Plastic Pipes	2,490.0	1.6
Quarry Waste	2,155.6	1.4
Block boards & MDF	2,109.4	1.4
Doors	2,076.1	1.3
Glass	2,014.9	1.3
Hire of machinery	1,964.4	1.3
Sanitary Fittings	1,925.2	1.2
Windows	1,815.9	1.2
Switches	1,680.4	1.1
Paving Blocks & Slubs	1,674.0	1.1
Water storage tanks	1,646.9	1.1
Water pipes & Fittings	1,607.5	1.0
Petrol	1,362.8	0.9
Hollow section	1,275.9	0.8
Nails & Screws	1,223.3	0.8
solar panels	1,059.1	0.7
Electricity	909.8	0.6
Binding Wire	871.9	0.6
Locks	848.8	0.5
Kitchen sink accessories	697.1	0.5
Extra over uPVC pipe	696.2	0.5
Conduits	667.4	0.4
Wash Hand Basin Accessories	618.5	0.4
Shower Fittings	490.2	0.3
MCB (Miniature Circuit Breaker)	444.6	0.3
Water	431.2	0.3
Gate valves & Fittings	425.5	0.3
Other construction materials	360.3	0.2
Translucent Plastic Roof Material	280.5	0.2
Mu PVC waste System	233.9	0.2
Fuse holder/fuses)	228.3	0.1
Air Conditioner & Fittings	219.7	0.1
Wrot Timber	217.7	0.1
Iron mongery	217.4	0.1
Lubricants	177.6	0.1
hoop iron	170.5	0.1
Thick Angle cleats	167.3	0.1
Precast Slabs	157.7	0.1
Heavy diesel oil	155.7	0.1
Flex Beams	154.6	0.1
R12 U bolt	151.4	0.1
Isolator & Consumables	116.6	0.1
Cyclone ventilators	114.5	0.1
MC30 (Medium Curing) Or MC70	73.7	0.0
LIME	39.4	0.0
<b>Total</b>	<b>154,599.5</b>	<b>100.00</b>

**Table 5.8: Share of Selected Raw Materials in the Construction of Civil Engineering Works**

<b>Raw material</b>	<b>Percentage</b>
Bitumen.....	12.7
Dense Bitumen Macadam.....	12.4
Cement.....	7.9
Murram.....	7.5
Ballast.....	6.1
Hire of machinery.....	5.9
Sand.....	4.9
Stone dust.....	4.8
Hardcore.....	4.7
Diesel.....	4.5
Gravel.....	2.8

In the construction of civil engineering works, bitumen, Dense Bitumen Macadam and cement accounted for 12.7 per cent, 12.4 per cent and 7.9 per cent of the total amount of raw materials spent, respectively. Figure 5.2 depicts materials most commonly used in the construction of roads and railways.

**Figure 5.2: Materials used in the construction of roads and railways**



## 5.4 Other Operating Expenses

In addition to the total cost of raw materials, expenditures on electricity, water and fuels data was also collected as well as on the consumption of other operating expenses. The CIP 2018 disaggregated operating expenses into various categories as such Telecommunication services, Postal and Courier, Accommodation and Travelling as shown in Table 5.9. The total operating expenses as reported in the census was KSh 358.8 billion.

**Table 5.9: Other Operating Expenses, 2017**

<b>Operating Expenses</b>	<b>Cost( KSh Mn)</b>
Motor vehicle running costs (parts and fuel)	25,796.86
Leasing and hiring of plant, machinery, equipment and vehicles under operatin	9,731.41
Insurance	15,720.46
Accommodation and travelling	11,378.93
Office supplies	6,099.99
Stores and consumables	12,699.13
Medicine & medical supplies	3,159.81
Postal and courier services	1,595.82
Advertising and promotion	13,468.35
Rental of land and premises	15,614.81
Repair and maintenance	23,193.18
Telecommunication services	3,379.73
Transport of goods (freight by rail, road, sea, air), warehousing and storage	34,268.77
Clearing and forwarding charges	7,875.06
Waste disposal	407.66
Exploration	238.94
Entertainment	982.85
License fees, permits, stamp duties and similar fees paid to government	7,667.98
Fees and Commissions paid	14,168.89
Containers and packaging materials	46,150.06
Donations, bursaries and sponsorships	1,571.76
Goods purchased for resale	103,647.85
<b>Total</b>	<b>358818.4</b>

## 5.5 Annual expenditures on utilities

The Census of Industrial Production (CIP) 2018 sought to find out the consumption and expenditures for utilities by establishments undertaking industrial and construction activities. The variables in question included use of petroleum products, non-renewable feedstocks (charcoal and firewood), coal, biogas, electricity and water.

Table 5.10 presents annual expenditure on utilities by sector in 2017. A total of KSh 84.4 billion was spent by industries in purchasing various utilities. Petroleum products and electricity jointly accounted for 79.7 per cent of total expenditure on utilities. Only a small proportion of expenditure on utilities went to biogas. Manufacturing sector had the highest expenditures on utilities at 62.9 per cent of the total, while mining and quarrying had the lowest expenditure on utilities. Manufacturing sector spent 52.9 per cent of its utilities expenditures on electricity while 18.7 per cent went to petroleum products.

**Table 5.10: Expenditure on utilities by industry, 2017**

Industry							KSh Mn
	Coal	Biogas	Non-Renewable	Petroleum Products	Electricity	Water	Total
Mining and quarrying	7.2	-	-	226.7	687.0	505.0	1,425.9
Manufacturing	7,021.0	68.6	4,203.3	9,947.2	28,068.2	3,786.9	53,095.2
Electricity, gas, steam and air conditioning supply	-	-	-	22,732.6	511.0	479.5	23,723.0
Water supply; sewerage, waste management and remediation activities	-	-	-	220.6	605.6	756.6	1,582.8
Construction	0.2	-	1.6	2,865.4	1,433.0	272.4	4,572.6
<b>Total</b>	<b>7,028.4</b>	<b>68.6</b>	<b>4,204.9</b>	<b>35,992.5</b>	<b>31,304.8</b>	<b>5,800.4</b>	<b>84,399.6</b>

Figure 5.3 displays utilities expenditures by industry in 2017. From the figure, 42.6 and 37.1 per cent of utility expenditures in industrial and construction sectors went to petroleum products and electricity, respectively in 2017. In the mining and quarrying sector, 48.2 per cent of utilities expenditure was on electricity. Similarly, 52.9 per cent of utilities expenditure in manufacturing were spent on electricity. Electricity, gas, steam and air conditioning supply; and construction industries spent 95.8 per cent and 62.7 per cent of their utilities expenditure, respectively, in the purchase of petroleum products.

**Figure 5.3: Utilities expenditure by Industry**

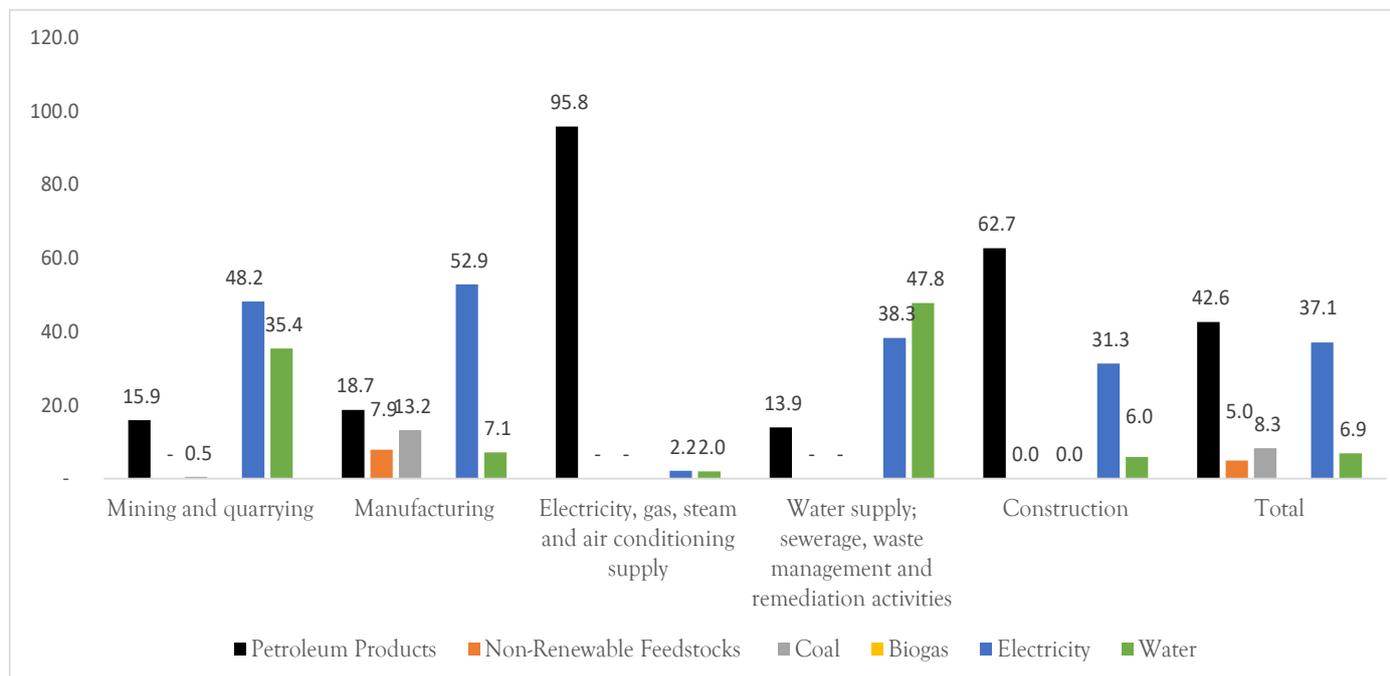


Table 5.11 presents annual expenditure on utilities by economic activity in 2017. Manufacture of food products and Electricity, Gas, Steam and Air Conditioning supply jointly utilized 51.7 per cent of total expenditure in utilities. Most of the coal was consumed by industries in the manufacture of other non-metallic mineral products where cement is the main product. The non-renewable feedstocks was mainly used in the manufacture of food products.

