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# **RESEARCH ON FAILURE AND COLLAPSE OF BUILDINGS IN KENYA**

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## ACRONYMS AND ABBREVIATIONS

AAK	-	Architectural Association of Kenya
ABMTs	-	Alternative Building Materials and Technologies
ACPs	-	Architectural Consultancy Practice
BAM	-	Board of Architects of Malaysia
BCA	-	Building and Construction Authority
BEM	-	Board of Engineers
BORAQs	-	Board of Registration of Architects and Quantity Surveyors
BIM	-	Building Information Modelling
CAD Fund	-	China-Africa Development Fund
CCC	-	Certificate of Completion and Compliance
CORENET	-	Construction and Real Estate Network
CSC	-	Certificate of Statutory Completion
DOSH	-	Directorate of Occupational Safety and Health
ECPs	-	Engineering Consultancy Practice
EMCA	-	Environmental Management and Coordination Act
EPS	-	Expanded polystyrene technology
EU	-	European Union
FDTCP	-	Federal Department of Town and Country Planning
GDP	-	Gross Domestic Product
HABRI	-	Housing and Building Research Institute
JBCC	-	Joint Building and Construction Council
KBRC	-	Kenya Building Research Center
KIRI	-	Kenya Industrial Research Institute
KNBS	-	Kenya National Bureau of Statistics
KRA TI	-	Ministry of Science, Technology and Innovation
NBI	-	National Building Inspectorate
NCA	-	National Construction Authority
NDMU	-	National Disaster Management Unit
NHC	-	National Housing Corporation
NUDP	-	National Urban Development Policy
OCPD	-	Officer Commanding Police Divisions
OSC	-	One Stop Center



PBI	-	Public Building Inspectors
PBT	-	Pihak Berkuasa Tempatan (Local Authority in Malaysia)
PPRB	-	Physical Planners Registration Board
PSP	-	Principal Submitting Person
QP	-	Qualified Person
REITs	-	Real Estate Investment Trusts
ROK	-	Republic of Kenya
RSS	-	Registered Site Supervisors
RTO	-	Research and Technology Organization
SOPs	-	Standard Operating Procedures
SSPS	-	Safaricom Staff Pension Scheme
TOP	-	Temporary Occupation Permit
UBBL	-	Uniform Building By-Law
URA	-	Urban Redevelopment Authority
VDC	-	Virtual Design and Construction

## DEFINITION OF TERMS

**Building** - Any structure or erection and any part of any structure or erections of any kind whatsoever whether permanent, temporary or movable and whether completed or uncompleted.

**Building codes** - Standards and requirements for construction, maintenance, and occupancy of buildings in the interest of health, safety, and welfare of the public.

**Building collapse** - Failure of a structure or component to maintain its structural integrity.

**Building control** - Process of ensuring that the construction work on a site is according to approved plan and meets the applicable requirements in building laws and regulations.

**Building failure** - Malfunction of the building performance in respect to the functionality, structural integrity, energy consumption, environmental protection etc.

**Building inspection** - An activity carried out by Building Inspectors to determine if the building and site is in proper condition, and if they conform to the applicable or specified requirements.

**Building inspector** - A person who is employed by either a city, township or county and is usually certified in one or more disciplines qualifying them to make professional judgment about whether a building meets building code requirements.

**Building material** - Any material which is used for construction purposes. Many naturally occurring substances, such as clay, rocks, sand, and wood, even twigs and leaves, have been used to construct buildings.

**Building occupation certificate** - This is a document issued by a County Government certifying a building complied with applicable building codes and other laws, and indicating it to be in a condition suitable for occupancy.

**Building permit** - Formal approval of building plans by the designated County Government as meeting the requirements of prescribed codes. It is an authorization to proceed with the construction or reconfiguration of a specific structure at a particular site, in accordance with the approved drawings and specifications.

**Building professional** - An academically trained specialist and statutorily registered professional responsible for Building, Planning, Designing and Production Management, Construction and Maintenance of Buildings for the use and protection of mankind and his assets.

**Competent person** - A person with relevant qualifications and experience for a specific assignment.

**Construction worker** - An artisan, laborer, or professional employed in the physical construction of the built environment and its infrastructure. They are responsible for a number of on-site tasks, such as removing debris, erecting scaffolding, loading and unloading building materials, and assisting with operating heavy equipment.

**Contractor** - In construction, a contractor is an organization (or sometimes a person), hired by the client to carry out the work that is required for the completion of a project. He or she is responsible for the day-to-day oversight of a construction works at a site.

**Development Control** - The process of managing or regulating the carrying out of any works on land or making of any material change. The use of any land or structures and ensuring that operations on land conforms to spatial development plans as well as policy guidelines, regulations and standards issued by planning authority.

**Geotechnical survey** - The first step in the construction or consolidation of a site. It includes information about soil consistency and structure, groundwater level and recommendations for the technical project.

**Material test** - Measurement of the characteristics and behaviour of such substances as metals, ceramics, or plastics under various conditions.

**Safe building** - These are buildings that meet set standards and are structurally sound.

**Sick building** - Describe situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified.

**Structural integrity** - Ability of a structure to support a designed structural load without breaking or deforming.



## PREFACE

The contribution of the construction sector to the economy of Kenya is both substantial and critical, with a registered growth of up to 6.3% in 2018. The industry is an indicator of the economic performance of the country and is linked with other sectors, which have corresponding demands for materials and labour inputs. Construction is critical for trade, facilitating flow of materials and information, reducing inequalities and poverty and enhancing economic development. The need for quality in the construction process and resultant products can therefore not be overemphasized.

Erection of poor quality structures in Kenya is an occurrence observed from the mid 1990s. Some of the structures fail in their functionality while others fail to the extent of physical collapse in the process of construction or usage. The building failures in the recent past have brought with them a lot of unnecessary anguish. This is why the government continually institutes measures to exterminate this incidence. One such measure is research.

Research work in this subject area is necessary for establishment of the truth regarding building failure and/or collapse – the nature, levels, determinants and effective solutions. These findings should help design and implement a consultative way forward.

Thus, this study by the National Construction Authority on building failures and collapses in Kenya is a major milestone towards enhancement of the regulatory control of our domestic construction industry and a significant contribution to knowledge in the discipline of construction management.

This research output is timely, coming at a time when the National Government is putting in place an enabling environment to facilitate the development of 500,000 housing units countrywide by the year 2022. Effective implementation of the recommendations of the study will positively affect both the existing stock of buildings and the proposed building developments, ensuring that they are of good quality and that they meet the acceptable standards.

I commend NCA for having undertaken this study, and I urge us all to internalize what is presented herein.

**MAJOR GEN. (RTD.) DR. GORDON KIHALANGWA, CBS**  
**PRINCIPAL SECRETARY,**  
**State Department of Public Works**

## FOREWORD

The National Construction Authority (NCA) is mandated to undertake or commission research into any matter concerning the construction industry. Since its inception, the Authority has developed research priority areas through a stakeholder-driven process called the National Construction Research Agenda (NaCRA). The quality of constructed structures is a cross-cutting issue in a number of the research themes, hence the conceptualization and execution of this research study.

As the industry regulator, NCA has worked tirelessly to enhance the quality of the built environment, through the registration of projects, quality assurance checks across the country and building the capacity of contractors and construction workers. However, structural failures and collapses remain major challenges in the construction industry. The frequency of their occurrence and the magnitude of the consequent losses - in terms of lost lives, destroyed properties, and a damaged image of the industry - are worthy of research inquiry, to be followed by concerted action towards making structural collapses a thing of the past.

In this report, there is consensus amongst the industry players that duplicity and overlap of development control functions spread over various government agencies, coupled with poor coordination of professionals, are the main underlying causes of structural failures and collapses in Kenya. There is therefore, an urgent need to establish a synchronized overarching institutional framework in order to enhance team synergies for a more productive and efficient industry.

From the Report, three salient policy recommendations can be highlighted, as follows: (1) Adoption of a one-stop shop for development approvals and the associated revenue collections. Such a move would reduce the approval delay and spur vibrancy in the construction industry; (2) Technical capacity in the industry should be boosted through increased institutional resources in financing as well as structured capacity building in order to grow numbers of construction professionals, contractors, technicians and artisans in the industry. In this regard, benchmarking with international best practices would greatly advance local skills for uptake of modern technologies and use of alternative local materials to strengthen the industry's capacity for internal audits to rein on lethargy and corruption. And finally; (3) A review of the NCA Act 2011 and its regulations, and anchoring of various building regulations in the same Act.

In a nutshell, the Report underscores the need for the enhancement of regulatory control of the construction industry. I invite the industry stakeholders to take an in depth look at the report, so that we can collectively establish an effective approach for a well regulated and developed construction industry in Kenya.

**QS. DAVID GAIHO**  
**CHAIR, NCA BOARD**

## **WORD FROM THE EDITOR**

The Research on failure and collapse of buildings in Kenya is timely and this publication is important as it comes when Kenya is reforming the construction industry with a view of eliminating incidences of collapsing buildings.

This edition was largely guided by the research undertaken by the National Construction Authority (NCA) in 2018 and also benefitted from additional secondary literature that included best practices in construction industry including United Kingdom, Malaysia, Singapore, and Canada. This publication also benefited immensely from the input from NCA research team and the input from the validation workshop that brought together various stakeholders from the industry.

The publication has exhaustively highlighted the key issues that ail the industry and outlined several recommendations that we believe if implemented in its entirety will provide policy direction that will achieve a quality building environment and more importantly and place Kenya's construction industry among the best in the world.

The editorial team appreciates all the support it received that led to successful completion of this publication.

**Professor Robert Rukwaro PhD**  
**Chief Editor**  
**Waaki Associates**

## WORD FROM EXECUTIVE DIRECTOR

According to the Building Audit Report of 2015, in 1980's and early 1990's Kenya had almost zero cases of collapsing buildings, perhaps due to the fact that the then Cities, Municipalities and County Councils did the actual construction of all major residential and commercial structures in the cities and towns. However, as demand fueled by rural - urban migration and population growth increased exponentially, the industry found itself faced with haphazard development underscored by lack of professional capacity to support the same.

Today, building collapses remain a harsh and troubling reality. There is a management challenge at the industry level: Particularly, the regulatory system lacks harmony. Consequently, promising strategies of individual regulators result in collective folly. As pointed out by many industry players who participated in this study, this lack of coordinated regulatory efforts has led to proliferation of quacks – in consultancy and contracting - in the industry. This study is not just timely; it is critical for the growth and development of construction in the country.

In conceptualizing the study, the Authority considered a number of important documents to ensure that the research work is anchored on the current government policies, national development plans and the law. The Authority also took cognizance of both the internal and external environment that it operates in and incorporated contributions from the relevant stakeholders. Therefore, this research was comprehensive and conducted by a competent team whom I must appreciate. The NCA research and business development department working in partnership with by Prof. Rukwaro (UON), Dr. T. Kivaa & Dr. Arch. Mugwina (JKUAT), Dr. Eng. P. Murigi (KU) and Dr. Eng. Muthumbi (UON) reached out to all information sources for a comprehensive work.

I am happy that given the consultative process we went through in executing this research, there is common understanding, common ownership and common commitment to the implementation of the study recommendations. As the Executive Director, I commit to remain the primary custodian and driver of the implementation process. What this industry needs is cohesiveness, synergy and a unifying policy that provides guidance to all relevant agencies taking into account the individual and collective mandate.

The implementation of the recommendations in this research will enhance regulatory control of construction activity at project, firm and sector levels across the country, which will ultimately lead to the attainment of our vision- a well- coordinated and developed construction industry!

**ENG. MAURICE AKECH**  
**EXECUTIVE DIRECTOR**  
**NATIONAL CONSTRUCTION AUTHORITY**



## EXECUTIVE SUMMARY

The construction industry is an important part of the economy of Kenya and is one of the drivers of economic growth. It is part of the major pillars of Vision 2030 that seeks to increase the country's contribution to Gross Domestic Product by at least 10% and propel Kenya towards becoming Africa's industrial hub. In 2018, the industry contributed 5.4% of Gross Domestic Product (KNBS, 2018). According to Economic Survey, 2019, the sector employed 334,600 persons both in the public and private sector.

In the last three decades, the sector has been characterized by unsafe buildings that are dangerous for human habitation. Over 100 cases of building collapses have been recorded in Kenya since 1990. An audit of 14, 895 buildings by the NBI revealed that 723 are very dangerous, 10,791 are unsafe, 1217 are fair and 2194 are safe. It is estimated that over 200 people have lost their lives since the first building collapsed in 1990, with thousands injured. The economy has equally lost over Kshs 2.4 billion worth of investments.

In a bid to address the inherent issues in the sector, National Construction Authority in 2018 commissioned a Research Study on Failure and Collapse of Buildings in the Construction Industry in Kenya. The key objective of the research was to investigate failure and collapse of buildings in Kenya, for the purpose of enhancing regulatory control of construction activity at the site, project, firm, industry and Government levels in the country. This report therefore presents synthesized information on the research including findings and proposed remedies. The information is presented under the following thematic areas: Review of Legal and Institutional Framework; Review of Best Practices; Construction and Devolution; Inputs for Effective Construction Industry; Causes of Failure and Collapse of Buildings; Proposed Solutions and; Monitoring and Evaluation.

This report establishes that the main causes of building failures are; poor workmanship, use of substandard materials, poor structural design and inadequate maintenance and non-compliance with statutory requirements.

The reviewed best practices from United Kingdom, Malaysia, Singapore, and Canada revealed that construction sector has been managed effectively and has such recorded few cases of building failures. Approval of buildings are carried out through one stop center, Development Control and Building Control are distinct though interdependent. External parties, mainly the professionals, have been enlisted in the supervision and inspection of construction works and in other jurisdictions to check the building design adequacy. Specific building works of certain value have specific number of site supervisors. Design and production are integrated in the early stage of building process to allow sufficient time for the parties to plan and adopt the most productive construction methods that enhance constructability of the development project. Contractors are required to undergo training and examinations in technical and managerial aspects of construction before being licensed. Contractors are required to have a construction log book to record daily construction activities which should be approved by project consultants.

In light of the foregoing, the report recommends that for the building failures in Kenya to be addressed, there is need to incorporate use of accredited checkers during the design stage and building control inspectors during supervision. These inspectors shall file inspections reports with the Enforcement and Compliance department for review and further action. Furthermore, geotechnical surveys should be made mandatory. This shall ensure that the design incorporates physical characteristics of construction sites. There is need for continuous supervision on contractors' works to be made mandatory and smart, whereby approvals for all stages by the design team and approving authorities should be required. In this respect, approval milestones should be so well defined that contractor should not be allowed to move forward without all the necessary approvals just like in Singapore, Malaysia and United Kingdom. An ideal model of monitoring and evaluation of building failures as well as no implementation matrix in report has been proposed in the report.

In conclusion, the report is a useful source of information to the National Government, County Governments, research and training institutions and other relevant stakeholders in addressing the problem of collapsing buildings.

# CHAPTER ONE: INTRODUCTION TO CONSTRUCTION INDUSTRY

## 1.1 Contribution of Construction Industry to National Economy

The construction industry is an important part of the economy of Kenya and is one of drivers of economic growth. The sector provides the buildings and infrastructure on which virtually every other sector depends. It is a key enabler to the pillars of Vision 2030 that seeks to increase its contribution to Gross Domestic Product by at least 10% (ROK, 2007) and propel Kenya towards becoming Africa's industrial hub. In 2018, the industry contributed 5.4% of Gross Domestic Product (KNBS, 2018) and expanded by 6.3% from a revised growth of 8.5% recorded in 2017 (KNBS, 2019). It is a major source of employment since for every 10 jobs directly related to a construction project, another 10 jobs are created in the local economy (Pricewaterhouse Coopers, 2013). According to Economic Survey (2019), the wage employment expanded by 2.2 per cent from 167.9 thousand persons in 2017 to 171.6 thousand persons in 2018. Private sector employment increased from 159.4 thousand persons in 2017 to 163.0 thousand persons in 2018. The sector has high potential to create more employment opportunities and stimulate growth in other sectors including Tourism and Agriculture.

## 1.2 Key Economic Indicators in the Construction Industry

Construction industry has been thriving for the past four years. Table 1.1 shows the index of the key economic indicators in the construction industry from 2014 to 2018. From the Table, the index of reported private building works completed in Nairobi City County increased by 5.3% from 443.1 points in 2016 to 466.8 points in 2017.

**Table 1.1:** Selected Key Economic Indicators in the Construction Sector in Nairobi County, 2014-2018

1982 = 100

Indicator	2014	2015	2016	2017	2018
Index of reported private building works completed in Nairobi City County	369.4	409.3	443.1	466.8	
Index of reported public building works completed in major towns	106.1	112.6	69.2	59.4	57.9
Index of government expenditure on roads	263.4	350.3	462.8	388.0	460.9
Index of employment	220	245	269.9	277.1	284.1
Cement consumption ('000 Tonnes)	5,196.7	5,708.8	6,310.1	5,857.9	5,948.7
Private employment ('000 persons)	125.3	140.2	155	159.4	163.0
Public employment ('000 persons)	7.6	7.9	8	8.5	8.6
Loans and advances from commercial banks to the sector (Kshs. Million)	80,406.00	107,842.60	104,825.80	111,985.2	114,014.9

\*Provisional

Source: KNBS, 2018

## 1.3 Urbanization and Construction Industry

Urbanization has also been a major driver in the growth of construction sector in Kenya. The rate of urbanization in Kenya has been rapid with an estimated 32.8% of its population living in urban centers

by 2014 (World Bank Report, 2015). It is estimated that this figure will be 60% by 2030 due to the rural urban migration fueled by search for employment and better living conditions (ROK, 2007). With this high rate of urbanization, a high demand for housing and related amenities is expected.

#### **1.4 Building Failure and Collapse in the Construction Industry**

The above notwithstanding, the construction industry has been under immense pressure to not only deliver housing and related infrastructural facilities, but also to guarantee safe built environment. This is more so because building failure is one of the dominant challenges facing the industry in Kenya. As discussed in detail in Chapter Seven (section 7.3) of this report, existing documented evidence available to National Construction Authority (NCA) shows that building collapses increased in frequency and severity from 1 in 1996 to over 20 in 2015. This has previously been attributed to a myriad of factors, including inadequate regulatory framework, unethical practices among others as discussed in detail in this report.

#### **1.5 Effects of Building Failure and Collapse on Economy**

Cases of building failure result in serious negative consequences to the economy and the socioeconomic fabric of society. It is estimated that over 200 persons have lost their lives from 1990 to 2019 in the documented cases of building failure and collapse. The economy has lost over Kshs. 2.4 billion due to building failure and collapse (NCA, 2018). This notwithstanding, the value of the loss could be higher because most the buildings that collapsed were not insured.

In view of the above-outlined consequences, elimination of failure and collapse of buildings in Kenya is a matter of national concern that requires urgent interventions. Significant efforts, though piecemeal, have been put into place to address the existing concerns. Nonetheless, as exemplified in this report, the efforts to address the problems of failure and collapse of buildings remain abundant.

#### **1.6 Observations**

- a) Building and Construction industry is a significant sector to Kenya's economy. The Government has laid down through the Vision 2030 its intention to support the sector achieve maximum returns.
- b) Vision 2030 identified need for a Framework for enhanced construction industry performance that strengthens the capacity of Kenya's construction industry.
- c) Failure and collapse of buildings have been identified as key impediments in the development of the construction industry.
- d) There is no central depository for data on failure and collapse of building in Kenya making it difficult to postulate economic impact of building failures in the Kenya.
- e) Insuring buildings should be made mandatory to cater for any eventualities. Insuring buildings would also facilitate access to historical data from insurance companies on failure and collapse of buildings especially on the value of the relevant investments.

## CHAPTER TWO: LEGAL AND INSTITUTIONAL FRAMEWORK

### 2.1 Policy Framework

Legal framework, which is largely existing laws, policies and regulations is backbone to a safe built environment. The framework define the operating environment and standards for compliance. This chapter presents existing policies and laws governing the sector, examines their adequacies, or lack of them, to address building failures in Kenya.

The above notwithstanding, the following are relevant policies that relate to Construction industry:

- a) Construction Industry Policy of 2019
- b) National Urban Development Policy (NUDP) Sessional Paper No. 2 of 2016
- c) National Housing Policy Sessional Paper No. 3 of 2004
- d) National Environment Policy of 2013
- e) National Building Maintenance Policy Sessional Paper No. 2 of 2015

#### 2.1.1 Draft Construction Industry Policy of 2019

The Construction industry in Kenya does not have a comprehensive policy and as such the Sector is regulated by a multiplicity of laws, which has left the sector exposed. The Construction Policy is still in draft stage. Kenya Vision 2030 identifies urgent need and significance of developing the policy to guide the industry towards enhanced construction industry performance and strengthened capacity.

#### 2.1.2 National Urban Development Policy (NUDP) No. 2 of 2016

NUDP is guided by Article 184 of the 2010 Constitution (ROK, 2010) that provides for governance and management of urban areas and cities. It is also guided by the Kenya Vision 2030. It was formulated to create a framework for sustainable urban development in the country and addresses the following thematic areas: urban economy; urban finance; urban governance and management; national and county urban planning; land, environment and climate change; social infrastructure and services; physical infrastructure and services; urban housing; urban safety and disaster risk management; and marginalized and vulnerable groups. It seeks to integrate urban and rural development in a mutually beneficial relationship (Nabutola, 2012).

#### 2.1.3 National Housing Policy Sessional Paper No. 3 of 2004

This policy aims at; enabling the poor to access housing and basic services and infrastructure necessary for a healthy living environment especially in urban areas; promoting and funding of research on the development of low cost building materials and construction techniques; harmonizing existing laws governing urban development and electric power to facilitate more cost effective housing development and facilitating increased investment by the formal and informal private sector in the production of housing for low and middle-income urban dwellers.

### 2.1.4 National Environment Policy of 2013

The policy pursues better quality of life for present and future generations through sustainable management and use of the environment and natural resources. Its objectives are to: provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources; strengthen the legal and institutional framework for good governance, effective coordination and management of the environment and natural resources; promote and support research and capacity development and; promote and enhance cooperation, collaboration, synergy, partnerships and participation in the protection, conservation, sustainable management of the environment and natural resources.

### 2.1.5 National Building Maintenance Policy, Sessional Paper No. 2 of 2015

The policy establishes framework for maintenance of building fabrics, services, sites, and grounds, cultural and historical sites, monuments and museums. It also seeks to promote health and safety measures within buildings and associated infrastructure. It empowers relevant agencies with necessary mandate and information for monitoring condition and the performance of buildings.

## 2.2 Relevant Laws Relating to Construction Industry

Table 2.1 presents the key legislations that relate to Kenya's building and construction industry. An analysis of their respective scope and the gaps therein has also been presented to inform the required policy priorities.

**Table 2.1: Legal Framework**

Law	Relevance to construction Industry	Identified gaps
National Construction Authority Act 2011	<ul style="list-style-type: none"> <li>This is an Act of Parliament that provides for the establishment, powers and functions of the National Construction Authority and for connected purposes.</li> <li>The Act establishes the National Construction Authority to oversee the construction industry and coordinate its development.</li> </ul>	<ul style="list-style-type: none"> <li>The provisions of the Act do not recognize role played by other actors in the Construction industry, including County Governments.</li> <li>The Act addresses limited aspects of building and construction process that leads to building failure i.e. registration and regulation of contractors and construction workers.</li> <li>The Act does not explicitly control building materials. For instance, unlike Construction Industry Development Board of Malaysia, it does not have a mandate over materials used by contractors.</li> <li>It also does not give the Authority investigative and prosecutorial powers to enforce their own regulations.</li> </ul>
Physical and Land Use Planning Act 2019	<ul style="list-style-type: none"> <li>The Act makes provisions for planning, use, regulation and development of land.</li> <li>It requires building plans to be subject to development control process to ensure that they meet parameters of user, siting, elevations, design, among others.</li> <li>County Governments are required to issue approval to compliant building plans.</li> </ul>	<ul style="list-style-type: none"> <li>The Act is not explicit on building control processes entailing overseeing construction related processes and activities.</li> <li>The Act does not make reference to the building code whose provisions County Governments use to effect building control activities.</li> </ul>
Public Health Act, Cap 242	The Act mandates every health authority to take all lawful action to prevent or remedy danger to health from unsuitable dwellings including demolition of unfit buildings.	<ul style="list-style-type: none"> <li>The Act bestows responsibility of ensuring safety of dwellings on public health officers who do not have requisite technical capacity in building and thus unable to identify defects in the buildings.</li> <li>The Act is not aligned to the new constitution and development control laws.</li> </ul>

**Table 2.1: Legal Framework (cont...)**

Law	Relevance to construction Industry	Identified gaps
Environmental Management and Coordination Act (EMCA) 1999	<ul style="list-style-type: none"> <li>This Act provides for the establishment of an appropriate legal and institutional framework for the management of environment.</li> <li>The Act establishes the National Environment Management Authority (NEMA) whose responsibility is to oversee quality control in respect to environmental protection.</li> <li>It provides for issuance of Environmental Impact Assessment (EIA) licenses for proposed building projects that have complied with Environmental Laws and Regulations as well as inspection of ongoing or complete buildings.</li> </ul>	<ul style="list-style-type: none"> <li>Standards prescribed for consideration are largely on environmental protection, including ecological, social considerations, landscape and water, and do not directly relate to the building process.</li> </ul>
Building Code, 1968	<ul style="list-style-type: none"> <li>This is a set of rules and laws which govern and specify the minimum agreed levels of safety for the structures and buildings. They were enacted in 1968 under Local Government Act, Cap 265.</li> <li>The Code provides minimum standards that should be followed to ensure building standards, safety, health and security of the property from all hazards that may occur to the structure.</li> </ul>	<ul style="list-style-type: none"> <li>Currently not anchored in any legal framework since Local Government Act, Cap 265 was repealed.</li> <li>Does not recognize new building materials and techniques.</li> <li>The by-laws are prescriptive in nature and not performance based.</li> <li>The Building Code has not been updated since 1968.</li> </ul>
Occupational Safety and Health Act, 2007	<ul style="list-style-type: none"> <li>This is an Act of Parliament that provides for the safety, health and welfare of workers and all persons lawfully present at workplaces including construction sites.</li> <li>The Act also requires that all plant, machinery and equipment whether fixed or mobile for use either at the workplace or as a workplace, be operated by a competent person.</li> </ul>	<ul style="list-style-type: none"> <li>The Act does not prescribe the requisite standards for measuring safety at the construction site.</li> <li>There lacks mechanism for quality control especially on the qualifications, training and experience of "competent persons" involved in operating construction equipment.</li> </ul>
Agreement and Conditions of Contract for Building Works	<ul style="list-style-type: none"> <li>It outlines the contractual relationships of the parties in a construction building project. These include forms of contract and levels of engagement of various professionals (Architect, Engineers and Quantity Surveyors) for instance schedules of inspection.</li> <li>The contractor must comply with all specifications given by the consultants.</li> </ul>	<ul style="list-style-type: none"> <li>The document is not legally anchored in law although it is the only one that establishes contractual relationships for project team. As such, it is optional among the parties to use it.</li> </ul>

### 2.3 Key Institutions Involved in Construction Industry

Table 2.2 outlines the key institutions and their mandates as it relates to building control in Kenya. The gaps inherent in these institutions have also been identified with a view of informing appropriate institutional reforms for the sector.

**Table 2.2: Institutional Framework**

Institution	Mandate	Identified gaps
National Construction Authority (NCA)	<ul style="list-style-type: none"> <li>To oversee construction industry and coordinate its development. The NCA Act gives the Authority the following mandate: <ul style="list-style-type: none"> <li>Accrediting and register contractors and regulating their professional undertakings</li> <li>Accrediting and certifying skilled construction workers and construction site supervisors</li> <li>Registration of construction works</li> <li>Carrying out research on matters affecting the construction industry</li> <li>Encouraging the standardization and improvement of construction techniques and materials</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>The mandate given to it by the Act to “Oversee the construction industry and coordinate its development” is yet to be operationalized through regulations</li> <li>The Authority does not have prosecutorial powers to enforce its regulations or investigative mandate that enables them to recommend action on collapsed buildings.</li> <li>Overlapping mandates with County Governments particularly in inspection of buildings and their role in building control</li> <li>The Authority lacks full mandate to standardize and improve construction techniques and materials.</li> </ul>
National Building Inspectorate (NBI)	<ul style="list-style-type: none"> <li>NBI is established by Executive Order No. 1 of 2018 under the state department of Public Works. It is mandated to audit buildings for conformity with land registration, planning, zoning, building standards and structural soundness</li> </ul>	<ul style="list-style-type: none"> <li>Their mandates overlaps with the mandate of the County Governments, Ministry of Lands and National Land Commission</li> <li>The NBI does not have requisite technical capacity and appropriate legal framework</li> <li>The Inspectorate does not have legal status since it was established under an Executive Order</li> </ul>
County Governments	<ul style="list-style-type: none"> <li>Established under the Constitution of Kenya 2010, County Governments have the responsibility of;</li> <li>Controlling development and to a large extent, building control since they approve buildings during various stages of construction processes</li> <li>Planning and development, including; statistics; land survey and mapping; boundaries and fencing; housing; and electricity and gas reticulation and energy regulation.</li> <li>They also undertake Public works and services, including- storm water management systems in built-up areas; Water and sanitation services, Fire station services, and disaster management</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate technical capacity particularly in enforcement and compliance departments</li> <li>Political interference in the discharge of their mandates</li> <li>Reliance on outdated building code</li> <li>Do not recognize multiplicity of other actors and their role in the industry</li> </ul>
National Environment Management Authority (NEMA)	<ul style="list-style-type: none"> <li>Section 9(i) of EMCA mandates the Authority to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment</li> </ul>	<ul style="list-style-type: none"> <li>Their role in building control is inclined to Environmental Protection</li> <li>Lack capacity to review critical components of building</li> </ul>
Directorate of Occupational Safety and Health (DOSH)	<ul style="list-style-type: none"> <li>The Directorate ensures compliance with safety and health requirements at work place including sites</li> </ul>	<ul style="list-style-type: none"> <li>The Directorate does not have technical capacity to check building safety as far as construction process is concerned</li> </ul>



**Table 2.2: Institutional Framework (cont...)**

Institution	Mandate	Identified gaps
Joint Building and Construction Council (JBCC)	This is a registered Company founded by The Architectural Association of Kenya (AAK) and the Kenya Association of Building and Civil Engineering Contractors (KABCEC) in 1980. Among its objectives are: <ul style="list-style-type: none"> <li>to advance the science and art of planning, building and to promote excellence in the construction of buildings</li> <li>to promote just and honorable practice in the conduct of business, and to suppress malpractice.</li> </ul>	<ul style="list-style-type: none"> <li>Despite the fact that JBCC publishes several policy guidelines for construction industry including Agreement and Conditions of Contract for Building Works, it is not anchored in any legislations</li> </ul>
Directorate of Occupational Safety and Health (DOSHS)	The Directorate ensures compliance with safety and health requirements at work place including sites	<ul style="list-style-type: none"> <li>The Directorate does not have technical capacity to check building safety as far as construction process is concerned</li> </ul>
Kenya Bureau of Standards (KEBS)	It is responsible for: <ul style="list-style-type: none"> <li>developing, promoting and enforcing standards related to products, measurements, materials and processes;</li> <li>providing testing services, providing training.</li> <li>development of construction standards</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate capacity to carry out inspections and material testing in construction projects in Kenya.</li> </ul>
Energy and Petroleum Regulatory Authority (EPRA)	EPRA is mandated to Regulate Petroleum, Electricity and Renewable Energy Sectors in Kenya. With regards to Electricity, EPRA carries out the following functions; <ul style="list-style-type: none"> <li>Formulate, enforce and review environmental, health, safety and quality standards for the sub-sector, in coordination with other statutory authorities;</li> <li>Prescribe the requirements for accreditation of persons with appropriate skills to check accuracy of energy meters installed in residential, commercial or industrial premises;</li> <li>Impose sanctions and penalties on persons who are in breach of any of the provisions of the Act or any regulations made thereunder.</li> </ul>	<ul style="list-style-type: none"> <li>Weak regulatory regime in electrical sector</li> <li>Most of the buildings do not have electrical designs prepared by registered electrical engineers. Such designs and electrical works are not compliant with the requirements of building code</li> <li>High proliferation of unskilled/uncertified personnel undertaking connection of electricity with faulty designs</li> <li>Use of substandard electrical materials</li> </ul>
Water Resources Authority (WRA)	<ul style="list-style-type: none"> <li>Formulate and enforce standards, procedures and regulations for the management and use of water resources and flood mitigation</li> <li>To protect riparian areas against encroachment by construction of buildings or any other structures</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate control mechanisms of riparian zones.</li> <li>Overlapping mandates with NEMA, Land Act and Survey Act</li> </ul>

## 2.4 Construction and Devolution

### 2.4.1 Introduction

The Country introduced two levels of Governments through the Constitution of Kenya 2010; the County Governments and the National Government. Similarly the regulation of Building and Construction sector which was previously through Local Authorities under the National Government has since been devolved and being carried out by the County Governments.

## 2.4.2 Existing Legal Framework

### Fourth Schedule of Constitution of Kenya 2010

The Constitution under this schedule devolves county planning and development as well as County Public Works. In specific terms, the functions relating to planning development include; housing, planning, and roads as depicted in Figure 6.1.

### Inter-Governmental Relations Act, Cap 5G of 2012

This Act of Parliament establishes a framework for consultation and cooperation between the national and county governments and amongst county governments. It also establishes mechanisms for the resolution of intergovernmental disputes pursuant to Articles 6 and 189 of the Constitution.

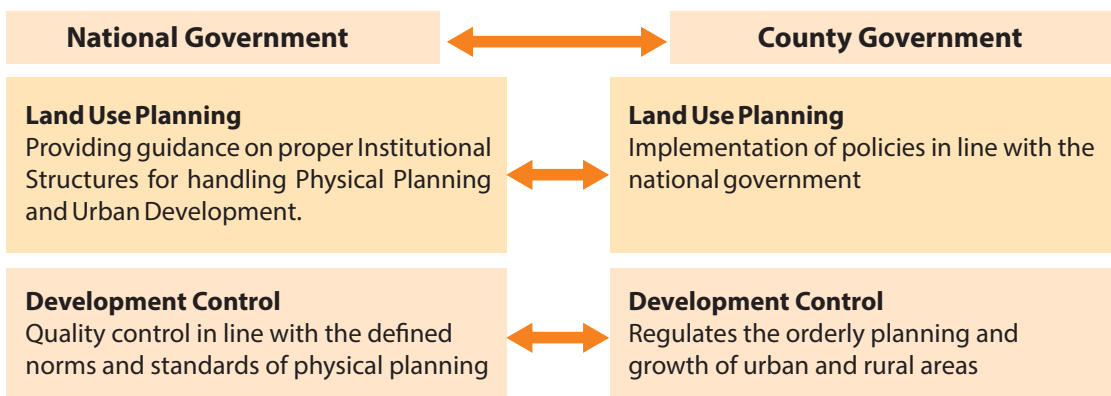
Section 24 of the Act provides for transfer and delegation of powers, functions and competencies to either level of government. This act is administered through Intergovernmental Relations Committee, established under Section 12 of the Act. The committee has earmarked the various functions relevant to construction process as shown in Figure 6.1.

From the Figure 6.1, delivery of safe construction industry is a concurrent function between the National and County Governments. However, development and building control is main function that the County Governments are mandated to implement.

## 2.4.3 Observations

- The linkage between the inter-relationship of the County and National Governments is blurred, especially on the mandate of building control.
- The Counties are yet to develop relevant frameworks and procedures to assist them carry out respective mandates as required by the Constitution of Kenya.

**Figure 3.1:** National and County Governments mandate as relates to Planning, Development Control and Public Work



**Figure 6.1:** National and County Governments mandate as relates to Planning, Development Control and Public Work (cont...)



Source: IGRTC, 2015

## 2.5 Observations

- There is no comprehensive policy framework to guide the sector.
- There is absence of coordination among the various agencies involved in building control and regulation.
- The building regulations (code) are not only outdated but are also not anchored in any law.
- There is inadequate quality assurance on construction techniques and materials.
- NCA has not unbundled its coordinating function as there is currently no legal and policy frameworks to guide its realization.
- Construction industry laws and regulations lack clarity of scope leading to overlapping mandates.

## CHAPTER THREE: BEST PRACTICES

### 3.1 Introduction

This section discusses the various systems and relevant procedures within the developed economies, i.e. United Kingdom, Malaysia, Canada and Singapore, with a view of deriving key lessons that are appropriate for the Kenyan context. Best practices have been presented in the following thematic areas.

- a) Existing Legal Framework
- b) Approval Procedures and Enforcement Mechanism
- c) Institutions
- d) Lessons

### 3.2 Best Practices

#### 3.2.1 United Kingdom

##### **a) Existing legal framework:**

The entire United Kingdom (Wales, England, Scotland and Ireland) is governed by Building Regulations that are domiciled under Building Act 1984 (for Wales and England), and Building Act 2003 (Scotland). The regulations are made by respective Governments.

The regulations made under the Acts have been periodically updated, rewritten or consolidated, with the latest and current version being the Building Regulations 2010 for England and Wales (Wikipedia, 2019).

Building Regulations are separate and distinct from “Town Planning” and Planning Permission” in United Kingdom.

Whereas the Building Regulations control how buildings are to be designed or modified on the public grounds of safety and sustainability, Planning Permission on the other hand is concerned with appropriate development, the nature of land usage, and the appearance of neighborhood.

##### **b) Approval procedures and enforcement mechanism:**

The approval process and enforcement mechanism in Wales and England are achieved through Building Control System. The Building Control System aims to guarantee the application and enforcement of the standards (Pedro et al., 2011).

The building approval process entails preparation of designs which must be submitted to Building Control System that approves its compliance with zoning demands and building regulations. During construction, site inspections guarantee that the structure is built according to design and that it complies with the building regulations. Once the construction is complete, a final check is conducted and a completion certificate or a use permit is issued.

## Detailed procedure is described below

**Pre-consultation:** This is a voluntary process that entails an applicant discussing the intended construction work with the local authority and asking for information about specific issues that should be taken into account when developing the intended building designs including possible use of the plot, allowable building lines and admissible heights.

**Planning permit procedure:** At this stage the applicant applies for planning permit. As earlier noted, the planning permission and building permission are distinct. Planning permission is the basis for development of a design but it does not bind the Building Authority to grant a building permit. Planning permission does not authorize the beginning of construction works.

**Submission and approval:** There are two types of submissions for building plans approval; Full Plans application and Building Notice. The former relates to the new projects while the latter relate to small projects or when changes are made to an existing building.

For full plan application, full details of the proposed project are provided and submitted for approval. An application form is used along with appropriate fees, location plan, floor plans, elevation and sections. On receiving the application, local authority will check the plans and may consult other relevant authorities including fire, sewerage and health. The approval process takes between five weeks or a maximum of two months from date of submission.

Building notice on the other hand is approved by Building Inspector if he/she is satisfied that the building regulations have been met.

Approved building plans are valid for three years from the date of approval.

**Commencement of construction works:** According to the procedure operated by local authorities, the construction work on site may start soon after application, but to receive the full benefit and protection from the regular procedure it is advisable to start the construction works after the notice of approval is received. If the applicant commences a construction work prior to plan approval, he/she proceeds entirely at his own risk.

The applicant, contractor or building surveyor must notify the building authority of his intention to start the construction work. The notification must state who is responsible for the construction work (building surveyor) and who is executing it (contractor).

**Site inspections:** Inspections of buildings are conducted by Building Control Surveyors to check compliance of construction works with building regulations with particular focus on the foundations, ground and floors, damp proofing, roof structure, drainage, structural beams, fire proofing and thermal insulation. These inspections are scheduled depending on the stage of the construction and the developer can request for one using mobile phone.

Public building inspectors, from Building Authorities, have right of access to building sites and are entitled to carry out inspections. They can examine construction works and can

request explanations and documents. During site inspections, all parts of the construction work can be inspected. Usually, for each examination the Public Building Inspector provides a report. If construction works take place without a building permit or do not comply with the approved design, they can be suspended until the relevant local authority takes a decision regarding demolition or continuation. Should this happen, the developer may also be sanctioned to pay an administrative fine and the relevant indemnities for damages caused.

A construction log-book to record daily progress of the construction work is maintained. This book must be accessible at the construction site to Public Building Inspectors.

Countries in EU, particularly Finland, Germany and Sweden, assign inspection to private parties.

**Completion:** Once the construction work has been completed, the building authorities are usually notified (i.e. completion notification). Several documents may be required for completion, such as, the building design with the works actually carried out; reports of site inspections; the construction log-book, and liability declarations by the contractor, building surveyor or designer. In these declarations, signatories attest that the construction work has been carried out in accordance with the approved design and, where applicable, changes comply with the applicable legal and regulatory requirements.

The purpose of the final site inspection is to verify whether construction works actually carried out comply with the building regulations, the approved building design and the building permit.

Once the Public Building Surveyor establishes compliance of building regulations with the construction works, he/she will issue client with a completion certificate, free of charge. This is an important document used by solicitors/personal search agents when selling the property and by mortgage lenders and property insurers (LABC, 2019).

### **c) Institutions: Building Control Body**

Building Control Body is a department under Local Authorities that is mandated to regulate building works under the Building Regulations in the United Kingdom. Its roles are exercised by officers in local authorities and by private sector Approved Inspectors.

The Building Control units have formed a network referred to as Local Authority Building Control (LABC). Government Construction Board and Construction Leadership Council (CLC) are important institutions involved in United Kingdom's construction industry. The Government Construction Board which was established in 2015 replaced the office of the Chief Construction Adviser. Its main responsibility is to oversee Government Construction Strategy which seeks to improve public sector construction and contribute to both growth and efficiency savings.

The Construction Leadership Council (CLC) was established in 2013 to oversee implementation of Construction 2025; industrial strategy for construction. The strategy seeks a long term vision outlining how industry and Government will work together to put

Britain at the forefront of global construction. CLC is chaired by the Secretary of State for Business, Innovation and Skills and an Industry Representative (Designing Buildings Wiki, 2019).

#### **d) Lessons:**

- (i) The building regulations, which prescribe building standards are anchored in Acts of Parliament.
- (ii) Building control bodies are the only bodies mandated to regulate buildings works.
- (iii) Approved private inspectors are enlisted for purposes of inspections.
- (iv) Planning permission and building permission are distinct approving processes.
- (v) Construction works can commence before approval of building plans though this is not encouraged.
- (vi) Site inspections are scheduled and the developer may make requests through mobile phone or internet.
- (vii) Contractor is obligated to keep construction log-book which monitors daily progress of construction work. This is part of the documents to be inspected.
- (viii) Final inspection is carried out before issuance of completion certificates. Several documents may be required for completion, such as, the building design with the works actually carried out; reports of site inspections; the construction log-book, and liability declarations by the contractor, building surveyor or designer. In these declarations, signatories attest that the construction work has been carried out in accordance with the approved design and, where applicable, changes comply with the applicable legal and regulatory requirements.
- (ix) Building Control Bodies have a network that assists in promoting standards in building and construction.
- (x) United Kingdom developed Government Construction Strategy and Construction 2025 which is significant in coordinating the construction sector.

### **3.2.2 Malaysia**

#### **a) Existing legal framework**

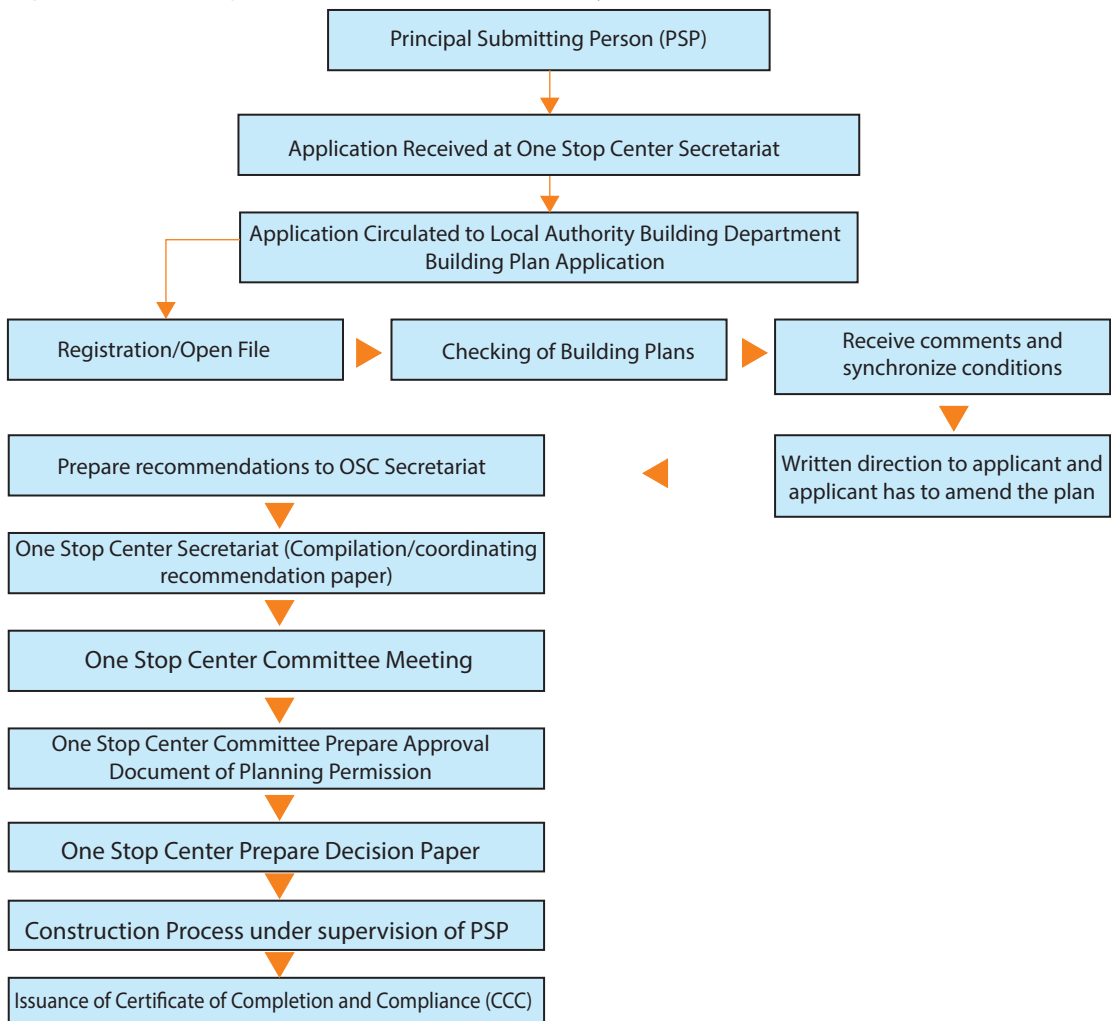
The main legal framework for regulating building and construction in Malaysia is Uniform Building By-Law 1984 (UBBL), the Street, Drainage and Building Act 1974 (Act 133) and the Town and Country Planning Act 1976 (Act 172). Malaysia's building regulations are based on the Street, Drainage and Building Act 1974 (Act 133) and its subsidiary, the Uniform Building By-Laws 1984 (UBBL). These legal instruments stipulate the procedures for building plans approval and other means of development and construction control.