**Table 5.11: Value of utilities purchased by Economic Activity, 2017**

KSh Million							
Economic Activity	Coal	Biogas	Non-Renewable Feedstocks	Petroleum Products	Electricity	Water	Total
Extraction of crude petroleum and natural gas	7.2	-	-	9.7	6.5	0.0	23.4
Mining of metal ores	-	-	-	-	422.8	316.7	739.5
Other mining and quarrying	-	-	-	217.0	220.4	159.4	596.8
Mining support service activities	-	-	-	-	37.2	29.0	66.2
Manufacture of food products	-	35.2	3,797.5	3,126.5	11,645.1	1,301.0	19,905.3
Manufacture of beverages	-	-	1.0	574.7	1,652.6	364.0	2,592.3
Manufacture of tobacco products	-	-	-	-	240.9	83.6	324.5
Manufacture of textiles	-	-	60.9	257.6	417.5	71.2	807.2
Manufacture of wearing apparel	-	-	2.5	44.7	646.8	95.0	789.1
Manufacture of leather and related products	-	-	0.4	15.9	316.0	36.7	369.1
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-	-	-	190.5	521.9	17.0	729.5
Manufacture of paper and paper products	-	26.5	75.0	262.4	819.4	152.1	1,335.4
Printing and reproduction of recorded media	-	-	-	91.7	605.0	109.1	805.8
Manufacture of coke and refined petroleum products	-	-	-	57.5	25.5	3.8	86.7
Manufacture of chemicals and chemical products	-	4.2	14.5	2,146.6	1,572.2	382.0	4,119.5
Manufacture of basic pharmaceutical products and pharmaceutical preparations	-	2.2	7.2	57.5	487.3	99.6	653.8
Manufacture of rubber and plastics products	-	-	0.7	423.7	1,798.3	218.4	2,441.1
Manufacture of other non-metallic mineral products	6,776.1	-	243.4	741.4	3,265.9	275.2	11,302.2
Manufacture of basic metals	218.6	-	0.1	645.2	2,045.3	248.1	3,157.2
Manufacture of fabricated metal products, except machinery and equipment	1.6	-	-	255.8	601.8	102.3	961.5
Manufacture of computer, electronic and optical products	-	-	-	-	6.4	0.9	7.4
Manufacture of electrical equipment	23.7	-	-	167.3	445.6	40.0	676.7
Manufacture of machinery and equipment n.e.c.	-	-	-	7.8	108.2	32.4	148.4
Manufacture of motor vehicles, trailers and semi-trailers	-	0.5	0.0	59.8	310.7	67.7	438.8
Manufacture of other transport equipment	-	-	-	0.5	0.3	0.1	0.9
Manufacture of furniture	1.0	-	0.0	785.2	183.9	16.9	987.0
Other manufacturing	-	-	-	15.9	186.4	11.1	213.4
Repair and installation of machinery and equipment	-	-	0.1	18.5	165.3	58.7	242.6
Electricity, gas, steam and air conditioning supply	-	-	-	22,732.6	511.0	479.5	23,723.0
Water collection, treatment and supply	-	-	-	148.5	584.9	755.5	1,488.8
Sewerage	-	-	-	-	0.1	0.0	0.1
Waste collection, treatment and disposal activities; materials recovery	-	-	-	62.7	17.8	1.1	81.6
Remediation activities and other waste management services	-	-	-	9.5	2.9	0.0	12.4
Construction of buildings	-	-	0.1	496.1	562.9	104.8	1,163.9
Civil engineering	0.2	-	1.5	2,214.2	660.3	122.9	2,999.1
Specialized construction activities	-	-	-	155.1	209.8	44.6	409.6
<b>Total</b>	<b>7,028.4</b>	<b>68.6</b>	<b>4,204.9</b>	<b>35,992.5</b>	<b>31,304.8</b>	<b>5,800.4</b>	<b>84,399.6</b>

The quantity of utilities purchased by industries in 2017 is presented in Table 5.12. The amount of water consumed as utilities by establishments engaged in industrial production and construction activities in 2017 was 2.3 billion cubic metres. Most of this water was mainly in the activities related to Electricity, gas, steam and air Conditioning Supply industry. A total of 765.2 million litres of petroleum products was purchased by industrial and construction sectors in 2017. In addition, 2,627.6 gigawatt hours (GWh) of electricity

was purchased by industries. Most of the electricity purchased (88.8%) went to the manufacturing sector.

**Table 5.12: Quantities of utilities purchased by Industry, 2017**

Industry	Coal	Biogas	Non-Renewable Feedstocks	Petroleum Products	Electricity	Water
	Tonne	Tonne	Tonne	Million Litres	GWh	Million Cubic Meters
Mining and quarrying	410.0	0	-	2.9	57.7	2.5
Manufacturing	553,259.0	23,483.0	269,143.0	143.6	2,333.4	40.2
Electricity, gas, steam and air conditioning supply	0	0	-	577.2	65.3	2,193.8
Water supply; sewerage, waste management and remediation activities	0	0	-	3.7	52.0	13.4
Construction	10	0	95.0	37.8	119.2	1.6
<b>Total</b>	<b>553,679.0</b>	<b>23,483.0</b>	<b>269,239.0</b>	<b>765.2</b>	<b>2,627.6</b>	<b>2,251.5</b>

Table 5.13 details the quantities of utilities consumed by various economic activities. All activities recorded consumption of electricity and water but only a few used coal and biogas. Almost all the coal reported was consumed in the manufacture of other non-metallic mineral products, which mainly comprises of the production of cement. The consumption of non-renewable feedstocks (charcoal and firewood) was mainly in the manufacture of food products mainly attributed to tea factories.

**Table 5.13: Quantities of utilities purchased by Economic Activity**

Economic Activity	Coal	Biogas	Non-Renewable Feedstocks	Petroleum Products	Electricity	Water
	Tonne	Tonne	Tonne	Million Litres	GWh	Million Cubic Meters
Extraction of crude petroleum and natural gas	410.0	0	-	0.3	0.7	0.0
Mining of metal ores	0	0	-	-	34.8	1.6
Other mining and quarrying	0	0	-	2.6	19.0	0.7
Mining support service activities	0	0	-	-	3.1	0.1
Manufacture of food products	0	19,233.0	242,085.0	42.2	951.6	15.2
Manufacture of beverages	0	0	67.0	8.1	137.0	3.0
Manufacture of tobacco products	0	0	-	-	23.2	1.1
Manufacture of textiles	0	0	4,062.0	3.0	31.5	0.6
Manufacture of wearing apparel	0	0	168.0	0.5	52.8	0.9
Manufacture of leather and related products	0	0	28.0	0.2	28.3	0.6
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0	0	-	2.2	44.0	0.2
Manufacture of paper and paper products	0	2,412.0	5,003.0	3.9	75.6	2.1
Printing and reproduction of recorded media	0	0	-	1.1	45.3	1.0
Manufacture of coke and refined petroleum products	0	0	-	0.9	2.1	0.0
Manufacture of chemicals and chemical products	0	278.0	966.0	41.0	130.6	3.7
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0	360.0	479.0	0.7	38.9	1.0
Manufacture of rubber and plastics products	0	0	47.0	4.4	132.4	2.1
Manufacture of other non-metallic mineral products	538,473.0	0	16,229.0	11.0	304.8	2.5
Manufacture of basic metals	13,660.0	0	3.0	7.3	167.9	2.7
Manufacture of fabricated metal products, except machinery and equipment	92	0	-	4.5	47.9	1.0
Manufacture of computer, electronic and optical products	0	0	-	-	0.5	0.0
Manufacture of electrical equipment	977.0	0	-	2.3	39.5	0.4
Manufacture of machinery and equipment n.e.c.	0	0	-	0.2	9.9	0.4
Manufacture of motor vehicles, trailers and semi-trailers	0	1,200.0	-	0.9	23.9	0.6
Manufacture of other transport equipment	0	0	-	0.0	0.0	0.0
Manufacture of furniture	57.0	0	1.0	8.9	16.5	0.3
Other manufacturing	0	0	-	0.1	13.5	0.1
Repair and installation of machinery and equipment	0	0	5.0	0.2	15.7	0.7
Electricity, gas, steam and air conditioning supply	0	0	-	577.2	65.3	2,193.8
Water collection, treatment and supply	0	0	-	2.9	50.5	13.3
Sewerage	0	0	-	-	0.0	0.0
Waste collection, treatment and disposal activities; materials recovery	0	0	-	0.7	1.2	0.0
Remediation activities and other waste management services	0.0	0	-	0.1	0.2	0.0
Construction of buildings	0.0	0	3.0	5.6	47.7	0.7
Civil engineering	10.0	0	92.0	30.2	54.0	0.7
Specialized construction activities	0	0	-	1.9	17.5	0.3
<b>Total</b>	<b>553,679.0</b>	<b>23,483.0</b>	<b>269,239.0</b>	<b>765.2</b>	<b>2,627.6</b>	<b>2,251.5</b>

Table 5.14 shows the utility expenditure quantities and values on water for all the sectors covered in the Census of Industrial Production. The expenditures were analysed based on the Economic Activities of Mining and Quarrying, Manufacturing, Electricity, gas, steam and air conditioning supply, Water supply, sewerage, waste management and remediation and Construction. Comparison across activities shows that Electricity, Gas, Steam, and air conditioning supply had the highest consumption of water at 2.2 billion Cubic Meters, whereas construction had the least amount of consumption at 1.6 Million cubic meters. In terms of values, manufacturing sector had the highest expenditure of KSh 3.8 billion whereas Water supply; sewerage, waste management and remediation activities sector recorded the lowest expenditure values. It is worth noting that the unit cost of water varies depending on the source.

**Table 5.14: Annual Water Expenditure by Economic Activity**

Industry	Quantity	Value
	Million Cubic Meters	KSh Mn
Mining and quarrying	2.5	505.0
Manufacturing	40.2	3,786.9
Electricity, gas, steam and air conditioning supply	2,193.8	479.5
Water supply; sewerage, waste management and remediation activities	13.4	756.6
Construction	1.6	272.4
<b>Total</b>	<b>2,251.5</b>	<b>5,800.4</b>

## Chapter 6 ~ Marketing of Industrial Products and Business financing

### 6.1 Sale of Industrial Products

The chapter covers the sale of goods from Mining and quarrying; Manufacturing; Electricity, gas, steam and air conditioning supply; Water supply, sewerage, waste management and remediation activities. It includes VAT and other taxes directly linked to the sale which are usually collected from the consumers and paid directly to government tax authorities, as well as all duties and taxes on the goods and services invoiced by the unit. It also includes charges for transport, packaging among others which are passed on to the consumer. Products and services used by the establishment for their own use are also included in the sales and it is valued at the prevailing market prices.

In 2017, the industrial sector sales amounted to KSh 1.82 trillion up from KSh 1.01 trillion reported in 2009, as shown in Table 6.1. Sales from manufacturing sector increased by 78.4 per cent from KSh 890.1 billion reported in 2009 to KSh 1.6 trillion in 2017. Sales from Electricity, gas, steam and air conditioning supply went up by KSh 62.9 billion. Sales from Water supply, sewerage, waste management and remediation activities almost tripled in 8 years. Sales from mining and quarrying stood at KSh 36.1 billion. Manufacturing sector contributed 87.3 per cent of the total sales followed at a distant by Electricity, gas, steam and air conditioning supply with 9.1 per cent.

**Table 6.1: Value of Sales by Economic Activity in 2009 and 2017**

<b>Economic Activity</b>	<b>KSh million</b>		<b>% share, 2017</b>
	<b>2009</b>	<b>2017</b>	
Mining and Quarrying	13,224.0	36,108.9	2.0
Manufacturing	890,117.6	1,587,747.2	87.3
Electricity, gas, steam and air conditioning supply	101,700.3	164,579.7	9.1
Water supply; sewerage, waste management and remediation activities	10,356.1	29,592.1	1.6
<b>Total Industry</b>	<b>1,015,398.0</b>	<b>1,818,027.8</b>	<b>100.0</b>

In the manufacturing sector, sales from food products sub sector amounted to KSh 644.2 billion which translates to 40.6 per cent of the total sales of manufactured products as shown in Table 6.2. This was followed by sales of chemical and chemical products, basic metals, beverages and non-metallic minerals which was KSh 121.1, 120.1, 117.4 and 90.7 billion, respectively in 2017.

Within the mining and quarrying sector, most sales were realized from mining of metal ores and other mining and quarrying activities with KSh 19.0 and KSh 11.1 billion.

Sales from the Electricity, gas, steam and air conditioning supply amounted to KSh 164.6 billion while that of Water supply, sewerage, waste management and remediation activities was KSh 29.6 billion.