The Building and Construction Standards are developed by the Department of Standards Malaysia (Standards Malaysia) under the Ministry of Science, Technology and Innovation (MOSTI) (Construction Regulation in Malaysia, 2016).

## b) Approval procedures and enforcement mechanism:

The building plan approval process is described in Figure 3.1. In summary, the application received by the One Stop Center (OSC) is distributed to Building Departments of the Local Authority. The departments vet the applications and give their recommendations to the OSC secretariat. Site visit is arranged to investigate characteristics of the site to ensure that the requirements are fulfilled or can be complied with. The recommendations are deliberated during the OSC Committee Meeting and decision on approval or rejection is arrived at. Approval Decisions from the OSC meeting are released to the applicant with or without conditions.

**Figure 3.2:** Building plan approval process in Malaysia



**Source:** Ministry of Housing and Local Government Malaysia, 2008



## Role of Principal Submitting Person (PSP)

PSP is an appointed Professional, in this case an Architect, who is responsible for overseeing the construction process that culminates into the issuance of Certificate of Completion and Compliance (CCC) (Yong, 2019). Below are the specific duties of PSP:-

- (i) To prepare and present planning and building plans to Local Authority for approval.
- (ii) Inform Local Authority of the commencement of construction works on site.
- (iii) Supervise construction works at site and ensure that laws and technical conditions of the Division of Planning and Permits (PBT) are followed.
- (iv) Report building breaches, explain reasons of breach and ensure breach is rectified during construction.
- (v) Present work resumption notice to the Local Authority.
- (vi) Ensure Forms are duly certified by bona fide Professionals practicing through ACPs/ECPs registered with BAM/BEM, at various stages of the works and when all the essential services have been provided.
- (vii) Issue CCC upon satisfactory completion of the works and after all conditions has been complied with, confirming the building is safe and fit for occupation.
- (viii) Deposit a copy of the CCC to the Local Authority and BAM/BEM within 14 days of issue.

Given the huge responsibility the PSP have been given in the construction process, they can be penalized an equivalent of Kshs. 6 million or be subject to imprisonment not exceeding 10 years or both under the following conditions:

- (i) The submitting entity is not a PSP but issues a CCC.
- (ii) Issues a CCC without all the relevant forms.
- (iii) Issues CCC in contravention of a direction by PBT.
- (iv) Make any false or fraudulent declarations.
- (v) Uses any forged, altered or counterfeit declaration, certificate and application.
- (vi) Occupies or permits to be occupied any building without a CCC.

### c) Institutions: One Stop Center

Malaysia has a body referred to as One Stop Center (OSC) which receives applications for various development permission. Applications for building permission are submitted by an Architect, who is referred to as Principal Submitting Person (PSP). Once the applications are received at the OSC they are distributed to Local Authority Building Department.

Applications for planning permission, building plan approvals, land use conversion, subdivision and amalgamation of land are addressed at this center. The center distributes the application to the respective departments and compiles the comments.

The tedious jobs of the OSC are the distribution of applications to respective technical departments and monitoring the progress of that department concerned. Technical departments are given 14 days to deliver their comments to applications located within an area having a local plan and 40 days for applications within areas with no local plans (Ibrahim

et al., 2019). The meeting for decision is held at the OSC where the OSC plays the role of secretariat for the meeting; and is responsible for related correspondent works to the applicants.

The OSC committee membership comprises of: Mayor, OSC Director, Deputy Mayor, four Ordinary Members of the Council, Director of State Urban and Town Planning, Director of Mineral and Land, Land Administrator, Director of Public Works, Director of Department of Drainage and Irrigation, Director of Department of Environment, Director of Department of Fire Fighter and Life Savings, Director of Department of Sewage Services, Manager of Telekom Malaysia, Manager of Department of Planning, Manager Department of Building, Manager of Department of Engineering, Manager of Department of Landscape, Manager Department of Health and Technical Departments that are relevant.

### **Construction Industry Development Board (CIDB)**

Malaysia construction industry is regulated mainly through Construction Industry Development Board (CIDB) of Malaysia, which is domiciled under the Ministry of Public Works. The Board is established under the Act 520 – Construction Industry Development Board Act 1994 (Construction Regulation in Malaysia, 2016). CIDB is tasked with regulating, developing and facilitating the construction industry towards achieving global competitiveness. The Board is also tasked with the role of coordinating and monitoring the overall progress of the implementation process of the Construction Industry Transformation Programme (CITP) 2016 – 2020 (CIDB Malaysia, 2015).

The Board's function can be summarized into the following;

- (i) Development and facilitative through research
- (ii) Advisory to the national and county governments
- (iii) Regulatory including accrediting and registering contractors, construction workers, site supervisors
- (iv) Quality assurance in construction projects

The Board is empowered, in the event of breach of safety, to immediately stop the construction work, to carry out inspection at the site at the contractor's cost, to order for the execution of specified construction works and to demolish the defective building or any defective parts of the building.

The Act 520 bestows upon the contractors and site managers, responsibility to ensure safety of buildings during or after the construction work.

### **Professional Regulatory Associations**

The construction professionals in Malaysia comprise of Architects, Engineers, Quantity Surveyors, Land Surveyors and Master Builders. The registrations and practice of these professionals are governed by their professional boards.

Under the respective Acts, no person is allowed to practice or assume the practice of these profession without prior approval from their respective Boards.

**d) Lessons:**

- (i) Malaysia has adopted a One Stop Center (OSC) where all applications for development permission are submitted and processed. The submissions to OSC are automated.
- (ii) Technical Committee for the OSC comprise of all the relevant departments and chaired by the mayor.
- (iii) All applications have to comply with approved development plans as such planning permission should be sought.
- (iv) The built environment professionals referred to as Principal Submitting Person (PSP) are charged with responsibility of supervising construction process and giving feedback to the Local Authority.
- (v) The fines for unethical conduct of the PSPs are prohibitive to deter any malpractice.
- (vi) CIDB regulates, develops and facilitates the construction industry towards achieving global competitiveness. The Board is empowered, in the event of breach of safety, to immediately stop the construction work, to carry out inspection at the site at the contractor's cost, to order for the execution of specified construction works and to demolish the defective building or any defective parts of the building.
- (vii) The construction industry is guided by Construction Industry Transformation Programme (2016-2020).

### 3.2.3 Canada

**a) Existing legal framework**

The Canadian building and construction sector is regulated by Building Codes adopted by respective provinces. These building codes are based on National Building Code of Canada 2015, which enjoyed no legal status until adopted by provinces (Alberta, British Columbia, Manitoba, Ontario, Prince Edward Island, Quebec, Saskatchewan and Yukon).

The regulations of building construction are the responsibilities of provinces as provided for by the Constitution of Canada. The Building Code is developed and issued by a National Research Council which is a primary national research and technology organization (RTO) of the Government of Canada, in science and technology research and development (Wikipedia, 2019).

**b) Approval procedures and enforcement mechanism:**

Upon the completion of drawings and application forms, an application is reviewed for compliance with the Ontario Municipal Code, Zoning Bylaws, and all other applicable laws. A number of other applications including “plan of subdivision”, “site plan control” and “part lot control exemption”, also known as STAR applications, may be required.

For reviewing the Rezoning applications, a pre-consultation with city planners at one of the

four civic centers is strongly advised. After the pre-consultation session, a complete Official Plan and/or Zoning Bylaw amendment application is submitted to the building division. The new proposal is then concurrently circulated to the applicable city departments, to some external agencies, such as school boards and energy providers, as well as the community council to get their feedback. The feedback is returned to the developer, who must then address all of the comments in the design. The application is revised, resubmitted, and re-evaluated at the City Council. A public meeting is also held at community council before the City Council makes a decision about the proposal (Shahi, 2018). A sample approving process of City of Toronto is given in Figure 3.2. Once the permit has been issued, it must be displayed in a visible location at all times.

### Site inspections

The respective Municipal Authorities are required by the Building Code to provide building inspections associated with construction. The permit holder arranges inspection at the following key stages:

- (i) Sewer Lateral - Required prior to backfill of sanitary and storm sewers and water service.
- (ii) Excavation - Required prior to placement of concrete footings.
- (iii) Plumbing Underground - Required prior to covering underground plumbing.
- (iv) Foundation - Before the foundation is backfilled.
- (v) Plumbing (Rough-in) - When plumbing is roughed in (includes drains, waste, vent and water piping system).
- (vi) Framing and Mechanical Rough-in - When structural framing and stairs, including fire separation and fire stopping components, are completed and the electrical system, fireplace, and ductwork for heating, ventilation and air conditioning, are roughed in. Exterior of building must be weather - proofed.
- (vii) Air Barrier/Insulation/vapour Barrier - When the insulation, air barrier and vapour barrier are installed.
- (viii) Plumbing Final - When plumbing system, fixtures and appliances are completed.
- (ix) Occupancy - A person may occupy a dwelling that has not been fully completed, provided an Occupancy Permit has been issued by the Building Official.
- (x) Final - When the building is complete, at which time the Building Inspector will issue a Final Occupancy Permit.

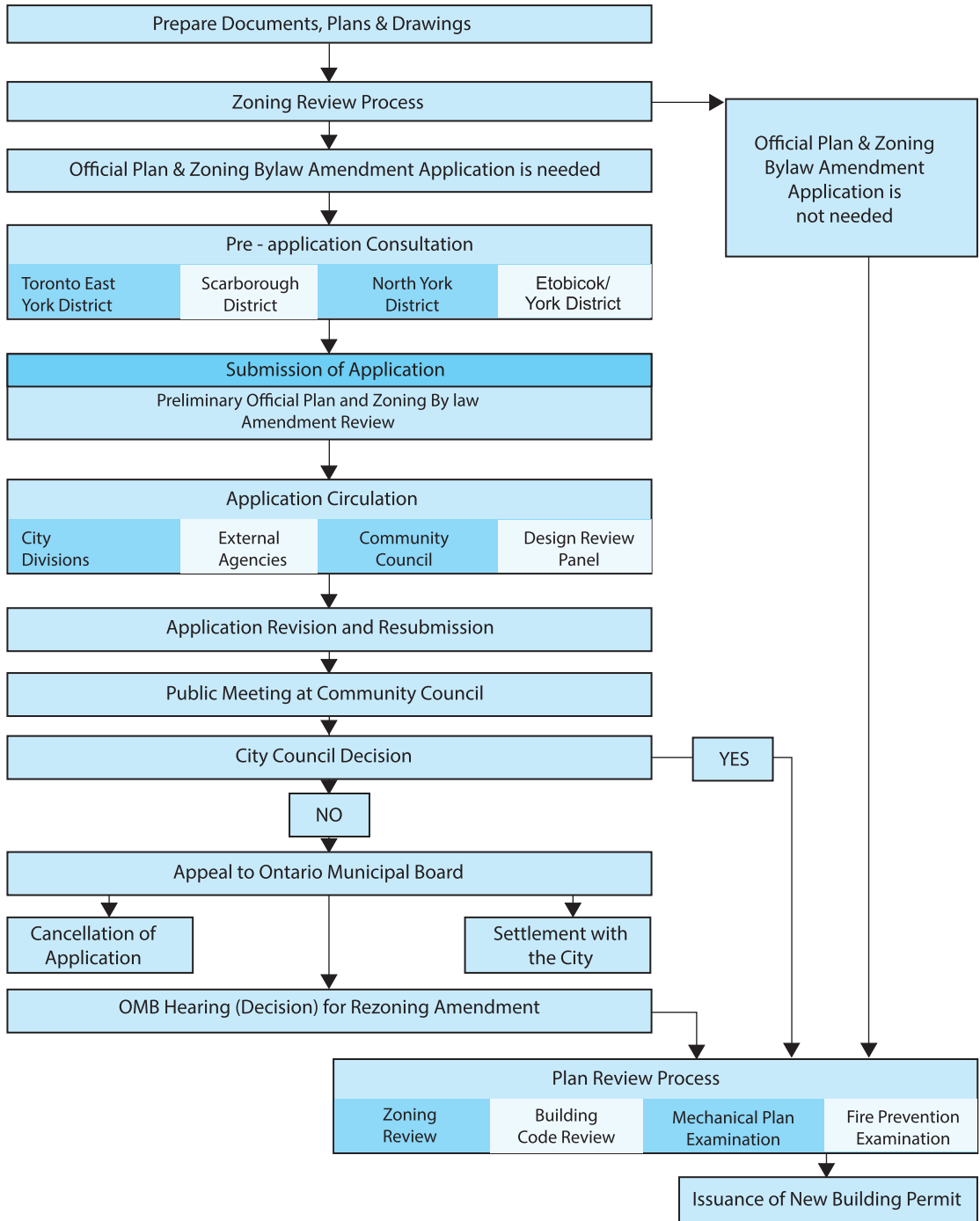
#### c) Institutions:

Municipal and City Councils are charged with the mandate of regulating building and construction industry. They are domiciled in respective ministries in the various provinces. Each Council has building departments.

#### d) Lessons learnt:

- (i) A model building code is developed by a National Research Center and the respective provinces domesticate it.
- (ii) Building and construction process is closely monitored by Councils department using an elaborate checklist and field inspections.
- (iii) Plan approval process is rigorous and elaborate. It involves all stakeholders and the public.

**Figure 3.2: Steps for reviewing new proposals in City of Toronto**



Source: Shahi, 2018

### 3.2.4 Singapore

#### a) Existing legal framework

The Building Control Act 1990 establishes a statutory duty to design and construct in accordance with the building regulations. Every building to which the building regulations apply should be designed and constructed in accordance with the provisions of such regulations and the responsibility for compliance rests with the designers, the contractors and the building owners.

The Act is the basis of Building Control and it allows for the establishment of Building Control Authorities. It empowers the Minister to make Building Regulations and Building Control Regulations. The Act also empowers a Building Control Authority to serve Enforcement Notices, to inspect works and buildings and to prosecute for noncompliance (Comhairle Chontae Lú. Louth County Council, 2019).

#### b) Approval procedures and enforcement mechanism:

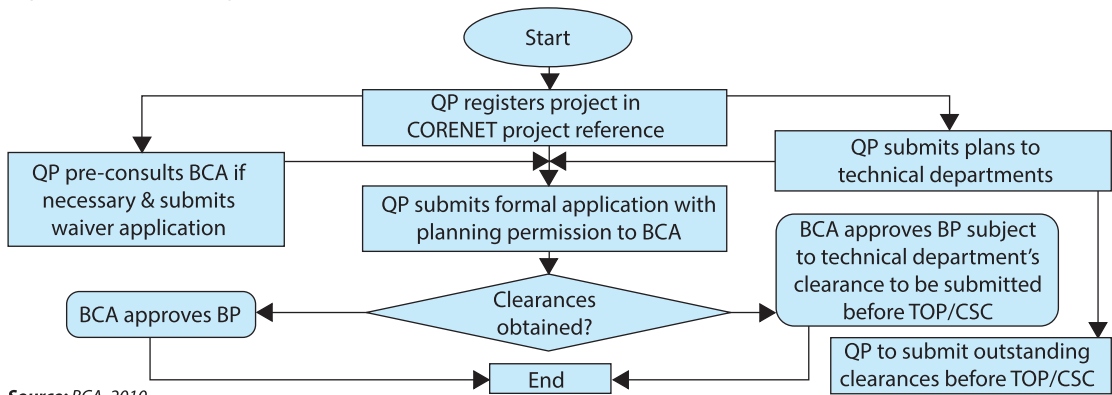
An individual intending to carry out building works shall appoint Qualified Persons (QPs) to submit building and structural plans to the Building and Construction Authority (BCA) for approval.

QPs are required to obtain written permission from Urban Redevelopment Authority (URA), prepare building plans, consult the relevant technical departments and incorporate their requirements to building plans. He or she will thereafter submit the plans with a prescribed fee and the BCA will approve the plans within seven days if the building plans have met the requirements of building regulations. The plans approval applications are submitted through Construction and Real Estate Network (Corenet) e-Submission System.

Before starting any works, the QP, builder and the applicant must jointly apply for a permit to commence works from the BCA after having obtained structural plan approval and planning permission.

The QP shall also submit progress report of the building works at regular intervals to the BCA after commencement of works. Figure 3.3 shows the detailed steps undertaken during approval process of building plans.

Upon completion of building works, the applicant has to apply for the Certificate of Statutory Completion (CSC) or at least a Temporary Occupation Permit (TOP) before occupying these buildings. The QP can submit his request for a date of joint site inspection using the CORENET e-submission. This request can be made one month before the schedule date of site inspection. Application may be made directly for a CSC when all the requirements have been complied with. These requirements will include building plan clearances from the relevant technical authorities such as the Fire Safety & Shelter Department and National Environment Agency. Otherwise an application for TOP can be considered when the non-completion of the works is minor and is neither of a serious nature nor in any way detrimental to the well-being or safety of the persons who may occupy the building.

**Figure 3.3: Building plan approval process**

Source: BCA, 2010

### One-stop portal for Authority submission

A one-stop on-line portal, Construction and Real Estate Network (CORENET) <http://www.corenet.gov.sg>, has been developed to enable industry professionals to submit project related electronic plans and documents to various regulatory authorities for approval. This CORENET portal provides a one-stop convenience for submission of plans to multiple approving authorities from anywhere, at any time and access to check submission status online (BCA, 2010).

#### c) Institutions:

The Urban Redevelopment Authority (URA) is Singapore's national land use planning and conservation agency.

Building Control Agency (BCA) was established on 1 April 1999 to develop and regulate Singapore's building and construction industry. The BCA approves building and structural plans, and regulates requirements at construction sites. It is also responsible for the issuance of permits to start work, temporary occupation permits and certificates of statutory completion. It champions barrier-free accessibility and sustainability of the built environment. It also reviews building regulations and codes that are related to energy efficiency, barrier-free and buildable design. BCA ensures that buildings are designed, constructed and maintained to high standards of safety. It is also involved in training of construction workers through various scheme including Construction Registration Tradesmen (CoreTrade) Scheme and BCA academy. It also promotes adoption of more construction technologies and enhance building capability.

#### d) Lessons:

- (i) Singapore has adopted one stop shop (CORENET) similar to one used in Malaysia.
- (ii) Development control process is heavily dependent on external qualified persons, Accredited Checkers, Registered Site Supervisors (RSS), Licensed Builders as well as specialist builders. It is now mandatory for construction projects to seek a design review of the Professional Engineer's design by an Accredited Checker, who is one

of senior standing in the circle of Professional Engineers. Without such a design review, any intended project would not be able to proceed to the next level.

- (iii) Urban Redevelopment Authority and Building Control Authority are statutory boards established under Acts of Parliament and responsible for planning and building permission and control. They also issue relevant standards of practice and promote Research and Development in building and construction sector.
- (iv) Approval process is fast-tracked.
- (v) Pre-consultation with BCA is mandatory before submission of building plans.
- (vi) Development control process relies on externally qualified persons.
- (vii) It is mandatory that the QP seeks design review from accredited checkers before construction project proceeds to the next level.

### 3.2.5 Singapore Construction Practices

#### a) Planning for construction works

- (i) Design and production are integrated in the early stage of building process to allow sufficient time for the parties to plan and adopt the most productive construction method to enhance constructability of the development project.
- (ii) Pre-construction is carried out by the contractor together with design team to achieve the appropriate construction method with minimal adverse effects on the nearby building properties.
- (iii) Shop drawings are produced for ease of construction, to minimize construction error and to ensure correct and accurate construction details are reflected in the construction details. These are reviewed by the contractor with assistance of the designers. Where discrepancies are found, they are resolved early in order to avoid disruption of site construction works.
- (iv) The design consultants are charged with the responsibility of carrying out Risk Assessment on adjacent building, prioritize appropriate building design for approval, briefing site supervisor and briefing the contractor.
- (v) The client is charged with the responsibility of providing access to the site and engaging site supervisors for complex development projects.

#### b) Execution of construction works

- (i) The contractor is expected to comply with approved Architectural and Structural Plans. He or she should also not carry out any structural works without the supervision of design consultants or site supervisors. Should there be any need to deviate from approved plans, consent must be sought from the design consultants.
- (ii) The Contractor should comply with documented workmanship standards. He or she is free to consult design consultant for any clarification on the standards.
- (iii) The contractor is required to prepare monthly site inspection schedule for design consultant or site supervisors. He is required to inform the design consultant or site supervisor at least 24 hours before actual day of inspection.
- (iv) The contractor is also required to engage qualified construction supervisors to progressively inspect the construction works to ensure that construction works are carried out in the correct manner. As construction works are progressively inspected, it will be unlikely to have major shortcoming detected during the final



- site inspection carried out by the Site supervisor to approve concreting of structural elements of the building.
- (v) The contractor is expected to notify the building authority directly in cases of contravention of building regulations carried out by other project parties including design consultants for instance material changes without obtaining amendment to approved plan.
  - (vi) Site supervisors are required to;
    - 1) Ensure construction works carried out by the contractor follow strictly to the approved plans. He should report to design consultant immediately in case of breach of approved plan.
    - 2) Immediately notify design consultant and the contractor any construction irregularities detected so that corrective measures can be taken to rectify the irregularities before next stage of construction works at the site.
    - 3) Adhere to site inspection schedule by the contractor. He shall notify the design consultants in the event that he could not carry out inspection on the scheduled date and time for other arrangements to be made.
    - 4) Ensure form work is safe for use and dismantling.
  - (vii) Design consultants are required to;
    - 1) Safeguard construction works to meet design specifications of the building structure
    - 2) Comply with the building regulations
    - 3) Conduct essential tests on building materials
    - 4) Implement instrumentation monitoring measures
    - 5) Verify soil parameters of design of foundations
  - (viii) Completion of construction works
    - 1) Contractor submits certification of completion of building. The contractor should submit promptly as-built drawings of the structure.
    - 2) Supervisors check the constructed structural elements to ensure they comply with the technical design specifications of the development project.
    - 3) The design consultant submits the relevant record plans and certificates of supervisions upon completion of all building works to assists the architect for Certificate of completion.
  - (ix) Supervision of construction works  
Building regulations in Singapore require that specific building works of certain value have specific number of site supervisors as show in Table 3.1.

**Table 3.1: Value of Building Works and required minimum site supervisors**

Value of building works	Value of building works
Up to \$7.5 million	Appropriate qualified person or resident engineer or resident technical officer
Site Supervisors required for Full-Time Supervision of Structural Works in Large Building Works	
Value of building works	Appropriate qualified person or resident engineer or resident technical officer
More than \$7.5 million but not exceeding \$15 million	One (1) resident technical officer
More than \$15 million but not exceeding \$30 million	One (1) resident engineer
More than \$30 million but not exceeding \$75 million	One (1) resident engineer and one (1) resident technical officer
More than \$75 million but not exceeding \$150 million	One (1) resident engineer and two (2) resident technical officers
More than \$150 million	Two (2) resident engineers and three (3) resident technical officers

Source: BCA, 2017

"Value of building works" means:

- for any underground building works, the total cost to be expended in carrying out those building works estimated at the time of application for other building works, the total cost to be expended in carrying out the building works (including the foundations, basements, structural frame, finishes and the installation of building services) estimated at the time of application.

### c) Lessons

- (i) The building regulations specify the minimum number of site supervisors for specific value of the building works
- (ii) The Building Site Supervisors Manual has been developed and outlines the responsibility of each party involved in the construction process.
- (iii) Building Information Management is well entrenched in the Singapore construction industry.

## 3.2.6 Kenya

### a) Existing legal framework:

Physical Planning and Land Use Act, 2019 is the main statute that regulates the development control and building control in Kenya. The Act deals with the material change in the use or density of any buildings, land or subdivision of any land.

Building Code of 1968 is the existing standard for use in building and construction industry. It is worth noting that the Code is not anchored in any statute as the Local Government Act, Cap 265 was repealed.

## b) Approval procedures and enforcement mechanism

Table 3.2 shows a summarized construction approval processes and roles of the various parties involved.

**Approval:** The submitted building plans are checked to ensure that they comply with the conditions in Box 3.1.

**Table 3.2:** Approval Processes

Steps	Procedure
<b>Stage 1</b> Architectural plan approval	i) The developer selects an Architect to come up with architectural drawings for the buildings. ii) Once the architectural drawings are ready, the architect can then on behalf of the client apply to the Planning department of the County Government where the land is for building permission. It is important to note that the developer may be required to first carry out change of user of the plot. iii) The application is circulated to different departments for clearance (Physical Planning, Public Health, Water and Fire). iv) Once comments are received, the application is tabled before a technical committee for deliberations and approval.
<b>Stage 2</b> Structural Plan Submission & Approval	<ul style="list-style-type: none"> <li>Once the building plans are submitted, the structural plans are submitted by a structural engineer as well for approval. The structural drawings are checked by structural department.</li> </ul>
<b>Stage 3</b> EIA license	<ul style="list-style-type: none"> <li>It is a requirement that all construction projects have to undergo an Environmental Impact Assessment (EIA). As such, the developer hires a licensed EIA expert to prepare and submit the report to National Environment Authority (NEMA) for review and issuance of license.</li> </ul>
<b>Stage 4</b> Consider person's input by email	<ul style="list-style-type: none"> <li>The developer hires a registered contractor.</li> </ul>
<b>Stage 5</b> Registration by National Construction Authority (NCA)	<ul style="list-style-type: none"> <li>It is a requirement that all construction projects be registered by NCA. The developer therefore applies to NCA for registration of their building.</li> </ul>
<b>Stage 6</b> Construction	<ul style="list-style-type: none"> <li>With all the aforementioned approvals, the construction process commences.</li> </ul>
<b>Stage 7</b> Inspection	<ul style="list-style-type: none"> <li>The County Government enforcement officers carry out regular inspections of the construction process at site using the yellow card provided to the contractor.</li> </ul>
<b>Stage 8</b> Obtaining occupancy certificate	When the construction is complete, the developer applies for occupancy certificate. This application is forwarded to the enforcement department and a building inspector is assigned for final inspection of the construction. If satisfied that the building is in compliance with the approved drawings, the Inspector issues occupancy certificate subject to payment of requisite fee.

Source: NCA, 2018

### **i). Development and Building Control Processes**

Development control involves regulation on the use of land and related works. County Governments through the Physical Planning and Land Use Act, 2019 have been given powers to control developments and to a large extent a bulk of construction activities. In this context and as earlier stated, development control occurs mainly at approval and during building works as the constructions progresses.

### **ii). Compliance to Building Regulations (Building Code)**

The above notwithstanding, the building code of 1968 bestows upon the defunct local authorities (councils or municipalities) to ensure developers comply with the various standards including appropriate building materials, design and construction standards for building at specific sites, foundations, general load-bearing requirements, walls, roofs, floors, chimneys, water supply, refuse disposal, drainage, sewer and sanitary conveniences, among others. Box 31 shows various compliance conditions enforceable by the county governments:

#### **Box 3.1: Compliance Condition Required for Building Plans**

8. Where the development involves the erection of a building, the County government will consider the following:
  - a) The use of the building
  - b) Siting of the building within the plot
  - c) The elevations of the building, plinth area, canopies and height of the building
  - d) The set back and the building line
  - e) Access to and parking on land which the building is to be erected
  - f) Loading bay
  - g) Density
  - h) Plot coverage
  - i) Provision for rainwater harvesting facilities and water storage tanks in every building
  - j) Landscaping
  - k) Character
  - l) Ventilation and lighting
  - m) Infrastructure adequacy
  - n) Environmental, health and cultural consideration

Kenya's Building Code 1968 outlines the various stages through which buildings undergo during construction. These stages are shown in Box 3.2.

**Box 3.2: Notices and Inspections Required for Buildings under Construction**

**Notices and Inspection**

16. (1) Any person who erects a building to which these By-laws apply shall give to the Council (County Government) in writing a "Notice of inspection" card, obtainable from the Council, not less than thirty hours' notice (such period to count from the hour and date of receipt by the Council) of the date and time at which -

- (a) (i) the erection of the building will begin;
- (ii) the work of plumbing and drain-laying will begin; and
- (b) The following shall be ready for inspection or testing either in part or in whole-
  - (i) the foundation bed;
  - (ii) the foundation concrete;
  - (iii) the damp proof course;
  - (iv) the filling;
  - (v) the concrete after shuttering is removed;
  - (vi) the drainage;
  - (vii) the plumbing installations; and

**c) Institutions:**

The following are key institutions involved in building and construction process in Kenya;

- (i) County Governments: They are in charge of the development control that involves issuance of planning and building permission.
- (ii) National Environment Management Authority (NEMA): It ensures compliance with environmental regulations and issues EIA licenses.
- (iii) National Construction Authority (NCA): It oversees the construction industry and coordinates its development.

Figure 3.4 shows the institutions involved at different stages of construction process. Some of the institutions in the Figure 3.4 are sometimes requested to give approval for specialized building projects.

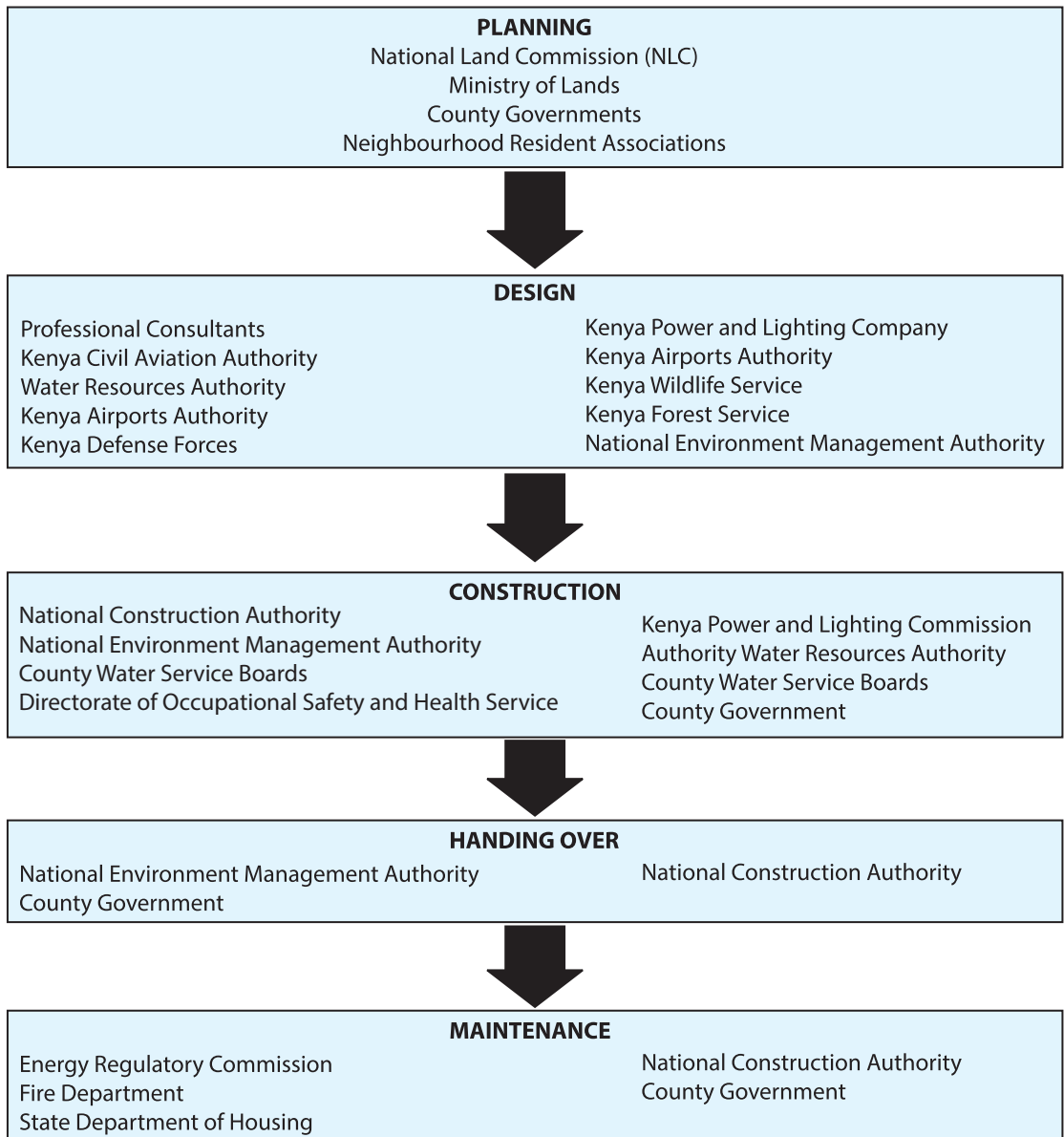
**Figure 3.4: Institutions Involved at Different Stages of Construction**

Table 3.3 shows comparative analysis of Kenya and the selected best practices in UK, Malaysia, Canada & Singapore. The table highlights various key learning areas that can be used to improve domestic construction industry.

Table 3.3: Comparative analysis of Kenya and Best Practices

Practice	United Kingdom	Malaysia	Canada	Singapore	Kenya
Existing legal framework	<p>a) Building Regulations are anchored in under Building Act 1984 (Wales and England) and Building Act 2003 (Scotland)</p>	<ul style="list-style-type: none"> <li>Construction Industry Development Board (CIDB) regulates, develops and facilitates the construction industry towards achieving global competitiveness.</li> <li>The construction industry is guided by Construction Industry Transformation Programme (2016-2020).</li> </ul>	<ul style="list-style-type: none"> <li>A model building code is developed by a National Research Center and the respective provinces domesticate it.</li> </ul>	<ul style="list-style-type: none"> <li>Urban Redevelopment Authority and Building Control Authority are statutory boards responsible for planning and building permission and control.</li> <li>The boards issue standards of practice and promote Research and Development in building and construction sector.</li> </ul>	<ul style="list-style-type: none"> <li>Different laws and regulations control building development, for example, Physical Planning and Land Use Act 2019, EMCA, NCA and Building Code 1968</li> </ul>
Approval procedures	<ul style="list-style-type: none"> <li>Approved private inspectors are enlisted for purposes of inspections.</li> <li>Planning permission and building permission are distinct approving processes.</li> <li>Construction works can commence before approval of building plans though this is not encouraged.</li> <li>Site inspections are scheduled and the developer may make requests through mobile phone or internet.</li> <li>Contractor is obligated to keep construction log-book which monitors daily progress of construction work. This is part of the documents to be inspected.</li> <li>Final inspection is carried out before issuance of completion certificates.</li> </ul>	<ul style="list-style-type: none"> <li>Adopted an electronic One Stop Center (OSC) where all applications for development permission are submitted and processed.</li> <li>All applications have to comply with approved development plans as such planning permission should be sought.</li> </ul>	<ul style="list-style-type: none"> <li>Plan approval process is rigorous and elaborate and involves key stakeholders and the public.</li> </ul>	<ul style="list-style-type: none"> <li>Adopted electronic one stop shop Approval process takes short period.</li> <li>Pre-consultation with BCA is mandatory before submission of building plans.</li> </ul>	<ul style="list-style-type: none"> <li>Multiple Institutions are involved in building approval and inspections Site inspections are adhoc</li> <li>Approvals are largely manual</li> </ul>

Table 3.3: Comparative analysis of Kenya and Best Practices (cont...)

Practice	United Kingdom	Malaysia	Canada	Singapore	Kenya
Institutions	<ul style="list-style-type: none"> <li>Building Control bodies (Government Construction Board and Construction Leadership Council) are the only ones mandated to regulate building works</li> <li>Building bodies have a network that assist in promoting standards in building and construction.</li> <li>Construction sector is coordinated by government construction strategy and construction 2025.</li> </ul>	<ul style="list-style-type: none"> <li>Technical Committee for the OSC comprise of all the relevant departments and chaired by the mayor.</li> <li>The built environment professionals referred to as Principal Submitting Person (PSP) are charged with responsibility of supervising construction process and giving feedback to the Local Authority.</li> <li>The fines for unethical conduct of the PSPs are prohibitive to deter any malpractice.</li> </ul>	<ul style="list-style-type: none"> <li>Building and construction process is closely monitored by Councils department using an elaborate checklist and field inspections.</li> </ul>	<ul style="list-style-type: none"> <li>Development control process is heavily dependent on external qualified persons, Accredited Checkers, Registered Site Supervisors (RSS), Licensed Builders as well as specialist builders.</li> <li>Without a design review by accredited checker, any intended project may not be able to proceed to the next level.</li> <li>The building regulations specify the minimum number of site supervisors for specific value of the building works</li> <li>The Building Site Supervisors Manual has been developed and outlines the responsibility of each party involved in the construction process.</li> <li>Building Information Management is well established.</li> </ul>	<ul style="list-style-type: none"> <li>Professionals mainly play facilitative role No</li> <li>Building Information Management</li> </ul>



### 3.3 Observations

The following are the key lessons from the best practices that can improve domestic construction industry

- a) There is need to consolidate and harmonize that the different laws and regulations that regulate the building and construction process in Kenya.
- b) The building regulations need to be anchored in an Act of Parliament, revised a to among others specify the minimum number of site supervisors for specific value of the building works
- c) There is need for a one-stop-center for all building control process. This will not only ensure that the process is coordinated but also ensure efficiency and cost effectiveness on the part of the developers
- d) The professionals need to be given prominent role and responsibility with regards to the integrity of construction process, like in Malaysia where Built Environment Professionals are responsible for supervising construction process and giving feedback to the regulator.
- e) Contractors should be obligated to maintain construction log-book which monitors daily progress of construction work.
- f) Pre-construction activities should be carried out by the contractor together with design team to achieve appropriate construction method.
- g) The Building Site Supervisors Manual that outlines the responsibility of each party involved in the construction process need to be developed
- h) Building Information Modelling need to be entrenched in the construction process
- i) **Poor coordination among the regulatory agencies**  
There are three main agencies involved in the construction process and numerous departments therein. The processes to obtaining requisite approvals from the agencies are lengthy. Enforcement for non-compliance are not coordinated amongst the various agencies since each agency uses unique parameters.
- j) **Overlapping roles given to institutions regulating construction industry**  
The Key institutions have overlapping mandates in approval and inspection of building and construction works.

## CHAPTER FOUR: CONSTRUCTION PRACTICES IN KENYA

### 4.1 Introduction

Building construction is a complex activity and requires trained manpower at design and approval processes; and supervision of different stages of construction. Owing to its highly labour intensive nature, construction work provides opportunities from employment for a wide range of people, skilled, semi-skilled and unskilled workers (Well & Hawkins, 2007). According to Ogunmakin (2005), workmen are the most important factor of production since they are the only factor that creates value and sets the general level of production. In order to develop a plot, developer, needs to engage the building professionals in the industry.

Construction involves numerous actors and several stages. The respective processes, procedures and all the players should work together in coordinated and harmonized manner to guarantee safe and healthy built environment.

This section therefore discusses the construction process, key stakeholders involved and their respective mandates.

### 4.2 Planning of Construction Works

There are several stages in the life cycle of building and they include; Inception, design, approval, construction and maintenance. The different stages of construction are outlined in Figure 4.1.

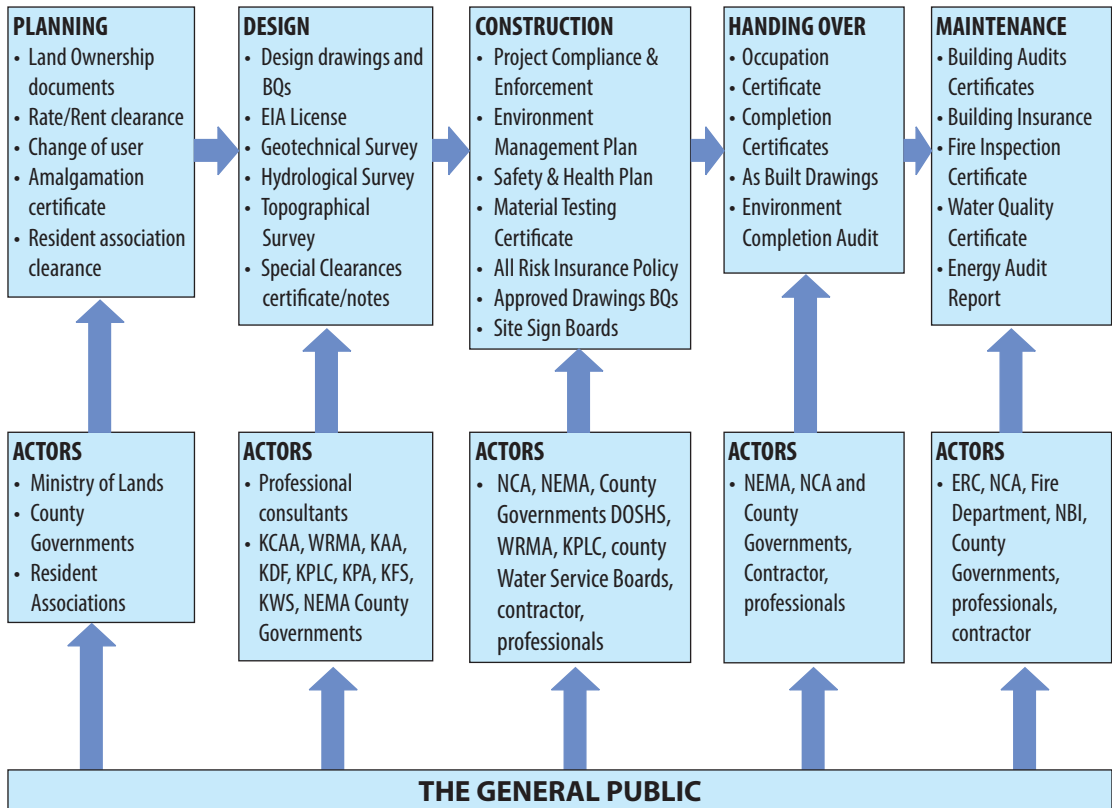
*Inception:* The design team is briefed by the client on the nature of project, project site, budget, and other project requirements. The design of a building commences with a site survey which shows beacons and dimensions of the plot, topography, and existing characteristics of the neighbourhood. The client also presents copies of land ownership documents to architect.

*Design:* Essentially the professionals building team comprises of an architect, engineers and a quantity surveyors; The design stage involves designing of building and its surrounding environment, and preparing required architectural and structural engineering drawings for submission to relevant county governments. The design team undertakes their responsibility as outlined in respective statutes, such as Board of Architects and Quantity Surveyor, (BORAQs) and Engineers Board of Kenya (EBK). After completing their work, the architect and structural engineers submit their drawings for approval by the approving agents as required by the Building Code and Environmental Management Coordination Act. The architect and engineers also sign indemnity forms.

*Procurement:* After the drawings are approved, the procurement stage commences. In this stage, a contractor is identified and selected. The process of selecting the contractor can be through open or negotiated tendering method. After contractor selection, the parties involved prepare a contractual agreement based on standard forms of contract prepared by Joint Building Council (JBC). The documents constituting contract are; architectural and

engineering drawings, bills of quantities, and agreement document from Architectural Association of Kenya (AAK) prepared by JBC.

**Figure 4.1: Construction project stages and key actors**



Source: Authors, 2019

### 4.3 Execution of Construction Works

After the planning stage, the site is handed over to the contractor by the client to commence the implementation of the building project. It is a requirement that the design and construction teams supervise the project on fortnight bases (site inspection) and have monthly meetings. The County Government is supposed to issue the contractor with a yellow card which alerts County Compliance and Enforcement officers when to visit the construction site to inspect different stages of construction.

It is a requirement that the selected contractor for the job must be registered with NCA. The registration of contractors by NCA has clear criteria starting from cash flow ability, technical personnel, site of owned plant and equipment, among others. The contractors hire competent and skilled registered artisans and professionals relevant for the construction work. Retention payments due to the contractor are withheld as a guarantee against poor workmanship, hidden defects and similar faults which might be observed after project completion. It is a requirement by building code for consultants and contractor to ensure the workmanship of the project is of high quality.

#### 4.4 Completion of Construction Works (Handing over)

During hand over period, following are some of the activities based on standard form of contract developed by Joint Building Council (JBC) that are carried out by the contractor and the design team;

- a) Preparation of snag list before practical completion
- b) Carrying out final inspection to satisfy completion of snags
- c) Informing the client need for insuring building
- d) Having hand-over meeting and declaration of practical completion
- e) Preparation and issuance of final accounts
- f) Prepare certificate of practical completion and releasing moiety of retention
- g) Preparation of defects list
- h) Carrying out all final inspection
- i) Issuance of a certificate at close of the contract
- j) Preparation for the process of issuance of occupation certificate by the County Government

#### 4.5 Maintenance

Buildings must be healthy, safe, secure, convenient and comfortable at all times. Therefore, regular maintenance should be carried out during life cycle of the building to sustain its quality and value. Well maintained buildings should always provide quality working, living, or recreating environment. Conversely, dilapidated and unhealthy buildings can easily lead to defective building and ultimately its failure/collapse. Regular inspection of building components and elements is critical for the safety, health and comfort of its occupants.

National Building Maintenance Policy, 2015 recommends a five year periodic inspection of all categories of buildings.

#### 4.6 Key Actors in the Construction Industry

As shown in fig. 4.1, the construction industry has many actors involved in the building process. These actors include:

##### *Clients:*

These are the largest actors in the construction process and comprise of public and private sector. According to Gitau (2015), the Government of Kenya (GOK) has been for a long time the major client for the construction industry constituting about 60% of the total value representing about 4% of the GDP.

##### *Consultants:*

These are professional individuals and entities engaged during the implementation of the construction project. They include Project Managers, Design Team (Architects and Engineers), Quantity Surveyors and Environmental Experts.

Project Managers oversee the project implementation including the planning, execution, monitoring and closure.

They ensure that timeframe, targets and budgets are met and they maintain appropriate client consultants' relationships throughout the project life cycle. A project manager has the responsibility to monitor and approve various activities within the design process. As such, he/she should establish clear reporting procedures, the format for presenting information, and the approved mechanisms for each stage. The Project Manager should ensure that all project information is effectively, clearly and correctly communicated between the design team, client and stakeholders so that it is fully understood.

Architects and Engineers (Civil, Mechanical and Electrical) represent design team that is responsible for developing and delivering the design solution. The nature, size and complexity of projects determine the size and make-up of the design team. Selecting the team is crucial for obtaining the correct level of service and design quality. The need for specialist knowledge should be assessed at each stage so that relevant skills can be called upon at the right time in the design process and design can be coordinated efficiently.

Environment Experts ensure that the environmental aspects such as lighting, acoustics and solar projection from building are well designed for in a building. The comfort of the spaces is ensured by these experts.

*Quantity Surveyors/Building Economists:*

They prepare Bills of Quantities (BOQ) and carry out valuation of construction works.

*Construction Workers:*

Construction workers in Kenya largely comprises of plumbers, electricians, welders, masons, carpenters, painters, machine/plant operators, interior specialist artisans and aluminum fabricators, among others. They execute construction work at the site under the direction of a supervisor appointed by the contractor.

*Contractors:*

The contractor is entrusted with design details from which he should follow procedures to deliver the project. In the design-and-build projects, the contractor provides an integrated project team that includes designers and construction personnel. For such projects, contractors take responsibility for the design and are in charge of producing design solutions that respond to the Client's requirements as set out in the detailed output performance specifications, which should reflect all key material in the Definitive Project Brief. The Contractor's design activities in a design-and-build project should follow the same procedures as those of an Employer in a traditional Employer-designed project, but may be in a less structured way.