**Table 6.2: Value of Sales by Activity**

<b>Industry</b>	<b>Sales Value (KSh Million)</b>
Extraction of crude petroleum and natural gas	268.1
Mining of metal ores	19,045.0
Other mining and quarrying	14,125.0
Mining support service activities	2,670.8
<b>Total Mining and Quarrying</b>	<b>36,108.9</b>
Manufacture of food products	644,179.0
Manufacture of beverages	117,422.7
Manufacture of tobacco products	27,291.7
Manufacture of textiles	24,194.5
Manufacture of wearing apparel	42,037.3
Manufacture of leather and related products	18,282.8
Manufacture of wood and of products of wood and cork, except furniture manufacture of articles of straw and plaiting mat	19,664.7
Manufacture of paper and paper products	62,037.0
Printing and reproduction of recorded media	39,370.1
Manufacture of coke and refined petroleum products	1,957.5
Manufacture of chemicals and chemical products	121,116.4
Manufacture of basic pharmaceutical products and pharmaceutical preparations	28,655.0
Manufacture of rubber and plastics products	79,087.7
Manufacture of other non-metallic mineral products	90,869.1
Manufacture of basic metals	120,071.0
Manufacture of fabricated metal products, except machinery and equipment	39,014.2
Manufacture of computer, electronic and optical products	1,109.2
Manufacture of electrical equipment	23,770.1
Manufacture of machinery and equipment nec	4,163.4
Manufacture of motor vehicles, trailers and semi-trailers	37,062.8
Manufacture of other transport equipment	6,686.4
Manufacture of furniture	16,731.1
Other manufacturing	9,901.7
Repair and installation of machinery and equipment	13,071.8
<b>Total Manufacturing</b>	<b>1,587,747.2</b>
<b>Electricity, gas, steam and air conditioning supply</b>	<b>164,579.7</b>
Water collection, treatment and supply	26,844.1
Sewerage	16.6
Waste collection, treatment and disposal activities materials recovery	2,393.3
Remediation activities and other waste management services	338.2
<b>Water supply; sewerage, waste management and remediation</b>	<b>23,510.8</b>
<b>Total Industry</b>	<b>1,818,027.9</b>

## 6.2 Business Financing

This section covers the ability of industrial businesses to access funding from various sources categorized as internal and external sources. As finance is a crucial ingredient in industrial growth, the census assessed whether the industrial sector received its funding internally or externally in the year 2016 and 2017. While Kenya has had a fully developed financial system for a couple of decades, the census results show that over half of industrial financing came from retained business earnings for the reference period. Establishments

reported that only 16.9 per cent of their operational funding originated from external sources.

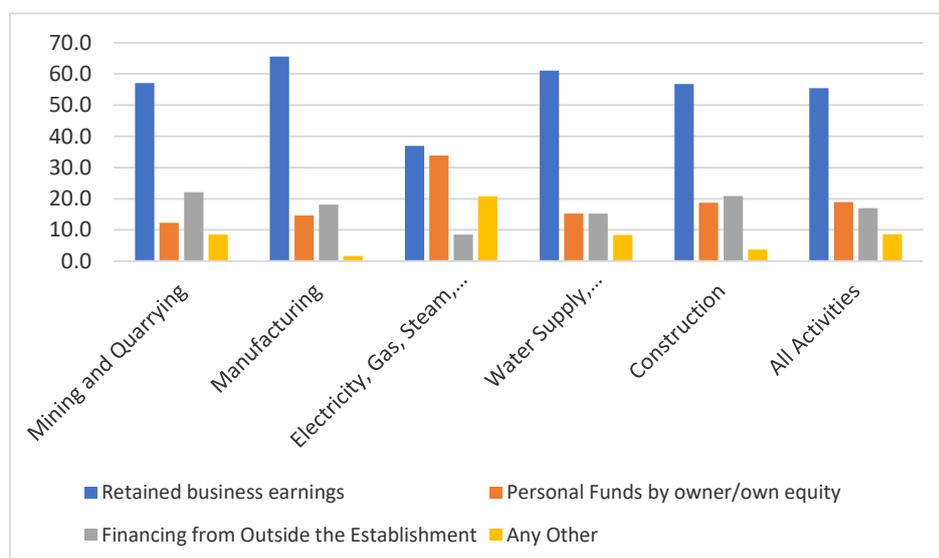
Firms in Mining and quarrying reported highest external funding in 2017 at 21.4 per cent followed by establishments involved in construction at 20.8 Per cent. Manufacturing establishments sought only 18.0 per cent of their operational funding from outside the establishments as shown in table 6.3.

**Table 6.3: Proportion of Business Financing by source and activity ( Per cent)**

	Retained business earnings	Personal Funds by owner/own equity	Financing from Outside the Establishment	Other Financing
Mining and Quarrying	58.4	11.9	21.4	8.2
Manufacturing	65.5	14.8	18.0	1.6
Electricity, gas, Steam and Air Conditioning Supply	30.0	14.0	6.0	50.0
Water Supply Sewerage Waste Management and remediation Activities	59.7	16.4	14.5	9.5
Construction	56.9	18.6	20.8	3.7

Figure 6.1 show the distribution of sources of funding by economic activity in the industrial sector.

**Figure 6.1: Proportions of business financing by activity, 2017**



**Table 6.4: Distribution of external and internal financing by activity**

	Mining and Quarrying	Manufacturing	Electricity, gas, Steam and Air Conditioning Supply	Water Supply Sewerage waste Management and remediation Activities	Construction
Inside Kenya Loans	78.4	79.1	0	47.2	79
Inside Kenya Equity investment (shares)	2.3	3.2	100	2.8	2.6
Inside Kenya Own equity	6.7	4.1	0	9.5	4.5
Inside Kenya Debt securities (commercial paper, bonds)	0	0	0	0	0
Inside Kenya Grants	3.3	1.2	0	31.1	0.4
Inside Kenya Trade credit/ merchant credit	7.6	5.8	0	0.6	5.2
Inside Kenya Operational leasing	0	0	0	0	1
Any other	0.7	1.8	0	3	2.9
Outside Kenya Loans	0.7	4.5	0	0	3.1
Outside Kenya Equity investment (shares)	0.3	0.4	0	1	0
Outside Kenya Own equity	0	1	0	0	1
Outside Kenya Debt securities (commercial paper, bonds)	0	0	0	0	0
Outside Kenya Grants	0	0	0	5	0
Outside Kenya Trade credit/ merchant credit	0	0	0	3	0
Outside Kenya Operational leasing	0	1	0	0	1
Outside Any other	0	0	0	0	0

Table 6.5 presents proportions of establishments that obtained loans by sectors and sources. Commercial banks stood out as the most preferred source of loans. Analysis of the establishments which sourced for loans revealed that, 100, 91.1 and 95.7 per cent of establishments in the mining and quarrying, manufacturing and water supply sewerage waste management and remediation activities sectors respectively, sourced loans from

commercial banks. However, 9.8, 8.3 and 8.1 per cent of establishments which sourced for loans in the manufacturing, mining and quarrying, and construction sectors respectively, obtained loans from Sacco's. Microfinance institutions awarded loans to 14.3 and 8.3 per cent of the establishments which received loans in electricity, gas, steam and air conditioning supply, and mining and quarrying sectors, respectively.

**Table 6.5: Proportion of Source of Loans by activity (Per cent)**

	Mining and Quarring	Manufacturing	Electricity, gas, Steam and Air Conditioning Supply	Water Supply Sewerage waste Management and remediation Activities	Construction
Commercial Banks	100	91.1	85.7	95.7	92.7
Sacco's	8.3	9.8	0	5.6	8.1
Microfinance Institutions	8.3	2.8	14.3	7.9	5.0
Mortgage Finance	0	0.4	0	0.7	0.5
Government	0	2.3	0	0.3	1.5
NGO	0	0.4	0	1.3	0.7
Insurance Company	0	0.2	0	2	0.8
Religious Institution	0	0.2	0	0	0.1
Self help group (ROSCAs, ASCAs)	8.3	0.2	0	1.3	0.7

## **Chapter 7 ~ Industrial Investments**

### **7.1 Gross Fixed Capital Formation**

Gross Fixed Capital Formation (GFCF) is defined as the acquisition, less disposals, of fixed assets plus major improvements to, and transfer costs on, land and other non-produced assets. The assets acquired may be new or they may be used. The assets disposed of may be sold for continued use by another economic unit, they may be simply abandoned by the owner or they may be sold as scrap and be broken down into reusable components, recoverable materials, or waste products.

It follows therefore that the value of fixed assets added to changes in inventory constitute the Gross capital formation or the level of investment in an activity and its future economic benefits. As investments are critical to economic growth, the Census of Industrial Production 2018 measured the value of investments in fixed assets added to each economic activity by type of assets in the year 2017. The census further reports on the accumulated assets over time by the end of 2017 through the net book values at the end of the reference year.

### **7.2 Additions to Fixed Assets and Gross Fixed Capital Formation**

The results reveal that total fixed assets worth KSh 1.21 trillion were attributed to the industrial sector by close of the year 2017. Electric power generation, transmission and distribution accounted for 60.8 per cent of the total value of fixed assets attesting to heavy investments in the energy sector as envisioned by Vision 2030. Investments in fixed assets by establishments in Manufacturing Sector accounted for 35.7 Per cent of Assets in Industry at the end of 2017. The Construction Sector Reported as having Assets worth 33.8 billion in 2017 while establishments in Manufacturing reported as having Assets worth 432.1 billion during the same period. Production/processing equipment were worth 516.9 billion by the end of year 2017.

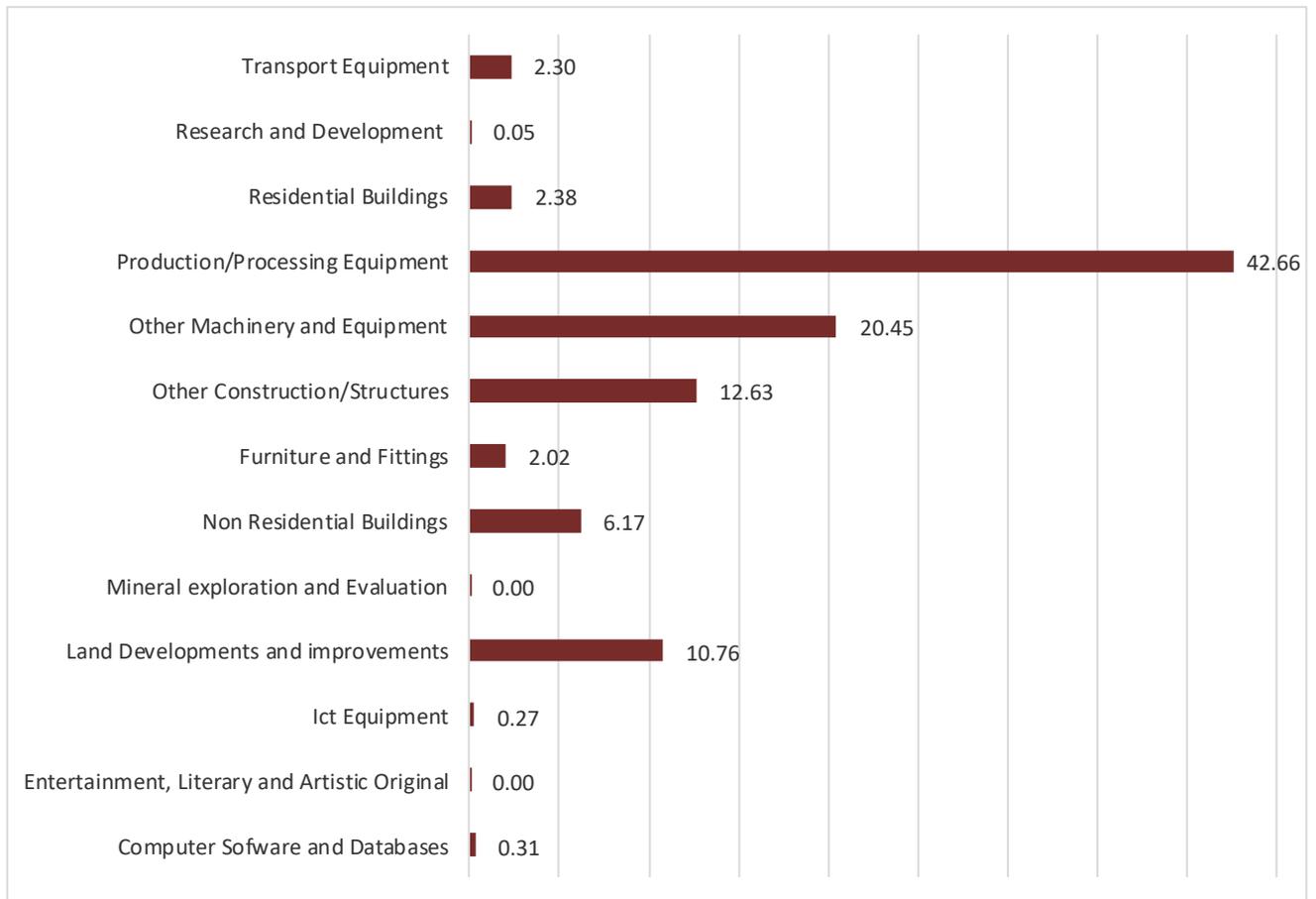
**Table 7.1: Value of assets at the end of 2017 by Economic Activity**

KSh Million

	Construction	Electricity, Gas, Steam, air conditioning	Manufacturing	Mining and Quarrying	Water Supply, Sewerage, Waste management and remediation activities	Grand Total
Computer Software and Databases	60.50	2,616.27	981.83	0.56	49.01	3,708.18
Entertainment, Literary and Artistic Original	0.12	-	52.36	-	-	52.48
Ict Equipment	664.12	0.94	2,380.17	7.27	267.65	3,320.16
Land Developments and improvements	6,315.49	42,231.80	81,229.45	243.29	306.63	130,326.65
Mineral exploration and Evaluation	0.22	-	1.23	-	-	1.45
Non Residential Buildings	1,532.16	-	70,902.62	194.46	2,115.85	74,745.10
Furniture and Fittings	1,099.11	18,214.87	4,606.09	9.01	491.62	24,420.69
Other Construction/Structures	3,072.84	138,113.79	11,658.04	20.06	197.47	153,062.19
Other Machinery and Equipment	4,099.53	218,006.17	24,986.94	241.83	444.08	247,778.55
Production/Processing Equipment	7,670.26	308,922.26	196,522.11	1,075.82	2,686.82	516,877.26
Residential Buildings	3,158.68	4,990.68	20,685.85	5.51	-	28,840.72
Research and Development	6,093.85	3,612.92	17,461.36	382.61	338.65	27,889.39
Transport Equipment	8.86	-	624.19	-	0.03	633.08
Grand Total	33,775.74	736,709.69	432,092.23	2,180.42	6,897.81	1,211,655.88

The production/Processing equipment accounted for 42.7 per cent of the total value of fixed assets while other machinery and equipment accounted for 20.4 per cent of the total value of fixed assets during the same period. Land developments and improvements accounted for 10.8 per cent of the total assets while investments by the industrial sector in residential buildings and transport equipment stood at 2.3 per cent each of the total value of fixed assets.

Figure 7.1: Proportion of assets stocks, 2017



## Chapter 8 ~ Water Abstraction, Waste Management and Disposal

### 8.1 Introduction

This section covers activities related to water abstraction and waste management including collection, treatment and disposal.

### 8.2. Water Use and Expenditure by Economic Activity

Table 8.1 shows the volume of water use and value by economic activities. The total volume of water use amounted to 11.5 million cubic meters. Electricity, gas, steam and air condition sector had the highest volume of water use in the year amounting to 11.1 billion cubic meters. This is brought about by the high volumes of water used in hydro power generation. The manufacturing sector had the second highest volumes of water use at 408.8 million cubic meters while the construction sector had the least amount of water during the year.

The Total expenditure on water for industries was KSh 64.1 billion in 2017. Manufacturing sector had the highest expenditure on water at KSh 52.2 billion translating to an average of KSh 127.6 per cubic meter. Electricity, gas, steam and air condition sector incurred a total of KSh 5.1 billion although the sector had the highest volume of water use. The unit value for this sector was of KSh 0.46 per cubic as most of the water is used for power generation in dams.

**Table 8.1: Water Use and Expenditures by Economic activities**

Industry	Quantity( Million M <sup>3</sup> )	Value(Ksh Million)
Mining and quarrying	12.3	2,525.0
Manufacturing	408.8	52,168.4
Electricity, gas, steam and air conditioning supply	10,995.9	5,076.4
Water supply; sewerage, waste management and remediation activities	57.8	2,985.6
Construction	8.2	1,362.0
Total	11,483	64,117

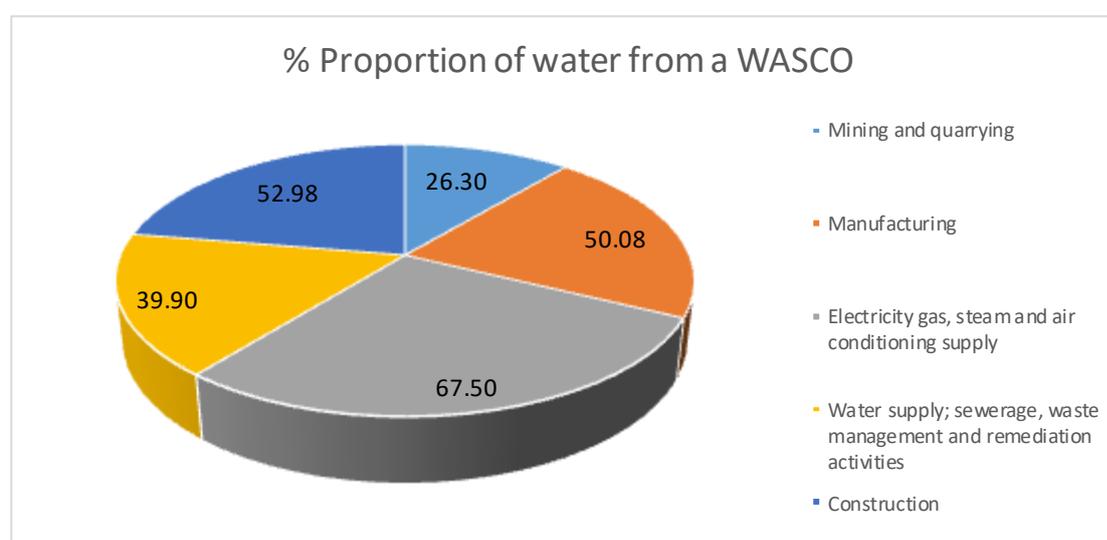
Table 8.2 shows the proportion of volume of water use by economic activities and by source. In Mining and Quarrying sector the highest proportion of water used was sourced from lakes, rivers, borehole, wells and dams at 56.9 per cent of all the water used. Similarly, Water supply, sewerage, waste management and remediation industry sourced most (52.3 per cent) of their water requirements from this source.

The data also shows that the rest of the industries i.e. in Manufacturing(50.1%), Electricity and gas(67.5%) and Construction(53.0%) sourced their water mostly from Water and Sewerage Companies (WASCO's).

**Table 8.2: Proportion of Quantity of water Used by Economic Activity**

Economic Activity	% from WASCO	% from vendor	% from rain water	% from lakes/ rivers/ boreholes/ wells or dams
Mining and quarrying	26.3	8.9	8.0	56.9
Manufacturing	50.1	9.2	2.1	38.7
Electricity gas, steam and air conditioning supply	67.5	32.5	0.0	20.0
Water supply; sewerage, waste management and remediation activities	39.9	5.7	2.0	52.3
Construction	53.0	27.4	2.5	17.2

**Figure 8.1: Proportions of Water from WASCO by Sectors**



### 8.3 Waste Management and Disposal by Economic Activities

For efficient management of waste, it is important to monitor the quantities of waste treated, recycled and disposed out of the waste generated by different economic activities. It is also prudent to know the distribution of modes of waste disposal for the different types of waste.

The census of industrial production captured information on waste disposal by all industries during the year 2017. This information was meant to establish the quantities of different types of waste generated in the course of production by industries. In addition, out of the quantities of waste generated, the census captured the quantities of waste which went into treatment, recycling and eventual disposal by the industries together with which mode of disposal the industries used.

#### 8.3.1 Solid waste

Total amount of solid waste generated by industrial and construction sectors in 2017 was 81.6 million tonnes. The manufacturing sector contributed the largest quantity of solid waste generated at 79.2 million tonnes while the industries under Water Supply, sewerage, waste management and remediation activities produced 1.3 million tonnes followed by construction sector which generated 1.1 million tonnes of solid waste.

**Table 8.3 Quantities of Solid Waste by Economic Activity, Tonnes**

Economic Activity	Generated / Produced	Treated	Recycled	Disposed
Mining and quarrying	895	500	532	363
Manufacturing	79,207,012	88,129	9,925,023	49,941,844
Electricity, gas, steam and air conditioning supply	45	-	-	20
Water supply; sewerage, waste management and remediation activities	1,340,998	18,036	91,388	1,198,086
Construction	1,099,085	1,230	92,817	712,096
Total	81,648,035	107,895	10,109,760	51,852,409

### 8.3.2 Hazardous waste

This is a type of waste that has substantial or potential threats to public health or the environment. Hazardous wastes are materials that are known or tested to exhibit one or more of the following hazardous traits: Ignitability, Reactivity, Corrosivity. Total amount of hazardous waste generated by various sectors was 4,261.8 tonnes most of which emanated from the manufacturing sector. Overall, 154 tonnes of hazardous waste was treated while only 13 tonnes were recycled.

**Table 8.4 Quantities of Hazardous Waste by Economic Activity, Kilograms**

Economic Activity	Generated / Produced	Treated	Recycled	Disposed
Mining and quarrying	733	600	600	133
Manufacturing	4,259,071	153,964	12,475	4,235,213
Electricity, gas, steam and air conditioning supply	-	-	-	-
Water supply; sewerage, waste management and remediation activities	-	-	-	-
Construction	2,037	124	628	1,285
Total	4,261,840	154,688	13,703	4,236,631

### 8.3.3 E-waste

These are used electronics which are destined for reuse, resale, salvage, recycling, or disposal are also considered e-waste. Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution. In 2017, total amount of e-waste generated by all the industries was to 17.1 tonnes out of which 15.5 tonnes were generated by the manufacturing sector. The amount of e waste recycled in the year 2017 from all the sectors was 12.7 tonnes.

**Table 8.5 Quantities of E-Waste by Economic Activity, Kilograms**

Economic Activity	Generated / Produced	Treated	Recycled	Disposed
Mining and quarrying	-	-	-	-
Manufacturing	15,527	10,100	12,555	12,919
Electricity, gas, steam and air conditioning supply	-	-	-	-
Water supply; sewerage, waste management and remediation activities	16	-	-	16
Construction	1,546	115	104	1,320
<b>Total</b>	<b>17,090</b>	<b>10,215</b>	<b>12,659</b>	<b>14,255</b>

### 8.3.4 Wastewater

Waste water is the liquid form of waste generated industries in the process of production or other processes. In 2017, the volume of wastewater generated was 197.3 million cubic meters out of which 75.9 per cent was treated. The manufacturing sector generated the highest volume of wastewater at 179.7 million cubic meters followed by the construction and Water supply; sewerage, waste management and remediation activities sectors at 9.5 and 8.1 million cubic meters respectively.

**Table 8.6 Quantities of Liquid waste/ Wastewater by Economic Activity, Cubic meters**

Economic Activity	Generated / Produced	Treated	Recycled	Disposed
Mining and quarrying	66,101	-	-	66,101
Manufacturing	179,692,217	146,725,578	6,944,066	172,151,210
Electricity, gas, steam and air conditioning supply	30	-	-	30
Water supply; sewerage, waste management and remediation activities	8,061,803	3,050,680	-	2,282,423
Construction	9,495,343	100,110	52,473	9,313,918
<b>Total</b>	<b>197,315,494</b>	<b>149,876,368</b>	<b>6,996,539</b>	<b>183,813,681</b>

### 8.4 Waste Management in the Water and Sewerage Sector

Quantities of various types of waste collected, treated, recycled and disposed in Water supply; sewerage, waste management and remediation activities only are shown in Table 8.7. The amount of solid waste collected by industries in water and sewerage during the year 2017 was 115.1 thousand tonnes, out of which 31.1 per cent was treated while only 2.6 per cent was recycled.

**Table 8.7 Quantities of Waste in the Water and Sewerage sector**

Type of Waste	Unit	Collected	Treated	Recycled	Disposed
Solid Waste	Tonnes	115,058	35,778	2,951	75,723
Hazardous Waste	Kgs	834,208	-	10,154	824,054
eWaste	Kgs	59,546	-	-	59,546
Liquid Waste / Waste Water	Cubic meters	14,117,223	31,909,034	2,344,100	11,840,232

Table 8.8 shows the cost incurred by industries under Water supply; sewerage, waste management and remediation activities of managing the various types of waste. The of collecting solid waste in 2017 amounted to KSh 343.9 million while the expenditure incurred in collection of Wastewater was KSh 69.4 million. The cost of collecting hazardous waste and e waste in 2017 was KSh 4.9 million and KSh 2.2 million respectfully.