**Observations**

- a) It is the standard practice that the lowest bidder is awarded the contract. However, this does not consider the quality of the delivered building project.
- b) Contractors are paid upfront in most of the public projects and where financial controls are weak, it is likely funds will not be available to execute quality building.

- c) Undue political interference sometimes lead to funds being used for unintended purpose, negatively impacting on construction project execution.

#### 4.7 Licensing Criteria for Contractors in Kenya

Contractors in Kenya are registered by the National Construction Authority (NCA). Below describes the basic criteria for the registration as a contractor.

- a) Certificate of Incorporation: A contractor is required to register as a legal company in the country as a limited liability, sole proprietorship or as a partnership company.
- b) Technical Qualifications: one of the technical directors of the registered company have minimal technical qualification, have skills or possess experience in a field related to construction. All the directors must forward their CVs to the National Construction Authority.
- c) Valid PIN, VAT and Income Tax compliance certificates, and Bank Account: The contractor applying to operate in Kenya must prove tax compliance by means of submitting these documents to National Construction Authority (NCA). The bank account should be opened under name of the contractor company and evidence for the bank account is required.
- d) Foreign contractors are issued with permission to operate for a specific period of time and are required to prove that they are in the country for that given time to undertake a project. They should not undertake another project after the one specified or targeted is completed.
- e) Foreign contractors willing to operate in Kenya are required to submit a commitment to transfer skills to the locals.

#### 4.8 Categories of Contractors

NCA regulations allow a Kenyan contractor to register in one or more categories according to class of construction works to be undertaken.

- 1) NCA1: Unlimited contract value: which has various classes: Unlimited contract value [Contractors – Building] Unlimited contract value [Specialist Contractors] Unlimited contract value [Roads and other Civil Works]
- 2) NCA2: Up to 500, 000, 000 [Contractors – Building], Up to 250, 000, 000 [Specialist Contractors], Up to 750,000, 000 [Roads and other Civil Works].
- 3) NCA3: Up to 300, 000, 000 [Contractors – Building] Up to 150, 000, 000 [Specialist Contractors] Up to 500,000, 000 [Roads and other Civil Works]
- 4) NCA4: Up to 200, 000, 000 [Contractors – Building] Up to 100, 000, 000 [Specialist Contractors] Up to 300,000, 000 [Roads and other Civil Works]
- 5) NCA5: Up to 100, 000, 000 [Contractors – Building] Up to 50, 000, 000 [Specialist Contractors] Up to 200,000, 000 [Roads and other Civil Works]
- 6) NCA6: Up to 50, 000, 000 [Contractors – Building] Up to 20, 000, 000 [Specialist Contractors] Up to 100,000,000 [Roads and other Civil Works]

- 7) NCA7: Up to 20, 000, 000 [Contractors – Building] Up to 10, 000, 000 [Specialist Contractors] Up to 50,000,000 [Roads and other Civil Works]

#### 4.9 Observations

- a) Contractors in Kenya are companies and the process of their registration does not put a lot of emphasis on the qualifications of the directors, unlike in other countries, where contractors are duly qualified individuals who undergo a rigorous examination process before being licensed.
- b) There is poor maintenance of buildings and in some cases renders them unsafe. Periodic inspections are required for early detection of defects. The provisions in the National Building Maintenance Policy 2015 have not been effected through relevant legal framework.
- c) Figure 4.1 also indicates that construction industry is fragmented and uncoordinated since the design and construction stages are very distinct and not interlinked to allow for seamless changeover. Also the approving agencies are located in different places thus making the approving processes convoluted and time consuming.
- d) Procedures for project execution stipulated under JBCC are not mandatory.
- e) The responsibilities of guaranteeing safety of a building is not explicit in law.
- f) Practitioners have commercialized their practice and abandoned professionalism essentially compromising construction quality and standards.
- g) Enforcement of Building Standards and Regulations is weak. The stipulated standards and regulations are not entirely adhered to. County Governments issue inspection cards but the inspection stages are not carried out as it ought to be. Inspections are ad hoc and rarely take place.
- h) There is inadequate technical capacities within the agencies to implement their mandates; Inspection of the different stages of construction is entirely the responsibility of the county compliance or enforcement officers. Some of these officers in the department of enforcement and compliance have no technical knowledge on built environment to allow them make proper judgement during inspections at construction.
- i) The construction approval process involves various departments within County Governments and the submissions are done independently. This makes the process not only lengthy but also costly. Online applications and approval is used by a few counties.

## CHAPTER FIVE: CONSTRUCTION INDUSTRY GROWTH ENABLERS IN KENYA

### 5.1 Introduction

Construction sector is a capital intensive process. It requires several resources particularly in terms of construction equipment, finances, human resource capacity as well as research and development.

This section describes the status of inputs required for an effective construction industry.

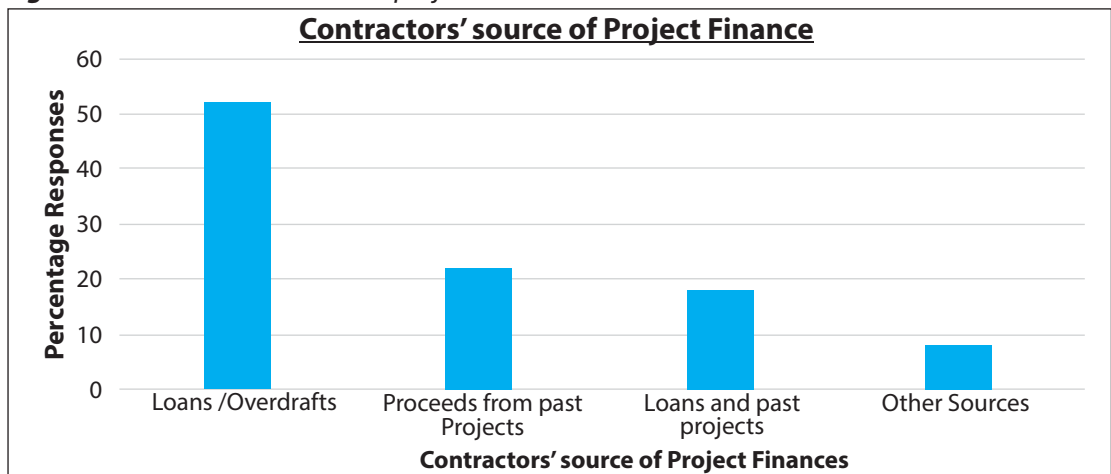
### 5.2 Construction Financing

This part reviews construction financing in Kenya as well as best financing practices in U.K, USA, Australia and Singapore.

#### 5.2.1 Construction financing in Kenya

Financing of Building and Construction industry in Kenya, like in other sector is characterized by own savings, construction loans from local financial institutions, funds from global institutions, local institutional investors, capital markets, Real Estate Investment Trusts (REITs), joint ventures and off – plan sales.

**Figure 5:1** Contractors' source of project finances



This study established that 52% of contractors' main source of project financing was loans/overdrafts, 22% proceeds from past projects, 18% both bank loans & past projects and 8% from other sources. Sources indicated as "others" include advance payment and shylocks (NCA, 2014). The Government has set up a scheme of funding, the National Housing Development Fund (NHDF), as a vehicle for financing affordable housing through National Housing Corporation where members of the public are contributing 1.5% of their monthly income. The Kenya Mortgage Refinance Company will be lending money to prospective affordable house buyers.



Figure 5.1, indicates that majority of the contractors rely on commercial loans to finance construction activities. Commercial loans in Kenya have been cited as the most expensive given the high interest rates. According to The World Bank Group (2020) in 2018 the average lending rate for commercial loans stood at 13.1% which is among the highest in Africa.

Construction being capital intensive requires incentives from the Government to motivate it. The existing incentives in the market are mainly tax related and target development in home ownership more so in affordable housing.

The above notwithstanding, Kenya tops the list of countries in Africa that are expensive to build after Johannesburg (Capital Business, 2019). This has been attributed to costly access to finance and high costs of land and construction.

### **5.2.2 Financing building and construction industry lessons from Best Practices**

Developed economies have put in place various policies and practices to support building and construction. This is in furtherance to their respective contribution to national economies. It is however worth noting that the trend for financing building and construction is biased towards sustainability. Some of the practices from developed economies have been discussed below;

United Kingdom developed various policies including the world's first Green Investment Bank, whose primary responsibility is to support and overcome barriers to investment in green projects. UK also has an established £4.5 billion Home Building Fund to support home ownership (Home Building Fund, 2018). In Australia, the Federal Government established a green building fund of approximately USD 71.24 to fund retrofit to existing buildings.

The United States of America have over decades initiated various programmes at federal level including Energy Efficiency and Conservation block grant programme and Weatherization Assistance Programmes to support the units of local government and Indian Tribes and low income families to carry out retrofits to their buildings. Singapore set up Build SG Transformation Fund (BTF) which is a consolidation of funding support for firms and individuals in key areas of the Construction Industry (BCA, 2019).

These programs reflect real commitment by policymakers in the developed countries to promote building and construction industry.

### **5.3 Construction Equipment**

There are several construction equipment used in the industry. These include Excavator, Wheel Loader, Truck, Concrete Mixers, Cement Concrete Mixer, and Mobile Concrete Mixers (Table 5.1). Some of the existing companies involved in leasing of equipment in Kenya include; Holman brothers, Atlas Copco Kenya, Car & General, Hyundai Construction Equipment, Nyati, Panafrican Group, XCMG and XGMA. The database of equipment and leasing companies are not readily available. Table 5.1 shows list of selected construction equipment and their average cost of hire in the Kenya market.

**Table 5.2: Average Rates of Hiring Construction Equipment**

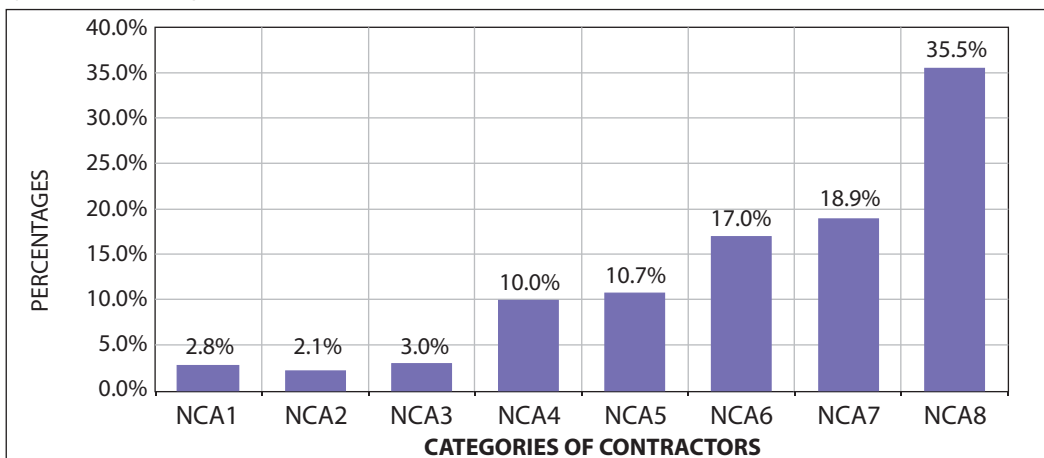
Equipment	Cost (Kshs)
Grader	5,500 per hour
Excavator,	6,000 - 10,000 per hour
Bull dozer	6,000 per hour
Wheel Loader	25,000 per day
Roller	25,000 per day
Truck	17,000 per day
Lorry	25,000 per day

A survey carried out by NCA in 2014 revealed 53% of contractors use leased equipment, 27% owned, 18% combined lease and owned and 2% use hired equipment. The service condition of the equipment is Good 47%, Average 34%, Excellent 18% and Poor 1%. Availability of road construction equipment is most inadequate in the industry at 58% with bulldozers and graders being singled out as most predominantly inadequate. Availability of other equipment such as cranes, concrete mixers, concrete pumps and vibrators are also inadequate. The survey established that the cost of acquiring construction equipment by the lower category of contractors, who have limited resources, is relatively high.

## 5.4 Human Resource Capacity

### 5.4.1 Contractors

Kenya started registration of contractors in 2012. A survey carried out by NCA in 2019 established that Kenya has over 86,868 registered contractors albeit only 46.3% (40,231 Contractor) have valid 2018/2019 practicing license. This contractor certificates are held with 18,821 companies recognized by the Authority as of June 2019. Building works has the highest proportion of licensed contractors at 37% followed by Roads at 34%. Water and Electrical works have proportions of 21% and 5% respectively. Mechanical has a paltry 3%. The individual registered contractor companies by NCA as of June 2019 are 18,821 companies. The sector is dominated by small and medium enterprise contractors which account for a total of 82.1%. Large establishment contractors account for 17.9%

**Figure 5.2: Categories of contractors with valid license as of June, 2019**

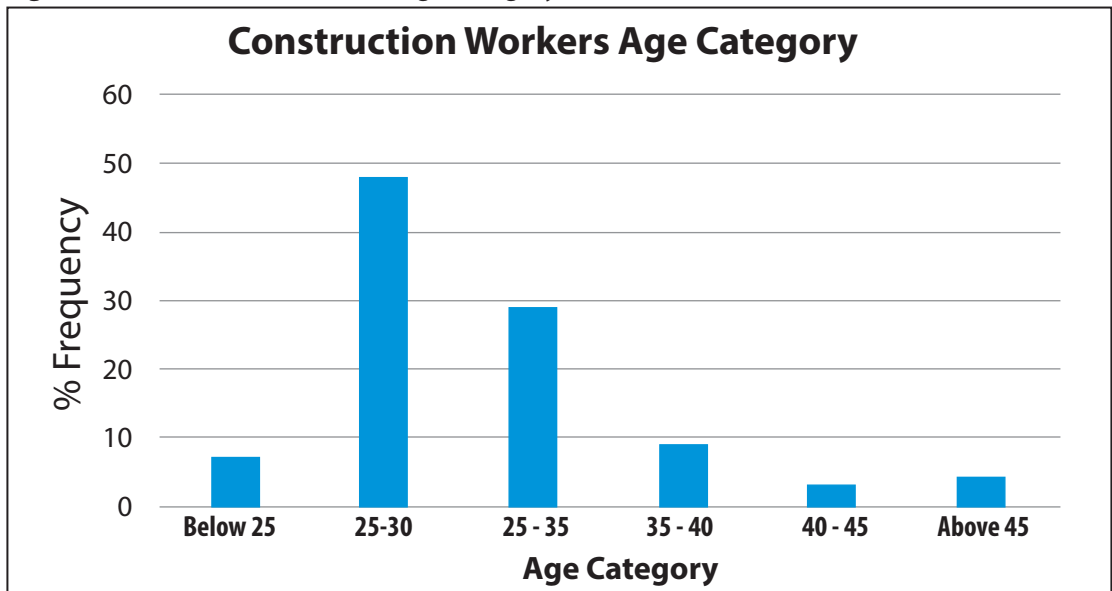
### 5.4.2 Construction workers

The construction sector in Kenya is comprised of skilled, semi-skilled and unskilled artisans. In a study by NCA in 2014, it was established that the sector has over 511,676 construction workers. The sector depends mainly on unskilled laborers, who account for 42% of the employed labor force within the sector. Skilled workers account for 25% whilst Semi-skilled workers are 33%. Women are under represented in all the categories with a proportion of 19%. The most predominant age group of construction workers is between 25-30 years (**Figure 5.2**).

The average number of construction workers employed per contracting entity under various categories is as below;

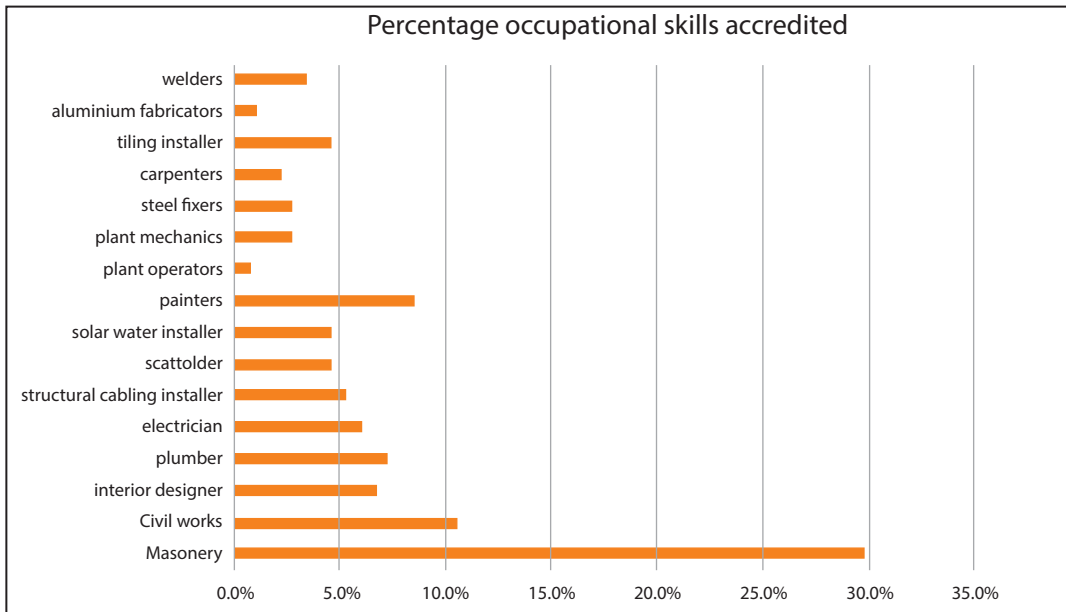
- NCA1: skilled - 37, semi-skilled - 96 and unskilled - 112
- NCA2: skilled workers- 28, semi-skilled - 8 and unskilled - 13
- NCA3 and NCA4: skilled workers are less than 15, whilst for
- NCA5 to NCA8, less than 10 skilled workers are employed.

**Figure 5.3: Construction Workers Age Category**



Source: NCA, 2014

The Authority data as of June, 2019 showed that the most registered construction skilled workers was masonry with over 29% of accredited workers while the list accredited was plat operators at 0.7%. Figure 5.2 below shows the categories of occupational skills accredited by NCA as of June, 2019.

**Figure 5.4:** Categories of occupational skills accredited by NCA as of June, 2019

### 5.4.3 Professionals in the built environment

These professionals are regulated by various regulatory authorities including BORAQS, Physical Planners Registration Board (PPRB) and Engineers Board of Kenya. Table 5.2 shows the total number of registered professionals in the built environment.

Some of the regulators have been empowered by the Act to undertake quality assurance in respective areas of discipline. Engineers Board of Kenya for instance is empowered to enter and inspect sites where construction, installation, erection, alteration, renovation, maintenance, processing or manufacturing works are in progress for the purpose of verifying that professional engineering services and works are undertaken by registered persons under the Act; standards and professional ethics and relevant health and safety aspects are observed.

Table 5.2 below shows statistics of categories of professionals as indicated at 2019 (Data from individual bodies)

**Table 5.6:** Registered Professionals in the Built Environment

Registered	Professional Number
Architects	1 509
Quantity Surveyors	931
Physical Planners	220
Engineers	1,323
<b>Total</b>	<b>3973</b>

**Table 5.7:** Comparison of architects per population of 1,000 in different countries

Country	Number of architects per population of 1,000
Austria	0.53
Canada	0.26
Netherlands	0.9
UK	0.58
Ghana	0.02
Uganda	0.04
Kenya	0.03

Source: NCA, 2018

The limited number of professionals in the sector and weak regulations by the regulatory boards has opened up space for unqualified persons. The Research by AAK established that over 50% of the development control related activities are carried out by unqualified persons. Rogue professionals collude with unqualified persons to allow professional work that they have not done to be approved in their names. Compared with developed countries, the number of architects is relatively low in Kenya. This implies that Kenya needs more architects to meet their service demand.

#### 5.4.4 Technical personnel

Technical personnel in the Counties are responsible for development control and are domiciled in the physical planning department. They comprise of Architects, Physical Planners, Engineers and Building Inspectors. In a study carried out by AAK in 2011, Nairobi, Kisumu and Mombasa were found to have respective building professionals for all sections of development control departments. 82% of the Counties did not have adequate personnel.

According to AAK, Kiambu and Machakos have the highest number of staff responsible for development control, at 40 and 31 respectively. According to World Bank Report (2019) the Urban Planning Department has only 15 staff to carry out building plan reviews and 34 building inspectors (on average 2 inspectors for each of the 17 sub-counties). This is on the backdrop average of 400 new building applications to process per month.

### 5.5 Research and Development (R&D)

This section reviews R&D in Kenya as well as in Japan and Singapore.

#### 5.5.1 Research and development in Kenya

Research and Development in building and construction industry entail broad range of activities that seek to improve quality, productivity, and efficiency of the materials, equipment, labour and management of construction.

In the Kenyan context, R&D in construction sector is mainly centered on new materials and building and construction technologies. There are a number of institutions that have

departments which seek to develop new materials and technologies:-

- a) Kenya Building Research Center (KBRC) whose mandate is to undertake research on new materials, technologies and processes;
- b) National Housing Corporation (NHC) who have pioneered Expanded Polysterene (EPS) technologies;
- c) Housing and Building Research Institute (HABRI) that carry out research on low cost housing project; and
- d) National Construction Authority that implements research agenda in the construction industry.

There are a number of Alternative Building Materials that have been developed as a result of R&D. These include: stabilized soil blocks, EPS panels, precast concrete hollow wall, straw bales, fly ash bricks, rice husk ash, aluminum form work technology and cement sisal fibre tiles.

### 5.5.2 Research and development in Japan

Japan established Ministry of Construction that sets national policies for construction industry. The ministry set a policy to encourage private firms to establish research and development capability that saw more than 20 of the largest firms in the Country invest 1 percent of their sales in R & D. Each of the firms currently have a well equipped campus-like research centers, and research is integrated throughout their operating divisions. The Government provides tax deductions of up to 1 percent of revenues (National Research Council, 1988). Their laboratories are furnished with the latest equipment.

### 5.5.3 Centre for Lean and Virtual Construction in Singapore

In 2015, Singapore's Building Control Agency developed the Center for Lean and Virtual Construction to equip built environment professionals with process change skills based on Lean Construction and virtual construction concepts. The center also facilitates Virtual Design and Construction (VDC) processes via Building Information Modelling (BIM) to encourage project teams to build digitally before actual construction.

## 5.6 Observations

- a) Access to finance remains one of the challenges to vibrant construction sector in Kenya. The interest rates from majority of the commercial financial institutions are prohibitive.
- b) Government incentives are biased towards specific segment of building and construction industry.
- c) Construction equipment leasing is not regulated in Kenya. Equipment leasing operates as a trade. This means the contractors may not get equipment that has up to date technology, well maintained, specialized machinery and that meets the emission of air quality standards.

- d) Use of construction equipment is equally not regulated. Specific equipment ought to be used for specific construction project.
- e) Building Information Management has not been integrated in Kenya's Construction Processes.
- f) The Country has an acute shortage of construction workers which has a negative impact on the construction industry.
- g) Currently, there lacks mechanism to ensure the categories of contractors carry out construction work whose value is commensurate with their license.
- h) The development of indigenous building materials in construction industry is still an untapped resource. The end users are not willing to use the ABMTs materials because they are concerned with their performance.
- i) There is limited funding for R&D. There is no policy to support Research and Development for the construction industry in Kenya. Funding is mainly from public sector.
- j) The necessary supportive research in building and building materials in Kenya is inadequate and does not provide sufficient input for the purposes of the development of the construction industry in developing countries.
- k) Due to limited funding, there are not incubation centers for testing prototype in construction industry.
- l) Limited trained construction workers is hampering delivery of construction projects
- m) As discussed under section 5.4.2, there are shortage of skilled construction workers. As such, most of the construction works in Kenya are carried by unskilled labour

## CHAPTER SIX: FAILURE AND COLLAPSE OF BUILDINGS AND THEIR CAUSES

### 6.1 Introduction

A shelter is a basic human need that is very critical for the survival of man. It therefore requires that designs of buildings guarantee safety of the occupants. Design requirements ought to ensure that the set standards, including safety considerations, are adhered to.