**Table 8.8 Expenditure on Waste Management in the Water and Sewerage sector, KSh Million**

Type of Waste	Collected	Treated	Recycled	Disposed
Solid Waste	343.91	116.97	19.27	93.03
Hazardous Waste	4.94	-	-	31.60
eWaste	2.21	-	-	0.12
Liquid Waste / Waste Water	69.39	42.51	10.02	7.78

## Chapter 9 ~ Information and Communication Technology (ICT) in Industries

### 9.1 Introduction

Rapid developments in innovations and technology have brought about the latest wave of technological revolution in industries. Currently the country is experiencing the onset of the fourth industrial revolution, which is significantly different from the ones that preceded it. The first industrial revolution was led by water and steam, the second industrial revolution was built on electric power while the third depended on electronics and information technology. The fourth industrial revolution (industry 4.0), is driven by the high uptake of ICTs in a more complex manner which is characterized by a trend of automation and data exchange in manufacturing technologies.

Through its capacity to integrate and blend a number of knowledge intensive technologies, ICT can enable traditional manufacturing base to be competitive in a global environment. Innovative use of ICT can result in new sales channels, new product capabilities and product differentiation, reduce costs, increase productivity and improve the base for strategic decision-making and risk management. These results should be reflected in enhanced business performance.

In order to measure the 4<sup>th</sup> industrial revolution, the CIP 2018 integrated key ICT indicators that would measure its uptake and use in industries. These indicators were measured under sections B (mining and quarrying), C (manufacturing), D (electricity, gas, steam, air conditioning supply), and E (water supply, sewerage, waste management and remediation activities) and construction of the ISIC rev 4.

### 9.2 Methodology

It is worthy to note that the ICT indicators were based on 2,584 firms that filled the ICT section of the CIP 2018. The breakdown of the number of establishments is presented in Table 9.1

**Table 9.1: Total number of Firms responding in ICT section**

Industry	Number	Percent
Mining and Quarrying	32	1.2
Manufacturing	1,656	64.1
Electricity, Gas, Steam and Air conditioning	6	0.2
Water supply, Sewerage, waste management and remediation activities	127	4.9
Construction	763	29.5
Total	2,584	100

Analysis of data on use of ICT by the establishments covered by the census is based on the recommendations of the United Nations Conference on Trade and Development (UNCTAD) Manual for the Production of Statistics on the Information Economy. The census included some core ICT indicators for industries and new digital economy indicators targeting to measure the:

- Use of ICT services and infrastructure
- Uptake of e-commerce by industries

- Cybersecurity in industries
- Uptake of the 4<sup>th</sup> industrial revolution

Table 9.2 shows the list of ICT indicators used to measure the above targets

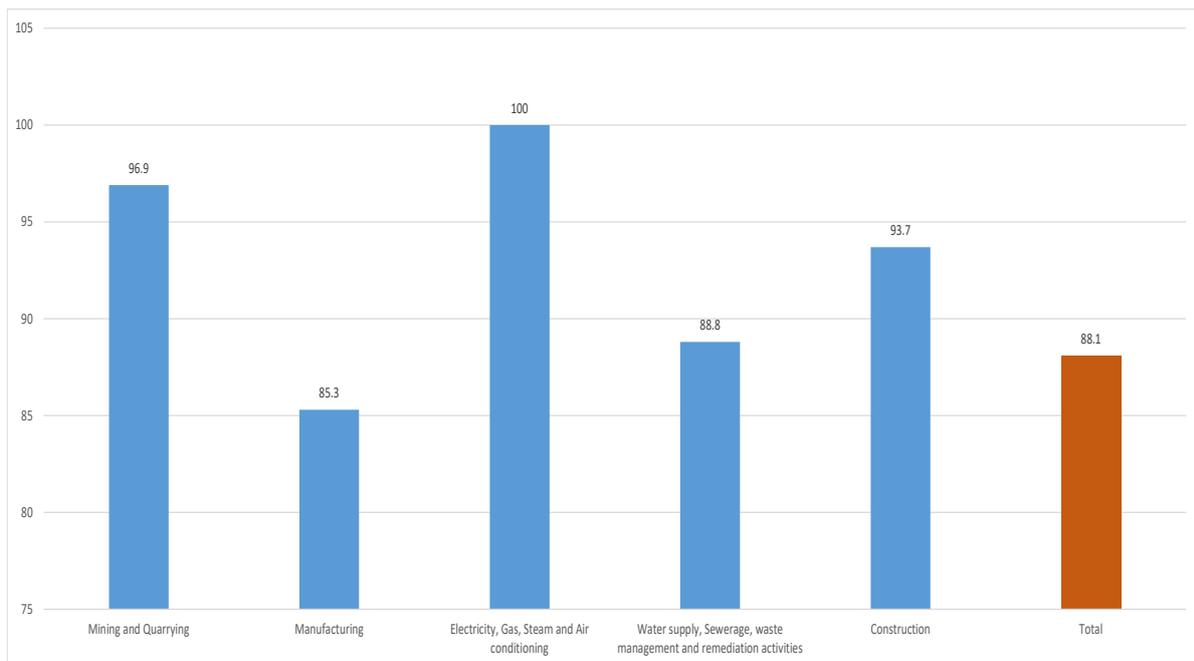
**Table 9.2: List of ICT Indicators**

	What they Measure	Indicator
<b>Selected Core Indicators</b>	Use of ICT services and Infrastructure	Proportion of Industries using computers
		Proportion of Industries using the internet
		Proportion of Industries using the internet by type of access (fixed and mobile broadband)
	Uptake of e-commerce by industries	Proportion of Industries receiving orders over the internet
		Proportion of Industries placing orders over the internet
		Proportion of Industries engaged in e-commerce
		Proportion of Industries not selling online, by type of barrier
<b>Other Indicators</b>	Cyber security in industries	Proportion of Industries that experienced online crime, by type
	Uptake of the 4th Industrial revolution	Proportion of Industries that are using the New Technologies
		Proportion of Industries that are plan to adopt the New Technologies in future, by type

### 9.3 Use of Computer

Industries have computers for various uses such as communication, controlling manufacturing equipment, monitoring etc. They also play key role in industries in efficient utilization of their resources. Figure 9.1 show the proportion of enterprises using computers as 88.1 per cent. The highest use of computers was reported in industries under Electricity, gas, steam and air conditioning while industries with the lowest proportion was reported in Manufacturing at 85.3 per cent.

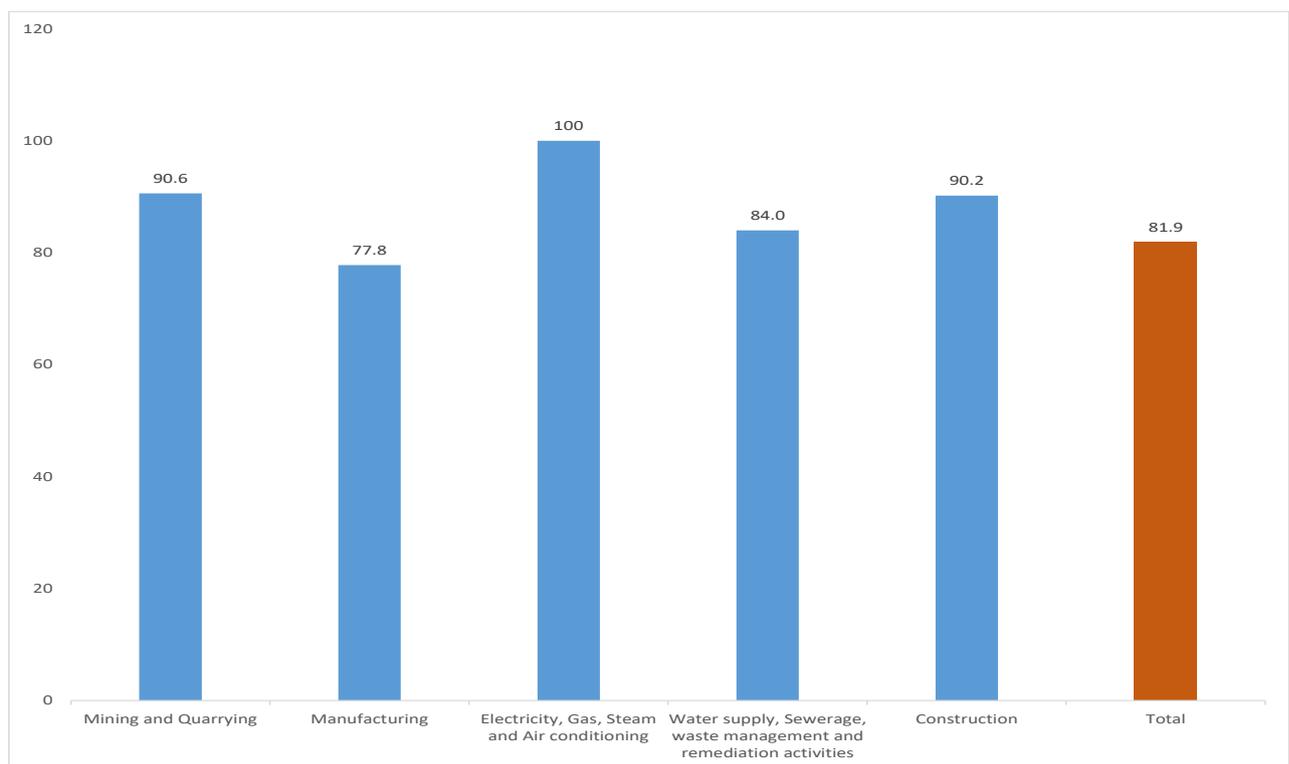
**Figure 9.1: Proportion of Industries using Computers**



## 9.4 Availability of Internet Infrastructure

Availability of internet plays a key role in information access and exchange, communication, marketing channel in e-commerce and similar e-business activities. The CIP established that 81.9 per cent of the surveyed industries had internet in their premises as shown in Figure 9.2. All industries under Electricity, gas, steam and air conditioning had internet in their premises followed by those under Mining and Quarrying at 90.6 per cent. Overall, only a paltry 18.1 per cent of the responding industries didn't have any type of internet connectivity in their premises.

Figure 9.2: Proportion of businesses with internet connection in their premises



## 9.5 Type of Broadband connection

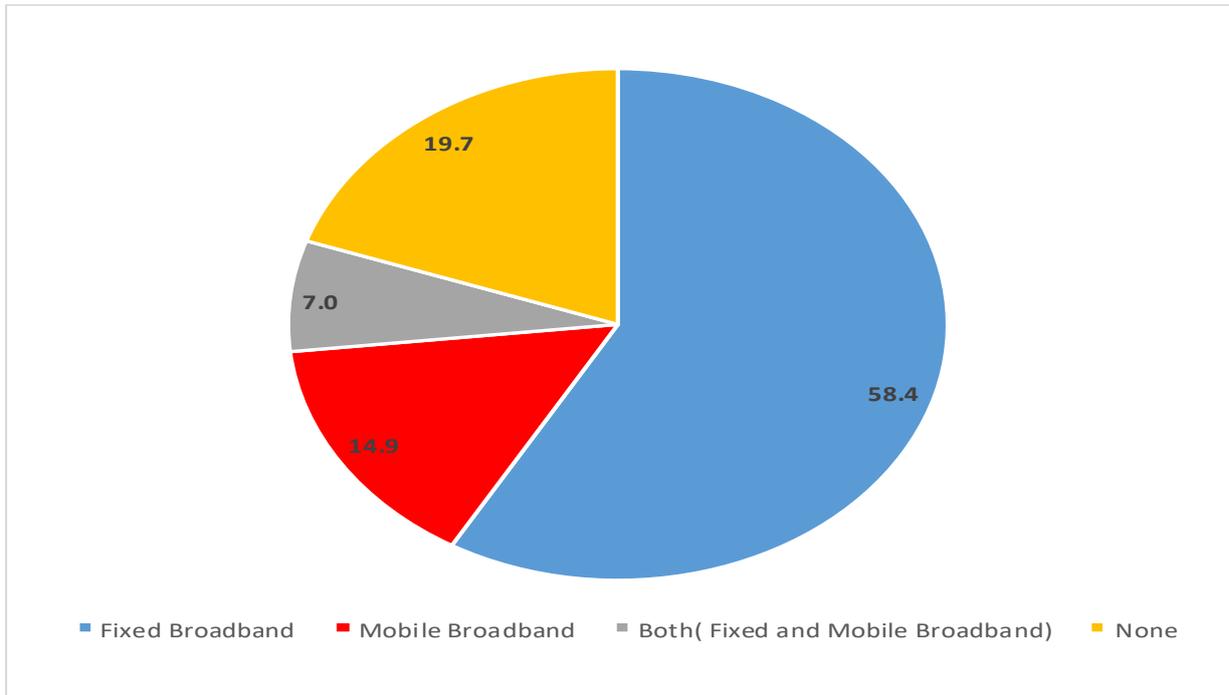
Broadband is defined as a transmission capacity that is faster than primary rate in Integrated Services Digital Network (ISDN) which is normally at 1.5 or 2.0 Megabits per second. Broadband is characterized through its pervasiveness in the economy, its constant evolution and improvement and its capacity to spawn new innovations. Its pervasiveness reflects a gradual transition to being a general requirement for a business premise, as is the case with other utilities like electricity connection. The two types of broadband include:

- a) Fixed broadband which entails cable modem, copper line, fiber to the office, satellite and fixed wireless
- b) Mobile broadband entails mobile phones and modems.

The census results show that overall, 58.4 per cent of industries connected to the internet through fixed broadband while 14.9 per cent connected through mobile broadband. Only 7.0 per cent of industries used both broadbands as shown in Figure 9.3. The high uptake of

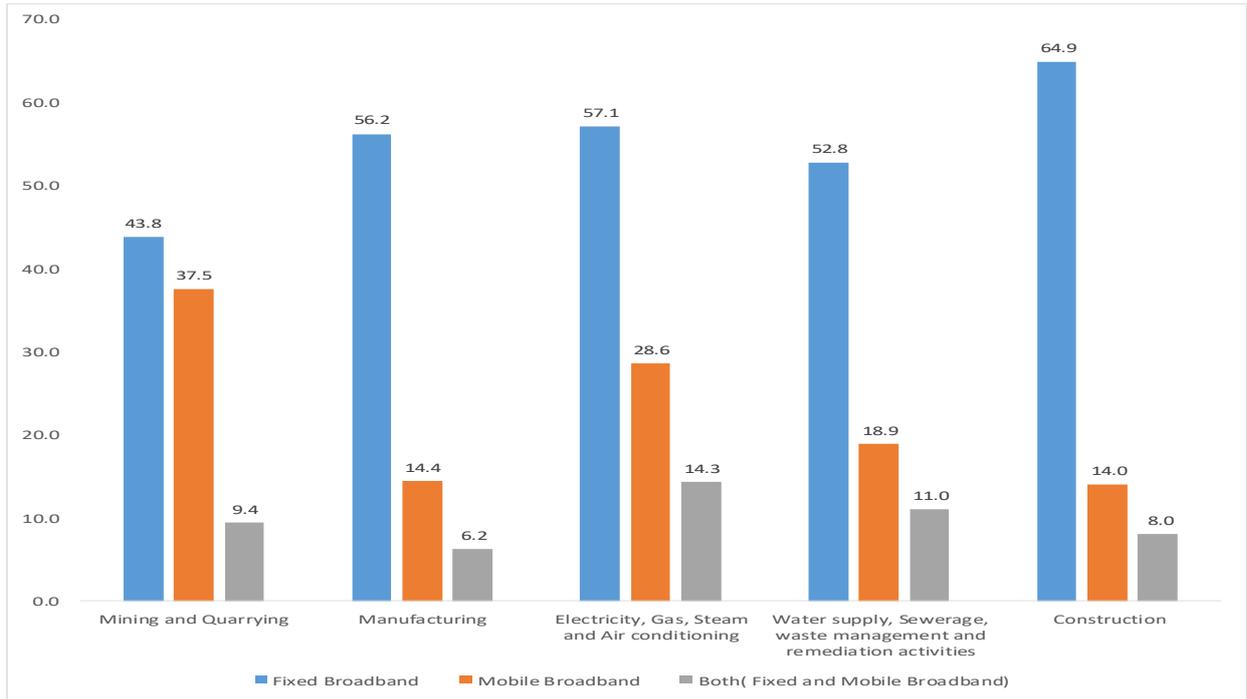
fixed broadband is as a result of the availability of fiber optic cables in the country and at affordable prices.

**Figure 9.3: Proportion of industries with broadband connection**



The use of fixed broadband generally should be optimized in major industries for maximum efficiency and stability. Construction sector had the highest use of broadband at 64.9 per cent followed by Electricity, gas, steam and air conditioning at 57.1 per cent.

**Figure 9.4: Proportion of Industries with Broadband, by Type**



## 9.6 E-commerce

E-commerce involves purchase or sale of goods or services via internet regardless on mode of payment and delivery. E-commerce is widely recognized as important in industries as they keep up with competition and demand from consumers. The report shows that out of all the industries interviewed, only 25.4 per cent of them engaged in e-commerce as shown in Figure 9.5. There is an opportunity for industries to engage in e-commerce for transactions, sales promotion as well as to lower their operational costs.

**Figure 9.5: Proportion of Industries engaged in e-commerce**

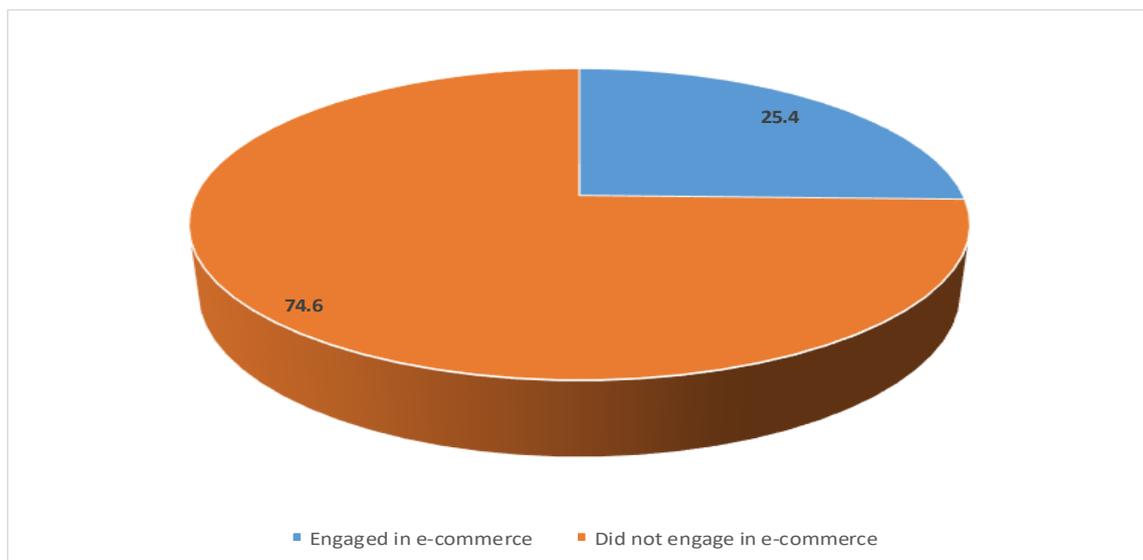
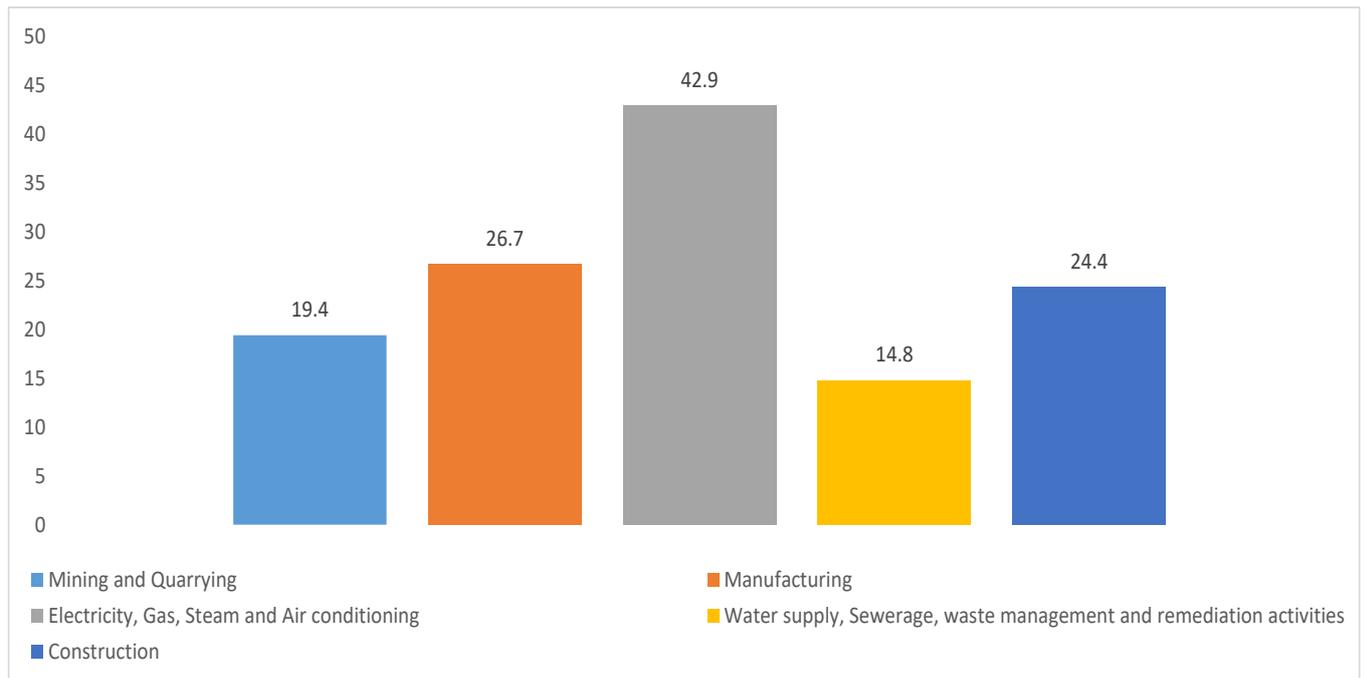


Figure 9.6 shows that Electricity, Gas, Steam and Air conditioning industry was ranked highest for engaging in e-commerce with 42.9 per cent followed by manufacturing at 26.7 per cent. Water supply, Sewerage, waste management and remediation activities industry had the lowest at only 14.8 percent of engaging in e-commerce among the industry players engaged in e-commerce.