This section discusses in detail the instances and causes of failure and collapse of buildings as a global phenomenon and in Kenyan context.

### 6.2 Cases of Building Collapse Globally

Building failures is common in most of the economies of the world including developed countries. Numerous incidences have been recorded in the past including recent cases of collapse of Exchange Walkway in Indonesia, partial collapse of a parking garages in Eindhoven Airport, collapse of Sampoong Department Store in South Korea (Plate 7.1), Collapse of Hotel New World in Singapore and Katowice Trade Hall in Poland (Plate 7.2). These cases demonstrate that building failure is a global phenomenon. However, frequency of building collapse is low compared to Kenyan context.

**Plate 6.1:** Sampoong Department Store, South Korea



Source: Almarwae, 2017

**Plate 6.2:** Katowice Trade Hall, Poland



Source: Almarwae, 2017

Table 7.1 describes some of the aforementioned cases with a particular emphasis on the respective actions after the collapse. This is significant in informing our local case in instances of the buildings collapse.



**Table 6.1: Building Collapse Globally**

Building Collapse	Description	Post collapse activities
Katowice Trade Hall, Poland	The central section of the roof of the hall collapsed, possibly due to the weight of snow. The collapse killed 65 people and injured more than 170	<p>Collapse as a result of design and construction flaws. The snow from the roof was not being removed which resulted in construction overload by more than 100% The hall had been repaired without getting a building inspector's clearance and without doing necessary tests and calculations to determine if the construction was stable and had sufficient strength. As a result, the following actions were instituted:</p> <ul style="list-style-type: none"> <li>• Design Architects were arrested and charged for the errors</li> <li>• The building owners were also arrested and charged with criminal negligence – allegedly they were aware of the fact that the building was unsafe and yet allowed usage of the building. By doing so they contributed to deaths of people</li> <li>• Polish building law was amended. Large buildings were thereafter required to undergo technical survey twice every year (before and after winter) to make sure they are safe and structurally sound. Failure to conduct the survey is punishable by a minimum 1,000 zloty fine (Kshs. 27,000 or a term in prison)</li> </ul>
Hotel New World, Singapore	A six storey building hosting a hotel, commercial offices and restaurant collapsed killing 33 people	<p>Extensive investigation was carried out revealed that the original structural engineer had made a serious error in calculating the building's structural load. The structural engineer had calculated the building's live load (the weight of the building's potential inhabitants, furniture, fixtures, and fittings) but the building's dead load (the weight of the building itself) was completely omitted from the calculation. This meant that the building as constructed could not support its own weight. The building was designed by unqualified draftsman instead of professional structural engineer. The following actions were taken by the Government:</p> <ul style="list-style-type: none"> <li>• Buildings built in the 1970s were checked for structural faults, and some of them were declared structurally unsound and had to be evacuated</li> <li>• The government introduced tighter regulations on building construction; since 1989, all structural designs are required to be counter-checked by accredited checkers</li> </ul>
Hotel New World, Singapore	A six storey building hosting a hotel, commercial offices and restaurant collapsed killing 33 people	<ul style="list-style-type: none"> <li>• Investigation was carried out which revealed that the building was built with incorrect application of a technique called "flat slab construction".</li> <li>• The owners of the building were jailed for criminal negligence and forced to compensate families of the victims.</li> </ul>

Source: NCA, 2019

### 6.2.1 Observations

- Cases of building collapse are extensively investigated from a criminal angle and the parties involved through actions of commission or omission are subjected to punitive terms including compensating the victims.
- The sites are preserved until relevant investigations are completed.
- Majority of the cases have resulted into legal reforms to strengthen building control processes.

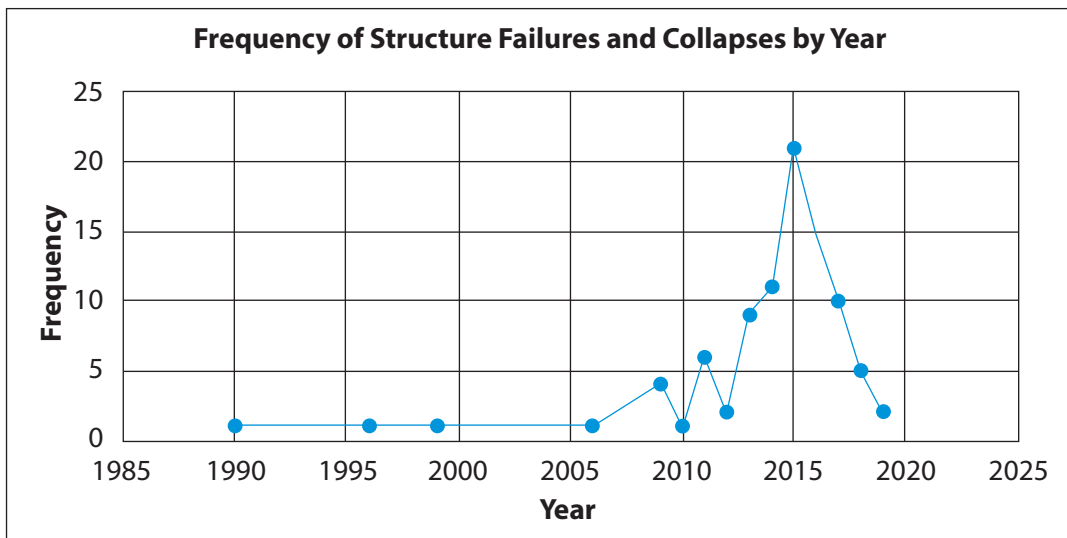
### 6.3 Cases of Building Failure and Collapse in Kenya

The construction sector in Kenya in the past three decades, has been characterized by unsafe buildings that are very dangerous for human habitation. This phenomenon has been so pronounced that it has not only attracted a lot of concern from players in the sector but also the top leadership of the Country. As a result, commissions of inquiries have previously been formed and the legal and institutional reforms have been proposed. Nonetheless the challenges still persist.

An audit carried out in 2018 by the National Building Inspectorate (NBI) covering 14, 925 buildings revealed that 723 are very dangerous, 10,791 are unsafe, 1217 are fair and 2194 are safe. These unsafe and dangerous buildings eventually collapse.

The earliest documented case of building collapse in Kenya was in 1990 when the collapse of a multi-storey building in Dagoretti killed one person and injured others. Thereafter a total of 87 buildings have so far collapsed, with a total of 21 being recorded in 2015, alone (Figure 7.1 and Appendix 1). Plates 7.3, 7.4 and 7.5 and Table 7.2 give three images of collapsed buildings in Kenya.

**Figure 6.1:** Documented Cases of Building Failures from 1990 to 2018



**Table 6.2: Building Failures and Collapses 1990-2019**

Date	Area	Description	Status of the building	Reason	Action
<b>1990</b>					
12th January	Nairobi-Dagoretti Corner	A section of the building under construction collapsed killing a mason	Under construction	• Poor workmanship	Records not clear
<b>1996</b>					
13th May	Nairobi- Moi Avenue	16 people died while sheltering from the rain in Sunbeam Supermarket when the old building collapsed	Complete old building	• An overload on a weak canopy and a deteriorated building structure	Demolished
<b>1999</b>					
5th June	Nyeri	A building under construction collapsed in Nyeri Town. One man was seriously injured	Under construction	• Poor workmanship • Substandard materials	Records not clear
<b>2006</b>					
23rd January	Nairobi-along Ronald Ngala Street	Five storey building collapsed killing 11 people and injuring dozens	Complete building	• Poor workmanship • Substandard materials	Records not clear
<b>2009</b>					
30th January	Eldoret	A roof of an old building collapsed killing one person and injuring five	Complete- old building	• Poor workmanship	Records not clear
10th April	Mombasa	Several people died after a building under construction came tumbling down at Spaki in Mombasa	Under construction	• Poor workmanship • Substandard materials	Records not clear
16th June	Kisii	Two people were killed after an unfinished building collapsed	Under construction	• Poor workmanship • Substandard materials	Records not clear
19th October	Kiambu	Two people were killed and many more trapped after a 3 storey building collapsed in the middle of Kiambu Town	Complete building	• Poor workmanship • Substandard materials	Records not clear

<b>2011</b>						
14th June	Nairobi- Embakasi	Six storey building collapsed. At least six people were killed	Complete old building	• Poorly planned and put up using substandard materials	Records not clear	
20th June	Nairobi- Lang'ata Southern Bypass	The Lang'ata building along the Carnivore collapsed	Complete building	• Poor workmanship	Records not clear	
30th July	Nairobi- Ngara	A building collapsed injuring 6 people	Under construction	• Poor workmanship • Substandard materials	Records not clear	
17th September	Vihiga- Luanda (Mabona area)	A three storey building collapsed killing 4 people and trapping others in the debris	Under construction	• Poor workmanship	Records not clear	
18th September	Kakamega	Five people were trapped under the rubble of a collapsed building and two more died in Mwivona	Complete building	• Poor workmanship	Records not clear	
19th September	Nairobi- Mathare North	A residential building collapsed in Mathare	Complete building	• Poor workmanship	Records not clear	
<b>2012</b>						
7th May	Nairobi- Westlands	A six-storey building that was under construction in Nairobi's Westlands neighbourhood collapsed	Under construction	• Poor workmanship	Records not clear	
12th June	Nairobi- Mlolongo	A building under construction collapsed on all those who were working on it, killing 3 people	Under construction	• Poor workmanship	Records not clear	
<b>2013</b>						
10th January	Trans Nzoia-Kitale	Commercial	*****	• Heavy rain	missing	
14th January	Nairobi- Downtown	Building under demolition collapsed in Nairobi's downtown	Complete building being demolished	• Failure to adhere to safety requirements	Records not clear	
16th January	Kisumu- building located on Jomo Kenyatta highway	Five storey building collapsed. Seven people killed and scores missing	Under construction	• Poor workmanship • Substandard building materials	missing	

**Table 6.2: Building Failures and Collapses 1990-2019 (cont....)**

Date	Area	Description	Status of the building	Reason	Action
14th July	Kiambu-Ndenderu	A five storey building collapsed	Complete building	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	Demolished
14th July	Nairobi-Industrial Area	Factory wall collapsed	Complete	<ul style="list-style-type: none"> <li>Failure to adhere to statutory requirements</li> <li>Poor workmanship</li> </ul>	Demolished
14th August	Taita Taveta	Wall in Wundanyi collapsed	Complete	<ul style="list-style-type: none"> <li>Strong wind (poor structural design)</li> <li>Poor workmanship</li> </ul>	None
2nd September	Uasin Gishu, Eldoret	A four storey building collapses killing seven, injuring dozens	Under construction	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	Records not clear
3rd September	Nairobi CBD Muindi Mbingu Street	Sojpal Building opposite the City Market collapsed on one side	Complete	<ul style="list-style-type: none"> <li>Collapse could have been caused by deep excavation to pave way for an up-coming building besides it</li> </ul>	missing
28th November	Embu-Runyenyjes	A 5-storey commercial building collapsed killing one person	Complete building	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	Records not clear
<b>2014</b>					
14th January	Nairobi-located near Accra and Dubois Road junction	Three people were injured after a two storey building they were demolishing collapsed in downtown Nairobi	Under demolition	<ul style="list-style-type: none"> <li>Use of manual tools for demolishing by masons</li> </ul>	missing
1st August	Kiambu- Thika	A building under construction collapsed near Bambini school	Under demolition	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	Site closed
14th September	Lamu	Mosque under construction collapsed in Pate Island	Under construction	<ul style="list-style-type: none"> <li>Poor workmanship</li> <li>Substandard materials</li> </ul>	Site closed
2014	Laikipia-Nanyuki	8 storey building under construction collapsed in Nanyuki	Under construction	<ul style="list-style-type: none"> <li>Poor workmanship</li> <li>Substandard materials</li> </ul>	Site closed

November	Kiambu- Ruaka (Gacharage)	5 storey structurally complete building collapsed in Ruaka	Complete	<ul style="list-style-type: none"> <li>Poor workmanship</li> <li>Substandard materials</li> </ul>	Demolished	
November	Mombasa	5 storey building under construction near Mombasa Railway Station collapsed	Under construction	<ul style="list-style-type: none"> <li>Poor design</li> <li>Poor workmanship</li> </ul>	Site closed	
November	Nyeri- Skuta	4 storey building under construction in Skuta collapsed	Under construction	<ul style="list-style-type: none"> <li>Introducing basement beneath foundation levels</li> <li>Poor workmanship</li> </ul>	Investigation in progress	
November	Nairobi- Baba Dogo	Evacuation of tenants as a 4 storey building developed cracks in Baba Dogo, Kasarani	Complete	<ul style="list-style-type: none"> <li>Failure to adhere to statutory rules</li> <li>Poor workmanship</li> </ul>	missing	
December	Nairobi- Kasarani	Tenants ordered to vacate a building found to be unfit for occupation in Kasarani	Complete	<ul style="list-style-type: none"> <li>Failure to adhere to statutory requirements</li> <li>Poor workmanship</li> </ul>	Demolished	
17th December	Kiambu- Thika (Makongeni)	5-storey building collapsed near Makongeni Station	Complete	<ul style="list-style-type: none"> <li>Poor design</li> <li>Poor cement-to-sand ratio</li> </ul>	The CID and police took over as the building was already complete and occupied	
December	Kaloleni	5 storey building partially occupied collapsed in Kaloleni still under construction, killing 7 people	Complete incompl...	<ul style="list-style-type: none"> <li>Structural failure due to poor design</li> </ul>	None	
<b>2015</b>						
4th January	Nairobi- Huruma	A six storey residential building in Huruma Estate collapsed injuring and trapping a number of people in the rubble	Complete	<ul style="list-style-type: none"> <li>Substandard materials</li> <li>Poor workmanship</li> </ul>	Demolished	
2nd April	Nairobi- Roysambu	A 6-storey building (behind TRM) collapsed killing two people and trapping more	Under construction	<ul style="list-style-type: none"> <li>Poor and hurried workmanship</li> <li>Unethical behaviour (building was certified for only 3 floors)</li> </ul>	Investigation in progress	

**Table 6.2: Building Failures and Collapses 1990-2019 (cont...)**

4th February	Kakamega- Milimani Estate	Commercial building collapsed killing 2 people and injuring 3	Under construction	Demolished slab collapsed while digging foundation	Records not clear
15th April	Kiambu- Thika	More than 30 people were seriously injured in Muthaiga area of Thika after a building collapsed	Complete building	<ul style="list-style-type: none"> <li>Poor workmanship</li> <li>Substandard materials</li> </ul>	None
15th April	Nairobi - Muthurwa	1 person died and 4 others injured after a building under demolition in Wakulima Road collapsed; building caved in trapping people	demolished	<ul style="list-style-type: none"> <li>Lack of safety precautions during demolition</li> </ul>	None
16th April	Kisii- Jogoo Estate	A residential building started sinking, prompting residents to evacuate	Complete	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	Records not clear
26th April	Kiambu- Kiambaa	A five storey building collapsed in Kiambaa after heavy rain that was experienced overnight	Under construction	<ul style="list-style-type: none"> <li>Poor workmanship, construction had been stopped</li> </ul>	Demolished
29th April	Kiambu- Kikuyu	A three storey building under construction collapsed in Kikuyu town	Under construction	<ul style="list-style-type: none"> <li>Substandard materials</li> <li>Poor workmanship</li> </ul>	Matter in court
April	Nakuru	School perimeter wall collapsed in Kiti Estate in Nakuru and fell on two students	Complete	<ul style="list-style-type: none"> <li>Strong wind</li> <li>Poor design</li> <li>Poor workmanship</li> </ul>	None
13th May	Nairobi- South B	A perimeter wall at South B mosque collapsed in Mukuru Fuata Nyayo slum after a heavy downfall that led to the death of 9 people	Complete	<ul style="list-style-type: none"> <li>Heavy rain</li> <li>Poor workmanship</li> <li>Substandard materials</li> </ul>	Demolished
25th May	Mombasa- VOK Nyali	The building's ground and first floors columns' failed on compression and shearing effects. The structure is still upright with the second floor shifting to ground floor level	Complete	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	The collapsed structure was demolished before comprehensive investigation was done
3rd June	Kisumu	15 people rescued and 30 trapped as building collapses in Kisumu	Under construction	<ul style="list-style-type: none"> <li>Poor workmanship</li> <li>Non-compliance</li> </ul>	Site closed

2nd July	Estate Kisumu - Manyatta	A three storey building collapsed	Complete	<ul style="list-style-type: none"> <li>Substandard materials</li> </ul>	County government to assist in identifying the plot owner to enable further inquiry. Steel reinforcements and concrete samples to be taken for testing
7th June	Nairobi- Lower Kabete	Building under construction collapsed in lower Kabete	Under construction	<ul style="list-style-type: none"> <li>Poor workmanship</li> <li>Non-compliance</li> </ul>	Site closed
14th July	Nairobi - Zimmerman	A four storey building in Zimmerman whose construction was questioned 2 years before collapsed. Building had been vacated at time of collapse	Complete	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	Records not clear
6th September	Kajiado- Ongata Rongai	Six storey residential house under construction collapses	Under construction	<ul style="list-style-type: none"> <li>Poor quality materials</li> <li>Poor workmanship</li> </ul>	Records not clear
26th September	Kiambu- Lower Kabete	Five storey building under construction sunk	Under construction	<ul style="list-style-type: none"> <li>Poor construction</li> </ul>	Records not clear
9th October	Busia	A four storey building collapsed in Busia Town killing a security guard	Complete	<ul style="list-style-type: none"> <li>Substandard workmanship</li> </ul>	Records not clear
28th October	Kiambu	School wall collapses on nearby house, killing student	Complete	<ul style="list-style-type: none"> <li>Substandard workmanship</li> </ul>	Records not clear
12th November	Meru- Chuka	A wall to an ablution block at Chuka University in Njaka hostel collapses after heavy rains	Complete	<ul style="list-style-type: none"> <li>Heavy downpour</li> </ul>	Records not clear
19th November	Kitui	A portion of the 3rd floor wall of a building under construction collapsed, no one was injured	Under construction	<ul style="list-style-type: none"> <li>Substandard workmanship</li> </ul>	Records not clear



**Table 6.2: Building Failures and Collapses 1990-2019 (cont...)**

Date	Area	Description	Status of the building	Reason	Action
<b>2014</b>					
7th January	Nakuru	Foundation wall collapsed, killing one person and injuring another	Complete	• Loose soil	Records not clear
28th April	Nairobi- Lenana	A wall collapsed along Nairobi Lenana Road. 3 persons died and several were injured	Complete	• Poor workmanship	The DOD were advised to repair the wall and the reinforcement
29th April	Nairobi- Huruma	A seven storey building collapsed in Huruma, Ngei Ward, Mathare Sub-County. 140 persons were rescued alive, 51 people died and 2 persons were missing	Complete	• Non-compliance	Records not clear
9th May	Mombasa- Nyali	A section of six storey building collapses in Nyali Mombasa. The toilet section of Mombasa centre collapsed due to what residents said was poor construction. No injuries reported	Complete	• Poor workmanship	Sections of building closed
1st July	Nakuru	A basement of the proposed (13 storey) Commercial development on plot no. 5/43, Nakuru County collapsed	Complete	• No competent foreman on sight	Suspended
2nd August	Nairobi- Westlands	Wall collapsed. 4 people killed and 7 injured	Complete	• Building in wetland	Records not clear
21st August	Kajiado- Ngong	Collapsed boundary wall on an ongoing excavation	Under construction	• Poor workmanship	Work was suspended until the contractor provides a detailed safety report on the excavation
24th September	KajiNairobi- Huruma	Masonry wall collapsed destroying the roof of Alshadai Educational Centre's kitchen and the school's cookeriado- Ngong	Complete	• Poor workmanship	The site was suspended pending proper hoarding and safety

Date	Area	Description	Status of the building	Reason	Action
30th September	Athi River- Jam City Slum	Excavation was being done during sewer line construction and the walls of the trench caved in due to pressure exerted by the weight of the workers standing by leading to burying of 4 people	Complete	<ul style="list-style-type: none"> <li>Weak foundation</li> </ul>	Closure notice was issued and developer advised to involve requisite professionals
30th September	Kiambu- Ruaka	Collapse of a building in Ruaka	Under construction	<ul style="list-style-type: none"> <li>Wall collapsed</li> </ul>	Building is beyond repair and should therefore be demolished
10th November	Kisii town- Daraja Moja	Four storey building under construction collapsed. Death toll from the collapse was six and the number of injured, at 44	Under construction	<ul style="list-style-type: none"> <li>Weight of additional floors</li> </ul>	Police are looking for the owner and contractor of the building to help with investigations
5th November	Kakamega	Collapse of a wall at Bukhungu Stadium	Under construction	<ul style="list-style-type: none"> <li>Failure of formwork</li> </ul>	Resolved. Work has resumed
23rd November	Kiambu- Ruiru	A building sunk in Ruiru, Kimbo- building was constructed in a water logged area	Complete	<ul style="list-style-type: none"> <li>Non compliance</li> </ul>	Records not clear
23rd November	Kiambu- Juja	2 storey Residential building collapsed	Under construction	<ul style="list-style-type: none"> <li>Extra weight of additional floors</li> </ul>	Records not clear
19th February	Nakuru- Gilgil	A two storey building on plot no. 3/269/Gilgil failed. The 2nd floor slab was being cast as an extension on a building that was constructed in 2000. No casualties reported	Under construction	<ul style="list-style-type: none"> <li>Overload of structure leading to sagging of beams, and crushing of columns.</li> <li>Inadequate steel reinforcement to structural members.</li> <li>Poor workmanship</li> </ul>	Further investigation on all structural components as experts deem fit
28th February	West Pokot- Chepareria	1 storey Commercial building collapsed	Complete	<ul style="list-style-type: none"> <li>Poor workmanship</li> </ul>	Project stopped by NCA

**Table 6.2: Building Failures and Collapses 1990-2019 (cont...)**

Date	Area	Description	Status of the building	Reason	Action
9th May	Mombasa-Kizingo	A boundary wall collapsed (at Pandya Hospital Kizingo) on a temporary structure under occupation, killing 6 people	Complete	<ul style="list-style-type: none"> <li>• Heavy downpour</li> <li>• Poor structural design</li> </ul>	Records not clear
12th June	Nairobi - Embakasi	7 storey Residential building in Kware area, Mukuru Kwa Reuben slum collapsed	Complete	<ul style="list-style-type: none"> <li>• Cracks on the wall</li> </ul>	Records not clear
21st September	Nandi- Kapsabet	A building (Proposed Maternity Ward/Nursing Home Annex) collapsed in Kapsabet town - opposite Total Petrol Station at the exit of the town	Complete	<ul style="list-style-type: none"> <li>• Cracks on the wall</li> </ul>	Records not clear
11th October	Kisii- Mwembe	Four storey building collapsed at Mwembe area in Kisii town, killing 6 people, and 24 hospitalized	Under construction	<ul style="list-style-type: none"> <li>• Roof caved in building built in a classified wetland</li> </ul>	Site closed
12th October	Mandera	Perimeter wall collapsed	Under construction	<ul style="list-style-type: none"> <li>• Adequate propping was not done.</li> <li>• The ballast on site was not appropriate for suspended slab</li> </ul>	Suspension notice issued
15th October	Nyeri- Karatina	Karatina Stadium collapsed in Nyeri. At the time of collapse the structure was nonfunctional and already vacated. 1 person died and 14 admitted in hospital and discharged	Complete	<ul style="list-style-type: none"> <li>• Frost action</li> <li>• Pressure from leaning congregation</li> </ul>	Demolished
15th October	Nyeri- Karatina	Karatina Stadium collapsed in Nyeri. At the time of collapse the structure was nonfunctional and already vacated. 1 person died and 14 admitted in hospital and discharged	Complete	<ul style="list-style-type: none"> <li>• Frost action</li> <li>• Pressure from leaning congregation</li> </ul>	Demolished