**Figure 9.6: Proportion of Industries engaged in e-commerce, by Industry**

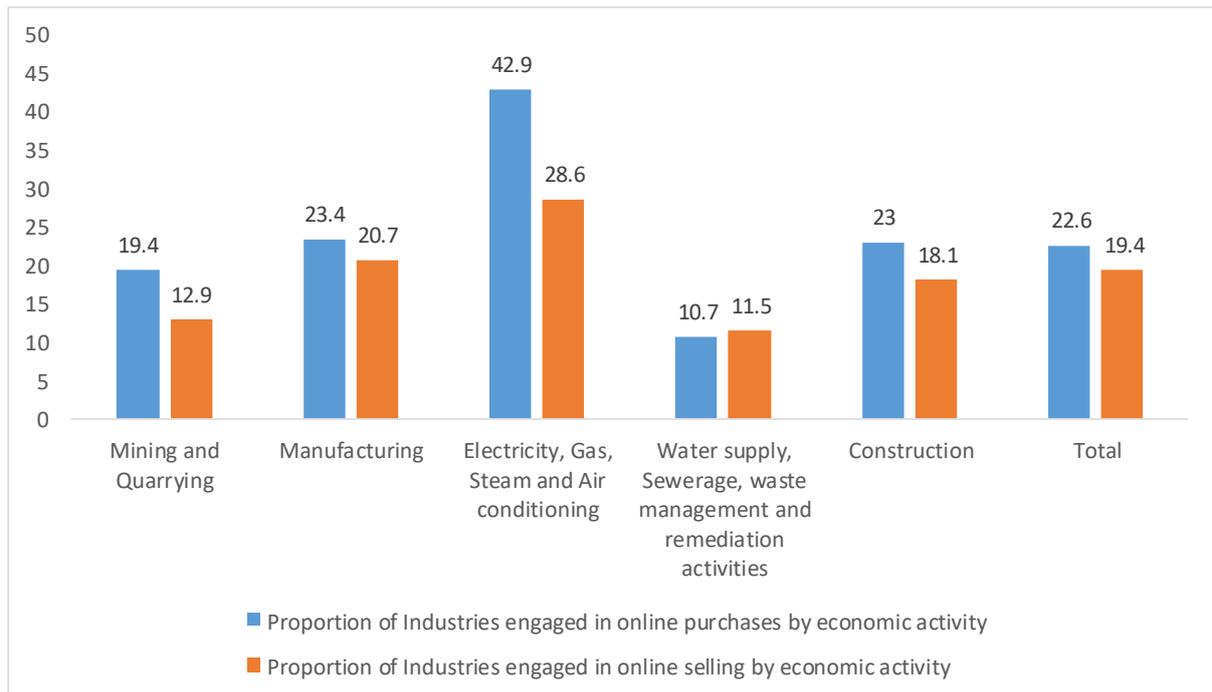


### 9.7 Uptake of Online Purchases and Sales

Figure 9.7 shows how industries engage in both online purchase and sale. The results show 22.6 per cent of the industries engaged in online purchases while 19.5 per cent engaged in online sales.

Out of the five sectors listed, Electricity, Gas, Steam and Air conditioning industry engaged most in online purchase and selling. The online purchase was at 42.9 per cent while sales online was 28.6 per cent. Manufacturing industry came second with 23.4 per cent online purchase and 20.7 per cent online sales. Water supply, Sewerage, Waste management and remediation activities industry engaged least in online purchase at 10.7 per cent and online sales at 11.5 per cent.

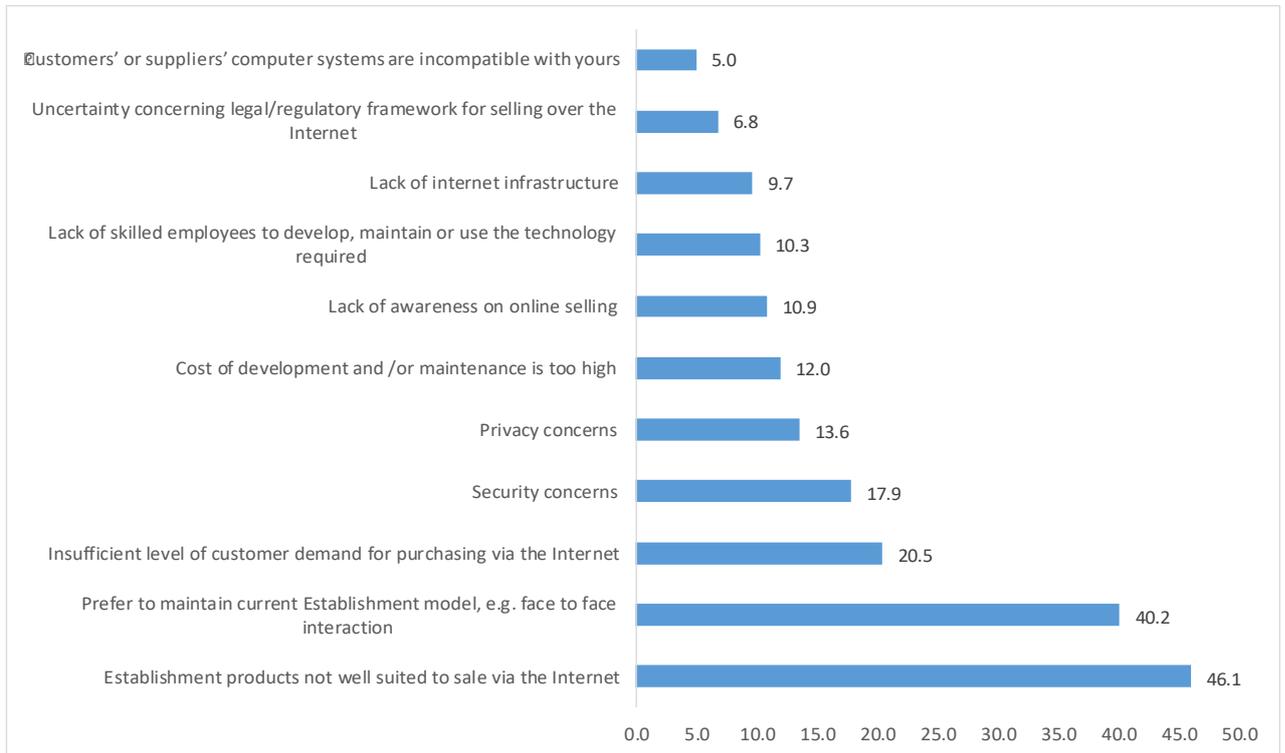
**Figure 9.7: Proportion of industries engaged in online purchase and sales**



### 9.8 Limitations of Online Selling

Most industries were unable to sell their products online even when the required infrastructure was available. The main reason limiting them was that their products were not well suited for sale via internet as cited by 46.1 per cent of establishment and the preference to maintain the traditional business model such as face to face which was reported by 40.2 per cent.

**Figure 9.8 Limitations of online selling**



### 9.9 Online Crime Experienced by Industries

Online crime which is also referred to as cybercrime refers to an offence committed through the use of computer systems, hardware and networks including hacking, phishing, identity theft and cyber bullying etc through internet. With the high uptake of Internet by industries, different types of cybercrime have also been on the rise. Figure 9.9 shows that overall, 16.9 per cent of industries were affected by computer virus followed by phishing and hacking at 3.6 and 3.5 per cent, respectively.

**Figure 9.9: Proportion of Industries that experienced online crime, by type**

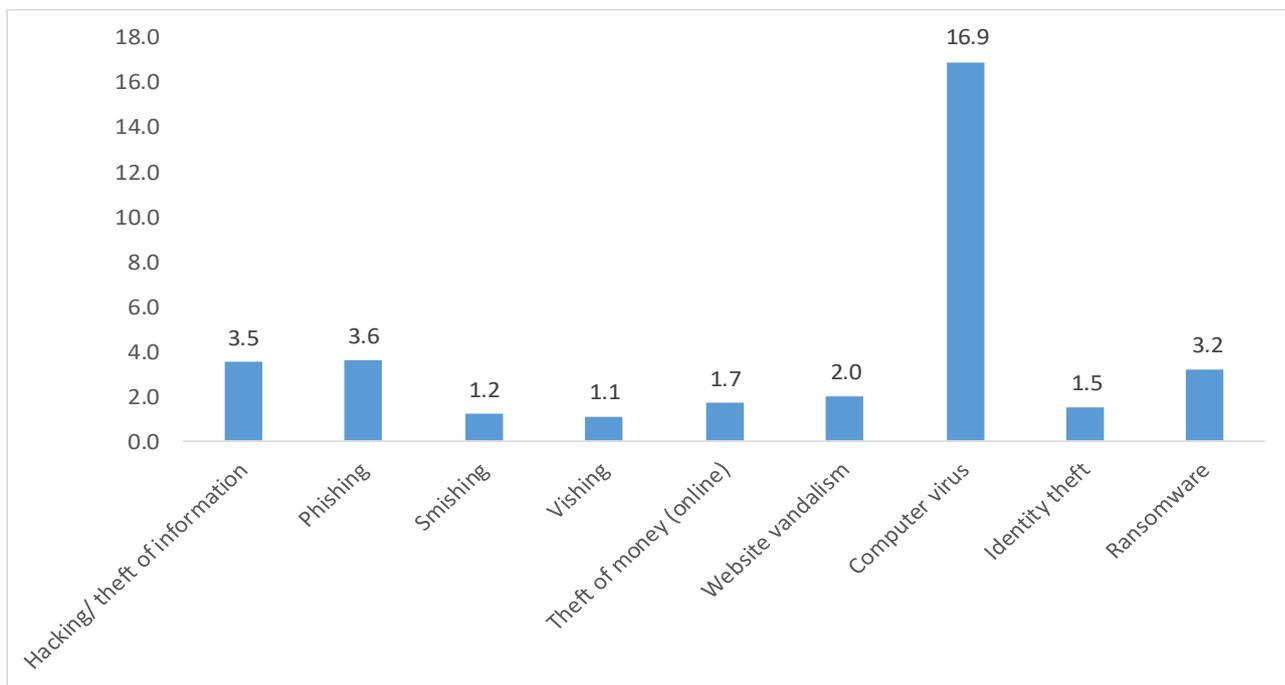


Table 9.3 shows the proportion of industries that experienced online crime in 2017 by economic activity. Generally, the industries that experienced hacking, phishing and ransomware were Construction (4.6 %), Manufacturing (3.9 %) and Water Supply, Sewerage, Waste management and remediation activities (5.4 %), while attacks by computer virus was reported in all industries.

**Table 9.3: Proportion of Industries that Experienced Online Crime, by Economic Activity**

Type of Online Crime	Mining and Quarrying	Manufacturing	Electricity, Gas, Steam, air conditioning	Water Supply, Sewerage, Waste management and remediation activities	Construction
Hacking/ theft of information	3.2	3.1	0.0	1.8	4.6
Phishing	3.2	3.9	0.0	3.6	3.0
Smishing	0.0	1.3	0.0	0.0	1.3
Vishing	0.0	0.8	0.0	2.7	1.5
Theft of money (online)	0.0	1.7	0.0	4.5	1.4
Website vandalism	0.0	2.2	0.0	2.7	1.4
Computer virus	12.9	18.2	14.3	16.1	14.5
Identity theft	0.0	1.3	0.0	2.7	1.8
Ransomware	0.0	3.4	0.0	5.4	2.5

### 9.10 New Digital Economy

The world today is focusing on the 4<sup>th</sup> industrial revolution or industry 4.0 which creates new digital economy powered by advanced cyber-physical systems spanning the advanced manufacturing, transportation, services and other systems. The term new digital economy frames on a set of technologies and processes that most prominently include: a) Advanced

production equipment, robotics and factory automation; b) new sources of data from mobile ubiquitous internet connectivity, c) cloud computing d) big data analytics e) artificial intelligence.

The fourth industrial revolution is characterized by the emergence of digital systems, networked communications, machine learning and large-scale data analysis that paves way for the advancement of technologies, such as autonomous vehicles, robotic, artificial intelligence, 3D printing, nano- and bio-technology, and quantum computing. The industry 4.0 is built on the infrastructure of the third, or digital, revolution that saw the availability of global digital communications, low-cost processing and high-density data storage, and an increasingly connected population of active users of digital technologies. It encompasses the combination of cyber-physical system, the Internet of Things, and the Internet of Systems which provides an enhanced and customized offering to help meet the needs of individuals and organizations that can adapt and evolve to changing situations and requirements over time.

The uptake of any form of New Digital Economy (NDE) stood at 39.7 per cent of the industries as illustrated in Figure 9.10. The forms of new digital economy measured included: robotics, artificial intelligence, internet of things, cloud computing, big data analytics, three-dimensional printing, digital payment systems, drones and block chains. The penetration of the NDE in Kenya is mostly favored due to the availability of affordable broadband, internet enabled devices, mobile money platform and the conducive environment of new technologies in the country. A number of foreign investors bringing in new technologies that are entailed in today's business model has also grown.

**Figure 9.10: Uptake of New Digital Economy**

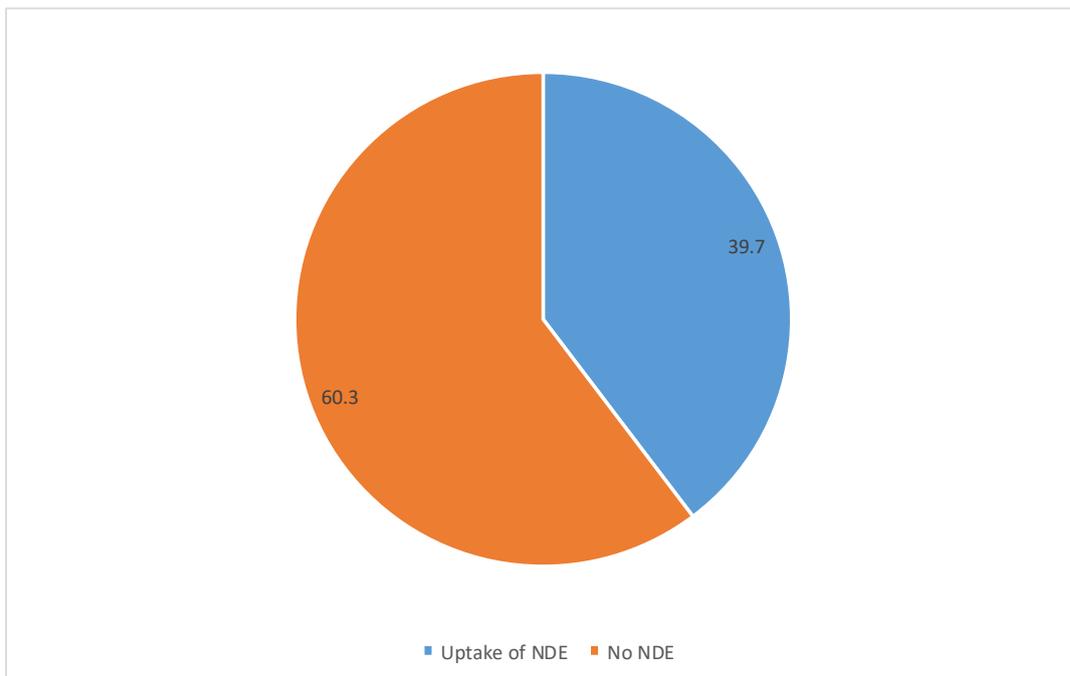
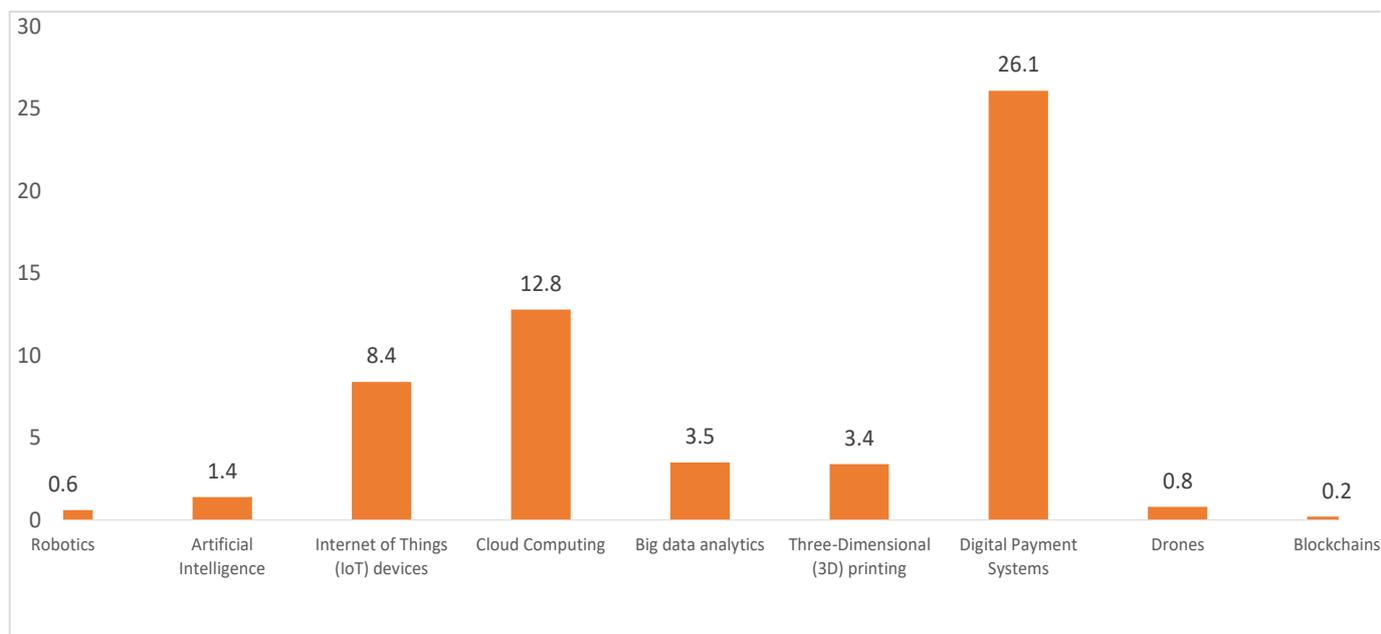


Figure 9.11 shows the type of emerging technologies that industries have adopted. The use of digital payments systems that include cashless payment systems such as the mobile

money platform and use of credit or debit card among the industries that responded constituted 26.1 per cent followed by use of cloud computing services at 12.8 per cent. The use of recent technologies such as block chains which entails cryptocurrencies and cryptographic, use of robotics and drones were used by less than 1 per cent of industries who had embraced NDE.

**Figure 9.11: Uptake of the 4th Industrial revolution, by type of technology**



### 9.11 Uptake of the new technologies by type of industries

Analysis of the uptake of the new technologies by type of industries show that robotics were mainly used by the Manufacturing and Construction industries while Artificial Intelligence was mainly used by Water Supply, Sewerage, Waste management and remediation activities (3.4 per cent) and Construction (3.5 per cent). Drones and Block chains technology was less used by the industries. Construction and Manufacturing firms were the only industries that used them.

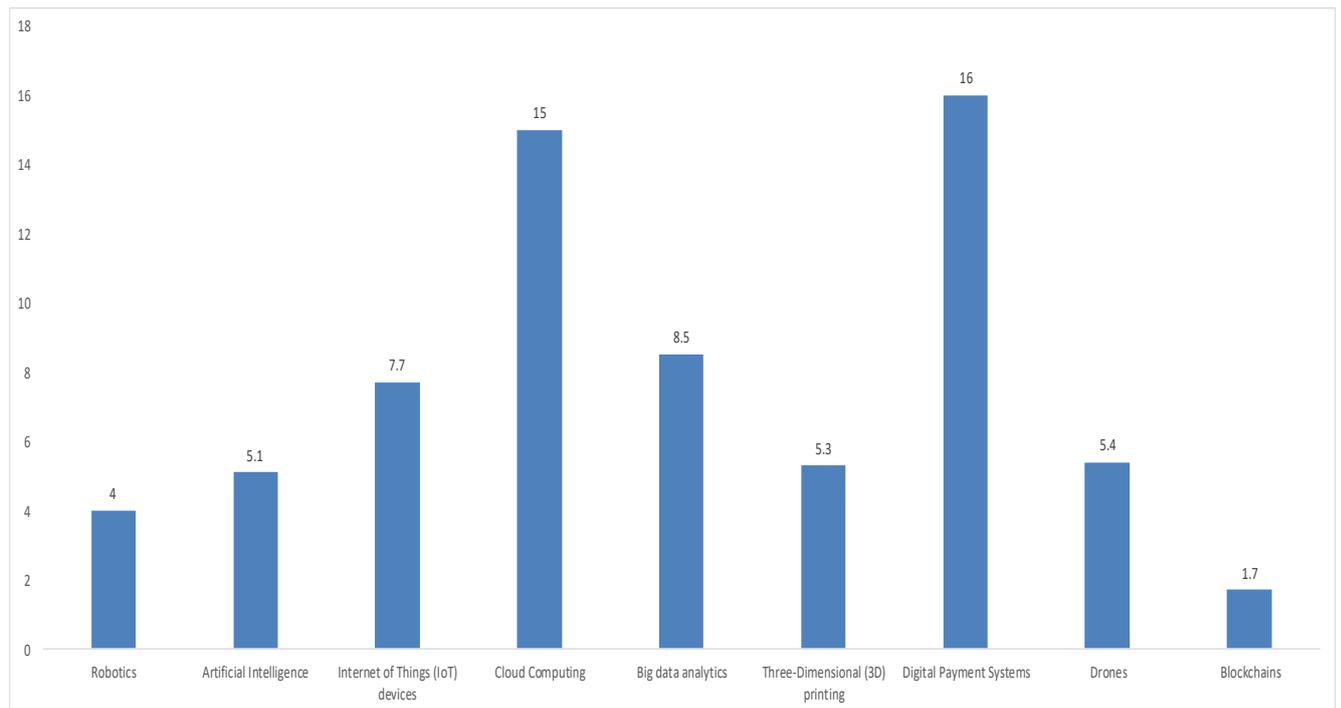
**Table 9.4: Proportion of industries using the 4<sup>th</sup> Industrial revolution technologies, by type**

Type of Technology	Mining and Quarrying	Manufacturing	Electricity, Gas, Steam, air conditioning	Water Supply, Sewerage, Waste management and remediation activities	Construction
Robotics	0.0	0.6	0.0	0.0	0.7
Artificial Intelligence	0.0	1.3	0.0	1.6	1.4
Internet of Things (IoT) devices	3.1	8.2	14.3	4.7	9.8
Cloud Computing	9.4	12.5	28.6	12.6	13.6
Big data analytics	3.1	3.7	14.3	3.1	3.0
Three-Dimensional (3D) printing	0.0	2.8	0.0	3.1	5.0
Digital Payment Systems	21.9	27.0	42.9	27.6	24.0
Drones	0.0	0.7	0.0	0.0	1.3
Blockchains i.e. Cryptocurrency, Cryptographic	0.0	0.1	0.0	0.0	0.4

### 9.12 Adoption of New Technologies in the Future

Plans to adopt new technologies in the next three years show the willingness industries have in using the emerging technologies in their business model. This shows that industries are increasing their focus on these emerging technologies to help them transform their business hence adopting the 4<sup>th</sup> industrial revolution. The Census show that an additional of 16.0 per cent of industries will adopt digital Payment systems followed by 15.0 per cent who plan to adopt cloud computing services while big data analytics came third with 8.5 per cent of firms planning to adopt these technologies in the next three years.

**Figure 9.12: Use of New Technologies in the Future**



Analysis on the use of emerging technologies by type of industry show that 15.6 per cent of Mining and Quarrying and 16.8 per cent of Manufacturing would adopt digital payment systems while 28.6 per cent of Electricity, Gas, Steam, air conditioning plan to adopt drones in their business model.

**Table 9.5: Use of New Technologies in the Future, by industry**

Type of Emerging Technologies	Mining and Quarrying	Manufacturing	Electricity, Gas, Steam, air conditioning	Water Supply, Sewerage, Waste management and remediation activities	Construction
Robotics	0.0	4.6	0.0	1.6	3.3
Artificial Intelligence	0.0	4.6	0.0	8.7	5.8
Internet of Things (IoT) devices	3.1	7.7	0.0	9.4	7.9
Cloud Computing	3.1	15.3	0.0	16.5	14.8
Big data analytics	3.1	8.9	0.0	10.2	7.6
Three-Dimensional (3D) printing	9.4	5.0	14.3	0.8	6.4
Digital Payment Systems	15.6	16.8	14.3	12.6	14.8
Drones	9.4	2.7	28.6	3.9	11.1
Blockchains i.e.Cryptocurrency, Cryptographic	3.1	1.6	0.0	0.8	1.8