Date	Area	Description	Status of the building	Reason	Action
22nd October	Nakuru	A commercial storey building collapsed in Nakuru town along Mburu Gichua rd. The building had been evacuated at the time of collapse. 5 people were rescued from the structure and taken to hospital with minor injuries	Complete	<ul style="list-style-type: none"> <li>Cracks developed in building</li> </ul>	Previously earmarked for demolition
22nd October	Kakamega	Partial collapse of staircase Complete	Complete	<ul style="list-style-type: none"> <li>Concrete works and the general workmanship on this site were grossly substandard.</li> <li>Construction failure is also attributed to the Client's refusal to engage Registered Contractor and Supervising Consultants in implementation of this Project</li> </ul>	Site suspended
<b>2018</b>					
3rd January	Nairobi - Pipeline	2 storey building undergoing demolition collapsed on the workers	Under demolition	<ul style="list-style-type: none"> <li>Semi-permanent building made of timber and iron sheets crumbled down on the casual workers hired to demolish it</li> </ul>	Investigation ongoing
15th March	Kiambu- Juja Joyland Estate	Building collapsed in Juja	Under construction	<ul style="list-style-type: none"> <li>Heavy rains</li> </ul>	Investigation ongoing
17th March	Nairobi- Ruai	4 storey building collapse in Ruai	Complete	<ul style="list-style-type: none"> <li>Heavy rainfall Building was earmarked for demolition</li> </ul>	Investigation ongoing
3rd June	Nairobi- Huruma (Ngei area)	Five-storey building collapsed, killing 3 people and others hospitalized	Complete	<ul style="list-style-type: none"> <li>Building developed cracks</li> </ul>	Earmarked for demolition

**Table 6.2: Building Failures and Collapses 1990-2019 (cont...)**

Date	Area	Description	Status of the building	Reason	Action
26th October	Kilifi- Malindi	Eight storey building collapsed in Barani, Malindi. One person was killed and 7 rescued	Complete		missing
<b>2019</b>					
11th March	Kisumu- Manyatta Estate	Two-storey Kisumu building collapses	Complete	<ul style="list-style-type: none"> <li>• Substandard materials</li> <li>• Poor construction</li> </ul>	Investigation ongoing
8th September	Dagoretti-Kabiria, Riruta Satellite	Three storey building collapse	Under construction	<ul style="list-style-type: none"> <li>• Structural failure (columns)</li> </ul>	
12th September	Nairobi- Industrial Area	Three people died and 11 others were seriously injured after a perimeter wall collapsed on shanties near Likoni roundabout at Industrial Area in Nairobi	Complete	<ul style="list-style-type: none"> <li>• Poor workmanship</li> </ul>	
23rd September	Nairobi- Dagoretti	Seven children died when the two-storey Precious Talent Top School collapsed during morning class	Complete	<ul style="list-style-type: none"> <li>• Substandard materials</li> <li>• Poor workmanship</li> </ul>	Investigation ongoing

**Source:** NCA, NBI and Public media

**Figure 6.2:** Collapse of residential building in Huruma, Nairobi County in April, 2014



**Figure 6.3:** Collapse of a building under construction at Laiser Hill area Ongata Rongai Town, Kajiado County in September, 2015



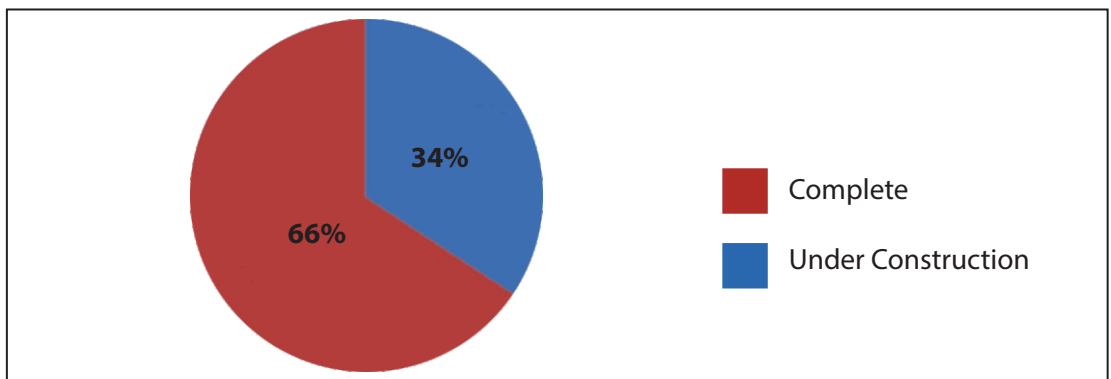
**Figure 6.4:** Collapse of Residential Development on Plot. N/B/Bobura/3546 in Mwembe Town, Kisii County in October, 2014



### 6.3.1 Stages of construction during documented cases of building failure

From the Figure 7.4 it can be observed that out of the 87 documented cases contained in 66% of the buildings collapsed after completion of works while 34% of the buildings collapsed while still under construction.

**Figure 6.5:** Stages of Building Failure

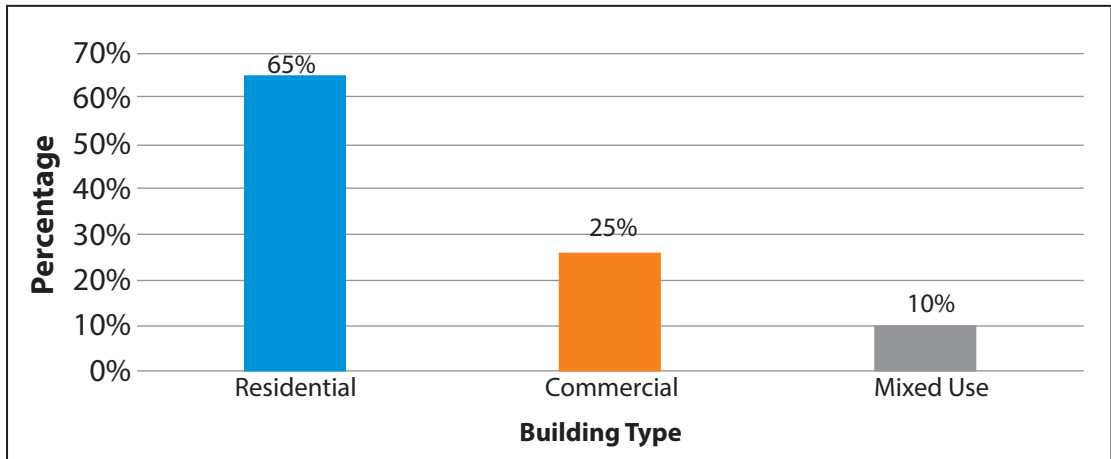


Source: NCA, 2018

### 6.3.2 Types of collapsed buildings

As shown in Figure 7.3, majority of buildings that collapsed were residential in nature. This is attributable to the high demand of residential buildings. 25% of the collapses were commercial, while 10% were not of mixed use. Mixed use included both commercial and residential sections within the divided units.

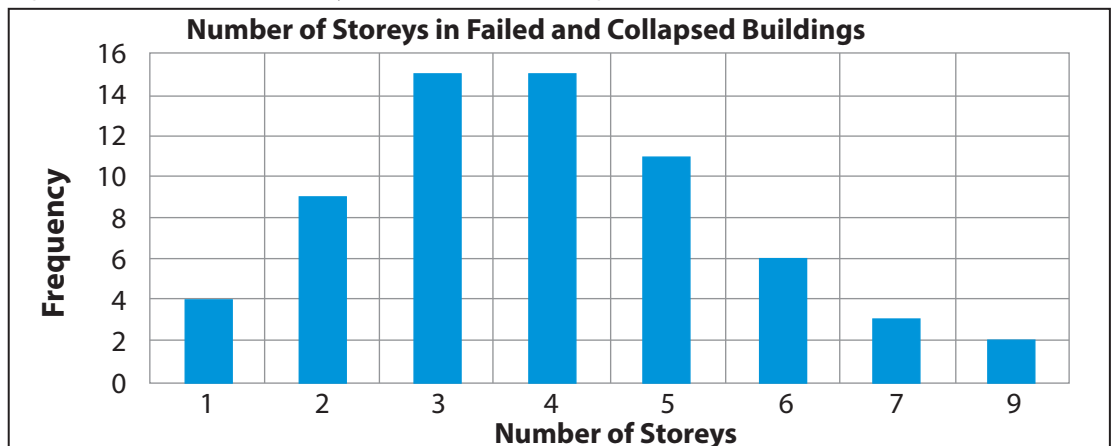
**Figure 6.5:** Building types that collapsed in Kenya during the period 2016-2019



### 6.3.3 Frequency of the number of storey collapses building

The figure below shows frequency of collapse of the storey-buildings. From data contained in Appendix 1, it is evident that 84% of structures that collapsed are buildings, with the rest of collapses (16%) being boundary walls.

**Figure 6.6:** Number of storeys in collapsed buildings

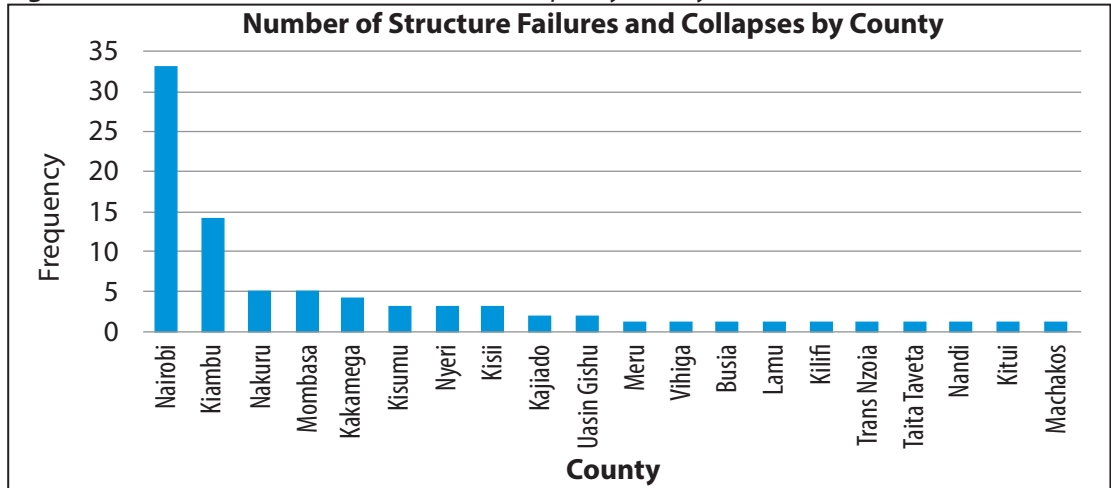




### 6.3.4 Frequency of buildings collapses per county

From fig. 7.5, the study established that building collapses are predominantly found in cities and peri-urban counties. Nairobi leads with 33 cases, followed by Kiambu with 14 cases while Nakuru and Mombasa each having 5 cases. This can be attributed to the high demand of residential and commercial buildings in the major towns.

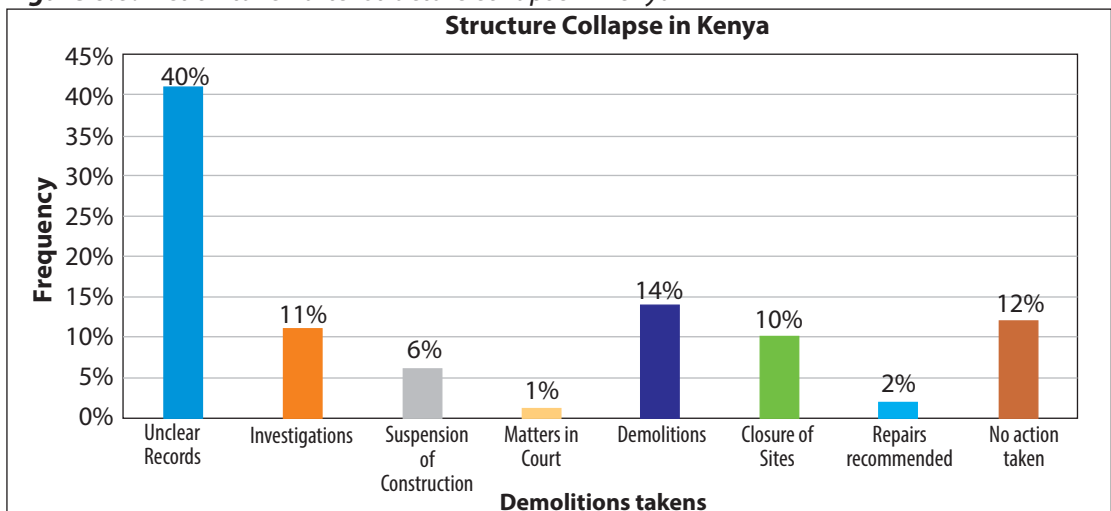
**Figure 6.7:** Number of structure failure or collapse by county



### 6.3.5 Actions taken after collapse in Kenya

As learnt from best practices in Singapore and Poland, a building collapse is followed by thorough investigation that leads to prosecutions and reforms that strengthens building control processes. This study established that minimal conclusive investigations that lead to prosecution are carried out in Kenya. Majority of the cases have no clear records of actions taken (see Figure 7.6). This in a way serves to encourage impunity from greedy investors, unethical professionals and weak institutions that regulate the construction industry.

**Figure 6.8:** Action taken after structure collapse in Kenya



## 6.4 Consequences

The data on building collapses give a gloomy picture of the construction industry in Kenya. It is evident that the country's investments have been going to waste due to building collapses. Additionally, the collapses have resulted in death and injury of citizens, and loss of assets.

This scenario has had dire consequences to the construction industry and general economy through:

- (i) Loss of environment integrity: Mushrooming of grotesque and unsafe buildings and infrastructure is an ugly thing in the environment.
- (ii) Loss of lives and property: Exact records of this loss are difficult to get. All the same, the order of the magnitude can be deduced from existing anecdotal evidence. It is estimated that over 200 people have lost their lives since the first building collapsed in 1990, with thousands injured. The economy has equally lost over Kshs 2.4 billion worth of investments.
- (iii) Damage to corporate image of the industry: Persistence of building failures or collapses in Kenya gives observers the impression of either: (a) a highly defective system – of policies, laws and institutions - for the regulatory control of construction activity at the site, project, firm and industry levels of the industry; or (b) highly incompetent managers and operatives in the whole regulatory system; or (c) both a defective system and incompetent system players.

In view of the above-outlined consequences, elimination of building failure and collapses from Kenya is as much a matter of national concern as eradication of disease and corruption in the country.

## 6.5 Causes of Building Failures

There are numerous factors that have been attributed to causing building failures. The Building Law & Regulation Review and Harmonization Committee (2009) pointed out the reasons for the collapse of buildings including; erroneous building design; inadequate building maintenance; incompetence of the contractor; use of unapproved building plan; corruption; cost of building materials; inadequate enforcement mechanism and lack of supervision by professionals.

Further, Mshiri (2016) cited the following as other contributory factors responsible for failure of building projects in Kenya: inadequate concrete and reinforcement specifications, lack of professional input during the construction, lack of individual accountability in design and construction teams, collusion between development control officers and project teams, lack of collaborative institutional mechanisms to address the real problems documented in the construction industry, non-prosecution of those involved in contravening the building regulations, and tolerance to cartels running the construction industry with their money, power and connections.

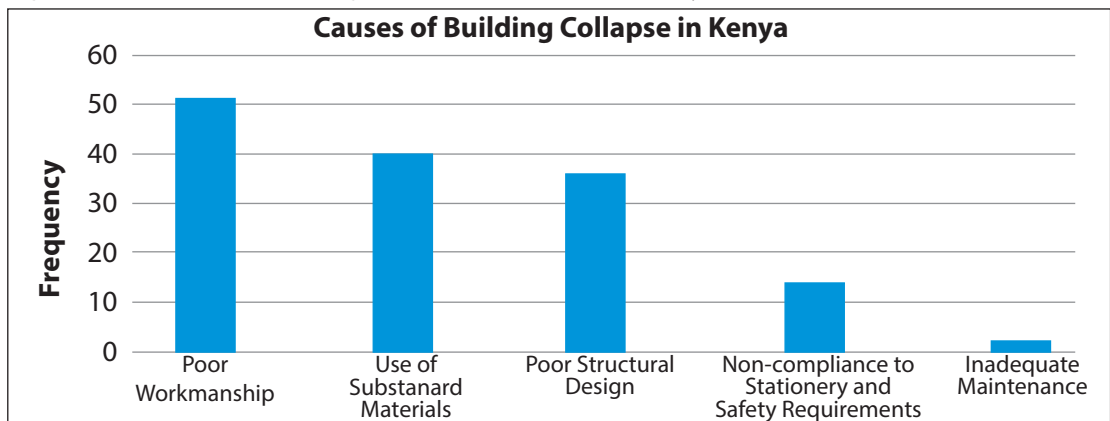
Kioko (2014) in his article on Causes of building failures in Africa: A case study on collapsing structures in Kenya attributes the buildings collapse to; concrete mix ratio being not right, lack of enough planking and strutting in place to uphold excavations, the column spacing being too wide, poor reinforcement, the slenderness ratio being too high, cost cutting by contractors by changing recommended concrete mix or reducing the amount of reinforcement recommended and a multitude of other reasons.

The report on the Commission of Inquiry constituted to investigate collapse of Sun Beam building in 1996 attributed building failure to; uncontrolled physical planning, inadequate and outdated legislation, inadequate controls and enforcement, corruption, professional inefficiency, inadequate definition of professional roles and easy entry by unqualified people into the construction business.

From the Table 7.4, the causes of building failure are classified into the following; poor workmanship; substandard materials; non-compliance with building standards and regulations (safety requirements, materials, mix-ratios, approvals); inadequate structural design, overloading of the structure and inadequate maintenance.

The analysis of the various causes of buildings collapse is shown in Figure 7.7. Poor workmanship is the main cause with 51 (35%) cases observed, substandard materials with 40 (28%) cases observed, poor structural design with 36 (25%) cases, non-compliance with statutory and safety requirements with 13 (9%) cases and inadequate maintenance with 2 (3%). These causes are discussed in detailed in the preceding sections.

**Figure 6.9:** Causes of Building Failures and Collapse in Kenya



Source: NCA, 2018

### 6.5.1 Poor workmanship

Workmanship is the ability of a contractor to follow proper standards to deliver safe and quality building. For instance, installing products and materials correctly, proper plumbing and proper concrete compaction, among others. The consequences of poor workmanship include weak structure, leaking roofs and cracks in the foundation among others. These

consequences result when a client does not engage a registered contractor and relevant professionals in the implementation of the construction process.

Building and construction must be carried out by registered contractors and supervised by competent architects and engineers. The unqualified persons do not understand processes, procedures and standards of building construction.

### 6.5.1.1 Observations

- a) The study established that in some instances, rogue contractors do not follow all approval processes, use unskilled workers, and took shortcuts when constructing the building elements and components.
- b) Architects and the engineers (civil/structural) are rarely engaged in the supervision of construction work although in some cases they prepare the building drawings.
- c) Some contractors using improper construction building techniques such as;
  - Mixing incorrect proportions of concrete ingredients, that is, cement, water, sand and coarse aggregate
  - Not observing correct compaction and curing technique of concrete in term of period required and regular watering
  - Erecting weak scaffolds to support wet and curing concrete
  - Not conforming with the structural design of spacing and sizing of the reinforcement members

### 6.5.2 Use of substandard materials

The most common types of building materials in Kenya include stones (manually cut and machine cut), sand, fired bricks, metals, cement, concrete, wood (timber), glass, bamboo, EPS panels, glazed ceramic tiles, roofing sheets and roofing tiles.

Section 32 of the Building Code, 1968 specifies that the materials should be:

- Of a suitable nature and quality for the purpose which it is used,
- Adequately mixed and prepared.
- Applied, used or fixed in a proper manner so as to adequately perform the functions for which it is designed.

Section (4) further states that any type of material or any method of mixing of materials should conform to British Standards or a British code of practice.

Most of the substandard materials used in the construction industry in Kenya are smuggled into the Country as counterfeit. According to Kenya Revenue Authority (KRA), the most counterfeited construction materials are steel, pipes and pipe fittings, valves, electric equipment, fasteners, roofing materials and cement (Construction Kenya, 2018). In other instances locally available materials including scrap metals, low quality stones and incorrect concrete ratios are used. A bulk of these materials are weak and cannot support the structures.

### 6.5.2.1 Materials tests

It is a requirement under Section 34 of the Building Code that structures materials need to be tested to ensure that they meet certain threshold (Box 7.1).

#### **Box 6.1:** Building Code Requirements to Test Construction Materials

34. (1) To ensure compliance with the provisions of by-law 32 of these By-laws, the Council may elect to carry out or cause to be carried out, any tests which it may deem necessary and the contractor or other person carrying out the work shall provide full facilities for enabling the tests to be satisfactorily completed, and pay all reasonable costs incurred by the Council.
- (2) The Council may remove or cause to be removed from the site samples insufficient quantity for the testing of the materials and methods used.
- (3) The Council may, for the purpose of securing the due observance of the provisions of these By-laws, serve a notice by affixing it on a conspicuous part of the building or by delivery to the person causing or directing the work, requiring him within two clear days from the service thereof, to furnish the Council with proof by means of samples of the materials, adequate tests, or otherwise as specified in the notice, that the materials used or to be used conform with the provisions of these By-laws.

There are specific centers that have been accredited to test the materials to ensure they meet structural requirements. Some of the accredited centers are; Kenya Research Building Centre, State Department of Public Works, Kenya Bureau of Standards, University of Nairobi and Kenya Industrial Research Institute (KIRI).

### 6.5.2.2 Observations

- a) Most of the building materials are not subjected to testing. Proper laboratory material tests and records are not kept in most of the construction site offices.
- b) Most building failures in Mombasa were attributed to poor knowledge of materials leading to use of substandard materials, for example, concrete.
- c) In Nairobi, it was observed that there lacked a tool to check the life cycle of a building as well as the knowledge about quality, cost and size of the materials.
- d) The Focused Group Discussion (FGD) in Nairobi also noted that there lacks quality control for building materials.
- e) The Public Procurement and Disposal Act, 2015 does not require professionals to approve materials hence leading to using inappropriate ones.
- f) In some instances, contractors are duped into buying counterfeits with fake authentication certificates while others buy counterfeits in a bid to maximize their profits.
- g) There are new materials e.g. EPS and technologies in the construction industry that have not been tested for climatic conditions and other physical characteristics within the Kenyan context.

### 6.5.3 Non-compliance to building standards and regulations (Safety Requirements)

Building and construction sector is governed by a set of planning regulations and building standards. Planning regulations, most referred to zoning regulations are issued by County Governments and dictate aspects of plot coverage, plot ratios, height and densities. Building standards on the other hand largely guide construction of building structures and cover aspects like siting and space about buildings, building sites, foundation, walls, roofs and floors. They are described in details in the Building Code of 1968 and seek to guarantee safety and make the buildings more habitable.

In order to enforce the applicable building standards and regulations, fines have been prescribed by various statues. For instance, the Physical and Land Use Planning Act, 2019 provides a fine not exceeding Kenya Shillings five hundred thousand or to imprisonment for a term not exceeding two months or both. Building Code on the other hand provides for a penalty of Kenya Shillings two thousand or imprisonment for a term not exceeding six months or to both. If the offence is of a continuing nature, to a further fine not exceeding twenty shillings for every day or part thereof during which such offence shall continue. In any event the aggregate of any such fine imposed shall not, in the case of any one continuing breach of the by-law, exceed two thousand shillings.

#### 6.5.3.1 Observations

- a) There are instances where buildings are being used for unintended use.
- b) Unscrupulous developers flout existing zoning regulations to, for instance, increase number of floors that eventually result in heavier load to the substructure.
- c) In some instances, existing regulatory agencies are compromised to approve substandard structures and issue occupation certificates to those that do not meet requirements.
- d) In extreme circumstances, developers put up structures without approval from the regulatory authorities. It is estimated that over 70% of the all buildings constructed in Nairobi do not have approvals from the Nairobi County Government (AAK, 2015).
- e) There is inadequate capacity within the County Governments for enforcement.
- f) Zoning requirements are not reviewed as often as they should. As such, buildings are approved against outdated zoning requirements.
- g) The fines prescribed for non-compliance are lenient. Further, no fines have been prescribed for actions leading to building collapse

### 6.5.4 Inadequate structural design and overloading of the structure

Structures in a building including foundations should be able to support loads acting upon them. Adequate foundations are usually costly and depending on the strength of the soil substrata and expected load of the building, they can contribute up to half of the entire cost of the building.

For instance, buildings constructed on sandy soils, swampy areas or those with several

storeys require far stronger foundations than those built on solid grounds or those with fewer floors. Some developers, however, want to save money when building on weak grounds by cutting on concrete and reinforcements resulting in structurally unstable buildings.

Although the building may have had a sound design of the structure, the ground beneath it may be incapable of carrying its loads resulting in collapse.

Similarly, a structural engineer may make errors in computation and fail to take into account weight that a structure will be expected to withstand. Defective architectural and engineering designs may result if architects and structural engineers fail to carry out feasibility studies, and soil and site investigation (Chendo *et al.*, 2015).

The Engineer may also follow inaccurate theories, use inaccurate data and make wrong choices of materials during construction of a building.

#### **6.5.4.1 Observations**

- a) Most of the designers do not carry out geotechnical survey on the construction site. This should be done to ensure that the bearing capacity of the substrata of the soil can withstand the transmitted loading of the building.
- b) There are no accredited checkers to counter check any errors and omissions in the design
- c) Involvement of the unqualified persons in the construction process.
- d) Unqualified persons i.e. quack engineers and architects engineering drawings to unsuspecting developers.
- e) Incomplete drawings from professionals lead to a lot of guesswork by the contractor on the construction sites.

#### **6.5.5 Inadequate maintenance**

Buildings have a lifecycle after which they demand high maintenance. The study established that completed buildings comprise 66% of building collapse. This implies absence of proper maintenance and early warnings of defective buildings.

##### **6.5.5.1 Observations**

- a) Currently there is no framework that requires buildings to undergo mandatory inspections by qualified building professionals. As such requisite mandatory maintenance are not budgeted for.
- b) There lacks a proper building inventory in Kenya, indicating general conditions of them, whether the constructions meet building regulations.

## 6.6 Data Collection on Failure and Collapse of Buildings

Data on the failure and collapse of buildings is critical component in monitoring building failure in Kenya. It not only informs trends but also it is necessary for corrective and preventive actions. Data on building collapse has been collected by different agencies for various reasons. Some of the Key agencies are as follows;

*National Construction Authority:* NCA is mandated by Section 5 (2) (c) to carry out research into any matter relating to construction industry.

*The National Disaster Management Unit.* The Unit was established by a Presidential Directive communicated through letter Ref. No. CAB/NSC/14/2/32 dated 8th August, 2013 as an effective and competent disaster management unit with an established command structure, budget and Standard Operating Procedures (SOPs) based on best practices. The unit together with stakeholders formulated the National Emergency / Disaster Plan and SOPs which were signed on 27th June 2014. The Unit is charged with the responsibility of coordinating, collecting, reviewing and analyzing information relevant to Disaster Risk Management.

*National Building Inspectorate (NBI):* The Inspectorate which is domiciled under the State department for Public Works audits buildings for conformity with land registration, planning, zoning, building standards and structural soundness. As of February 2018, it had led the inspection of 5,000 buildings, marked approximately 600 buildings as unsafe for occupancy and facilitated the demolition of 34 buildings on the brink of collapse (World Bank Group, 2019).

*County Governments:* Schedule Four of the County Government of Kenya devolves Disaster Management function to Counties. Subsequently, several counties have enacted legislations which set up Departments of Disaster Management under County Public Service, whose role include “set up, maintain, review and upgrade the mechanisms for early warnings and dissemination of proper information to the public.”

### 6.6.1 Reporting

Building failures in Kenya are regarded as disasters. In this case, the National Disaster Management Unit (NDMU) coordinates sectoral reports which are shared with public for the information and for use in collection of intelligence, investigation and prosecution. Accordingly, to the following case studies was investigated;



**Table 6.3: Case study of some of the Building Collapses in Kenya**

Building Collapse	Description	Post collapse activities
Collapse of residential building in Huruma, Nairobi Estate on 4 <sup>th</sup> January 2015.	The seven storey residential building collapsed and killed 52 people and injured 32 others. The building had 48 units, The building collapsed because of poor workmanship, substandard foundation, inadequate structural design, and low quality of concrete mix	<p>Commission on Administrative Justice investigated what lead to the collapse of the building and found poor workmanship, poor structural design and poor building techniques were the major courses of the disaster. The building was demolished. The commission recommended the following actions:</p> <p>1. Nairobi City County Government should:</p> <ol style="list-style-type: none"> <li>Increase and strengthen the capacity of compliance and enforcement department.</li> <li>Provide reporting hot lines for the public to report any unsafe buildings or suspicious constructions.</li> <li>Procure adequate and appropriate equipment for demolition of condemned buildings</li> <li>Develop standards and best practice to guard the building and construction industry in Kenya</li> <li>Monitor the building and construction industry.</li> <li>Adapt one system of building and construction approval.</li> <li>Take disciplinary action against its errant officers.</li> <li>Have routine inspection to detect building defects.</li> </ol> <p>2. Director of Public Prosecution should:</p> <ol style="list-style-type: none"> <li>Ensure speedy prosecution of cases of collapse building before the court.</li> <li>In conjunction with the Director of Criminal Investigation, to investigate criminal act of negligence of officers on duty.</li> </ol>
Collapse of a building in April, 2016 in Nairobi County, Mathare Sub-county, within Huruma location at Ngei ward (Metameta area)	The seven storey residential building collapsed and killed 51 people. The building had 140 units, The building collapsed because of poor workmanship, substandard foundation, inadequate structural design, and low quality of concrete mix. The building was condemned and was scheduled to be demolished.	<p>The National Disaster Management Unit mobilized the rescue operations and compiled "Building Collapse Disaster Incident Report", which recommended as follows;</p> <ol style="list-style-type: none"> <li>NDMU to lead stakeholders in training the Huruma community and the Disaster Risk Management Teams,</li> <li>The County Ggovernment, Mathare sub-county commissioner and the OCPD Starehe to collaborate with relevant stakeholders to settle the victims,</li> <li>The disaster site to be reserved as a public monument,</li> <li>All relevant authorities to continue with prevention, mitigation and preparedness for deterring incidents of similar nature,</li> <li>Developers to involve professionals and follow due process of the law,</li> <li>Members of the public should report to relevant authorities about unsafe buildings for investigations and appropriate action,</li> <li>There should be a continuous and more focus on disaster prevention, mitigation and preparedness and a better response and recovery mechanism,</li> <li>Relevant authorities including the Civil engineers from NCA should give an estimate cost as result of the incident in response and recovery process.</li> <li>Court proceedings ongoing for project stakeholders deemed liable for the collapse.</li> </ol>

**Table 6.3:** Case study of some of the Building Collapses in Kenya (cont...)

Building Collapse	Description	Post collapse activities
Collapse of building under construction at Laiser Hill area Ongata Rongai Town, Kajiado County on 6 <sup>th</sup> September 2016	The approved building was three storeys and had problem of structural design, poor workmanship, and poor concrete mix. The building collapsed after casting the 6 <sup>th</sup> floor. One person was killed and five others were injured.	<p>The National Disaster Management Unit incident report recommended as follows;</p> <ol style="list-style-type: none"> <li>There be established working County, Sub-county and Community Disaster Management Committees</li> <li>There be carried out frequent trainings and sensitizations on Disaster Management</li> <li>The Disaster and Emergency Kitty in Kajiado County be allocated funds and equipment procured</li> <li>There be done regular inspections on the buildings that are mushrooming</li> <li>There be done psychological support to the survivors and all the people who were affected.</li> </ol> <p>The NCA investigation team recommended:</p> <ol style="list-style-type: none"> <li>To ensure correct concrete mix</li> <li>The contractor be suspended for one year</li> <li>The consultants be investigated by the respective boards.</li> </ol>
Collapse of Residential Development on Plot. N/B/Bobura /3546	A proposed residential development building collapsed in Mwembe Town, Kisii County on Plot No. N/B/BOBURA/3546 resulting in the death of seven (7) people while twenty-four (24) others were injured.	<p>The investigation carried out by committee constituted by National Construction Authority (NCA) established that the building collapsed mainly because the foundation sliding due to the rain following the sippage of water by the foundation and Low concrete strength attributable to poor workmanship. They noted that the strength of concrete was about 30% which was too low.</p> <p>The investigation recommended as follows;</p> <ol style="list-style-type: none"> <li>Suspension of the Contractor for one year for flouting code of ethics. The Directors of the construction</li> <li>The Directors of the Construction company to be Charged for carrying out the business of a contractor without registration by the National Construction Authority. The charge attracts a fine not exceeding one million shillings, or to imprisonment for a term not exceeding three years or to both, and in the case of a continuing offence, to a fine not exceeding one hundred thousand shillings for every day or part thereof during which the offence continues.</li> <li>Developer to be prosecuted for the requisite criminal charges under the Penal Code CAP 63 for his role in the project resulting in the death of seven persons and twenty-four injured persons.</li> </ol>

In the above cases of building collapse in Kenya, data collection from collapse building has been haphazard with various agencies separately collecting information. These agencies conducted investigations on various aspects of the collapses to update the incident reports. The National Disaster Management Unit (NDMU) has been providing the leadership and coordination for the disaster management. The NDMU through its incident commander give overall leadership, coordination, command and control by mobilizing National and County Governments, public and private agencies and organizations, partners and volunteers to support in the process. In the April 2016 Huruma incident over 36 agencies responded while in the Laiser hill incident over 15 agencies responded. The NDMU assigned roles to the various agencies.

The multi-stakeholder operations were concluded when all the victims of the tragedy were accounted with recommendations and respective reports issued. There are other agencies that commenced parallel investigations, particularly the National Construction Authority and Commission on Administration Justice and developed recommendations. It is however not clear how far the various recommendations are being implemented.

## 6.7 Observations

- a) The NDMU mandate is limited to the disaster scene and its management. The incident reports published by NDMU are prepared by various agencies in their corporate capacity. Given this limitation of time for preparation of incident reports the technical details of the collapse are not adequately captured.
- b) The data collected by the above agencies is not conclusive and scarcely provide information on the specific causes for building collapse and as such do not point on any criminal culpability or any preventive action.
- c) There is no clear framework on monitoring and evaluation of collapse/building failure in Kenya. There no clear lessons learnt reports to allow improvements in future construction projects.
- d) There is not central depository of information on building failures in Kenya as such monitoring and evaluation becomes complex.

## CHAPTER SEVEN: REMEDIES FOR BUILDING FAILURES

### 7.1 Introduction

It is in the best interest of all the stakeholders in the construction industry that challenges resulting in building failures are addressed. Chapters Two, Three, Four, Five and Six have highlighted pertinent issues that may address the failures. This section discusses suggested solutions to building failures. In order to holistically address the issues, general recommendations addressing gaps in policy, institutions and administration as well as remedies along the project cycle i.e. Design, Approval, construction and Maintenance have been discussed.

### 7.2 General Recommendations

- a) The study research identified absence of comprehensive construction policy as one of the issues that has left regulation of the industry largely uncoordinated. It is therefore recommended that the Ministry responsible for construction urgently finalizes development of construction industry policy. The policy should integrate design and construction process and addresses issues of financing, research and development among others.
- b) The National Construction Authority Act, 2011 mandates the National Construction Authority to oversee construction industry and coordinate its development. This is a broad mandate that can be tapped into. The NCA should therefore develop regulations to enable them “oversee” and “coordinate” Construction industry. Such regulations should address the weak coordination amongst the agencies, relationship between parties involved in construction process and, use of construction materials and equipment.
- c) NCA should be empowered to carry out investigations in cases of building collapse and recommend prosecution. Such investigation should be in depth and address all aspects of building and construction process.
- d) The licensing criteria for contractors and construction workers needs to be reviewed to include requisite training for shareholders.
- e) Legal framework to adopt proposed National Building Regulations, 2015 to be formulated.
- f) NCA should create a hotline and reporting center for any malpractice detected by public including neighborhood associations and construction workers. Similarly, NCA should develop Information Education and Communication (IEC) materials for sensitizing members of the public to detect early failures
- g) The Ministry responsible for construction to establish Center for Excellence in building construction to disseminate emerging technologies, standards, policies and show casing best practices.
- h) Regulatory boards should be empowered to address the unethical practices and enforce professional standards.

## 7.3 Specific Recommendations

### 7.3.1. Design stage

The design stage of the project involve professionals in the built environment who conceptualize the project into Architectural and Engineering drawings. This study established that the specific issues that arise in this context include;

- a) Inadequate design drawings
- b) Failure of some design teams to consider physical factors of the site
- c) Absence of quality control in the process.

#### Remedies

The following are recommended remedies;

- a) There is need to ensure that design drawings are subjected to quality control to ensure their adequacy. As in the case of Singapore where there are accredited checkers, there is need to incorporate accredited checkers into Kenyan context
- b) As part of the design process, geotechnical surveys should be made mandatory. This shall ensure that the design incorporate physical characteristics of construction sites.
- c) Regulatory boards needs to address the prevalence of unqualified persons in construction processes.

### 7.3.2 Approval stage

The process of building approval is elaborate and involve three key agencies; County Governments, NEMA and NCA. These are the first entry of quality control in the building process.

The following are the key areas that have gaps in the process:-

- a) The process is disjointed between the agencies.
- b) The approval process is long and costly.
- c) The procedures stipulated in the various regulations are not adhered to. In some instances, approvals are politically manipulated and officers involved are compromised.
- d) Numerous buildings are being constructed without requisite approvals.

#### Remedies

- a) There is need to establish a one-stop-center that co-ordinates all approvals. Similar model is being implemented in Singapore and Malaysia. When implemented the center will streamline the coordination between various agencies.
- b) Building Information Management should be integrated in the construction processes
- c) Approval of building is a technical function and should be left to the technical departments at the Counties.
- d) There is need to urgently review building code and establish a legal framework on which to anchor it.

### 7.3.3 Construction

Manifestations of building failures characterized by collapse of buildings occur at this stage. The study established the following gaps at this stage;

- a) Poor workmanship
- b) Use of substandard materials
- c) Non-compliance with set regulations and standards.
- d) Limited capacity of regulatory agencies, more so the County Governments, to implement building control.

#### Remedies:

- a) Increase surveillance to ensure only registered contractors who have been duly trained are involved in the construction process.
- b) There is need to strengthen regulation of skilled workers by ensuring all construction workers are registered with NCA.
- c) There is need to reform the enforcement and compliance department of the Counties as well as the process. This can be achieved by:
  - Enlisting services of independent professionals, herein referred to as building control inspectors. Professionals shall comprise of registered architects, engineers, planners to carry out building inspections. These inspectors shall file inspections with the Enforcement and Compliance department for review and further action.
  - Developing a standardized inspection checklist and coordinating inspections.
- d) Requiring contractors to have a construction log book to record daily construction activities which should be approved by project consultants
- e) Leasing of equipment should be regulated to ensure that it is formal and standardized. There is need to ensure that a register of leasing companies is kept as well as the equipment being leased and persons involved.
- f) All the materials should be tested for their appropriateness. Building code should be reviewed to make this a mandatory requirements.
- g) There is need for more enforcement on the existing building regulations.
- h) Continual supervision on contractors' works should be made mandatory and smart, whereby approvals for all stages by the design team and approving authorities are required. In this respect, approval milestones should be so well defined that contractor should not be allowed to move forward without all the necessary approvals.
- i) The standard form of contract developed by the JBC which binds project team should be made mandatory and legally binding.
- j) Review the penalties applicable for non-compliance to ensure that they are punitive.
- l) There is need for guidelines for enforcing compliance with building standards including those of closed sites or X marked Sites.

### 7.3.4 Building completion and handing over

Completion of the construction project marks the end of the construction process. Final inspections and issuance of the certificate of occupation is carried out at this stage. However, these two importance steps are rarely undertaken and as a result, sick and dangerous buildings are occupied by innocent tenants.

To address this, it is recommended that no building should be occupied unless final inspection and issuance of occupation certificate is carried out.

### 7.3.5 Building maintenance

Buildings must be healthy, safe, secure convenient and comfortable at all times. Regular maintenance is therefore carried out to ensure the building is of good quality. The study established that there is no framework requiring buildings to undergo regular maintenance. Currently, there is no elaborate legal mechanism in place to ensure that buildings are periodically maintained.

The main objective of the National Building Maintenance Policy is to ensure a consistent approach to the maintenance of the built environment. An effective policy safeguards adequate health, safety and environmental standards, return on investment, convenience and comfort for users.

The nebulous provisions to be found in the Public Health and Licensing Acts requiring a modicum of maintenance prior to issuance of trading licenses, are considered both inadequate and ineffective to secure the desired standards of maintenance for safety purposes. Since maintenance costs money, both landlords and developers avoid that cost, thus resulting to dilapidated and dangerous buildings.

#### Remedies

- a) There is need for legal and institutional framework requiring buildings to undergo mandatory post-construction inspections and maintenance.
- b) Regular inspection should be done within a period of 5 years to detect any defects. A certificate of maintenance should be issued upon such inspection.
- c) There should be critical inspection of buildings of 30 years of age to detect signs of failure.
- d) There is need for proper inventory of all types of buildings in Kenya to ensure the building meet the building requirements.
- e) There should be a mechanism to provide early warnings for building failure.

### 7.3.6 Monitoring and Evaluation of Building Failures

Monitoring building failure is significant in addressing the inherent challenges facing the industry. Informed by the challenges, the industry stakeholders are in a position to set up early warning system and address problems before they arise. There is need to develop

platforms for showcasing the lesson learnt from various collapse incidents and also provide distinct evidence-based findings on cause of failure of a structure.

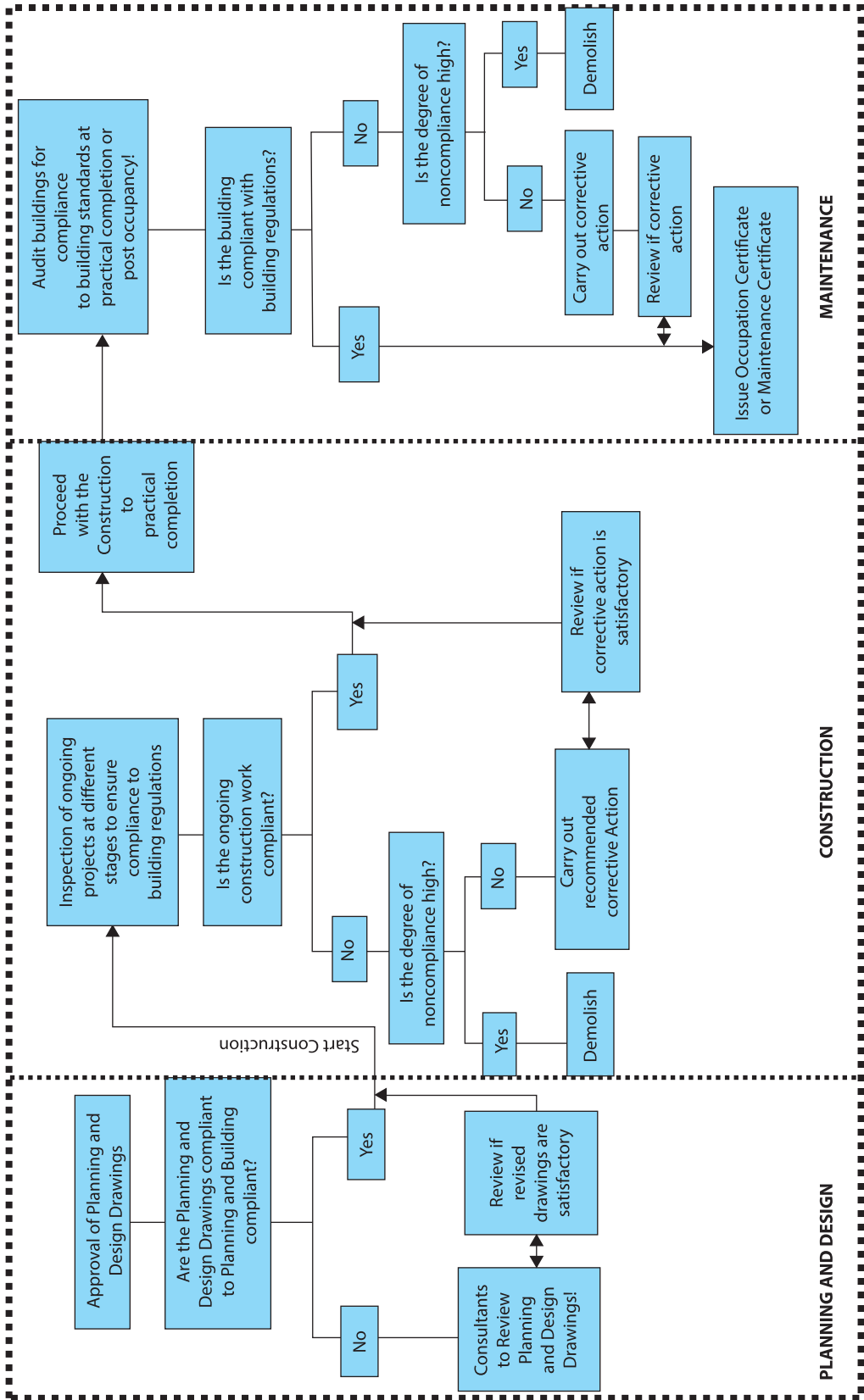
The National Construction Authority Act mandates the authority to generate and manage construction information in Kenya. It's important that data management for construction failure be resident in the authority and through a framework be made public. The nexus between incident management and building failure reporting should be well identified and applied.

### Remedies

- a) There is need for legal and institutional framework to provide for first responder protocol, incident reporting protocol and detailed investigating mechanism for construction failure. There is also need for a framework for evidence protection during incident management.
- b) There is need for public reporting framework to allow for Authorities to give press briefings and publish investigation reports on a public portal. The lessons learnt should be explicitly captured.
- c) A detailed investigation manual to be developed to provide for technical evidence for building failure. The NCA to enhance the building failure/ collapse investigation procedure to allow for experimentation, testing and reporting culpability.
- d) Fig. 9.5 below illustrates the proposed monitoring and evaluation model to ensure adequate collection and dissemination of data on building failures and collapses.



Figure 7.1: Proposed Model for Monitoring and Evaluation of Building Failures in Kenya



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