SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF GRADUATE STUDIES

A Reconnaissance Study and a Model for Estimating Real Estate Market Value in Inefficient and Unstable Markets: Real Estate Valuation in Sudan

دراسة إستكشافية ونموذج لتقدير القيمة السوقية للعقارات في الأسواق غير الكفؤة وغير المستقرة: تقدير قيمة العقارات في السودان

A Thesis Submitted in Fulfilment of the Requirements for the Award of the Degree of

Doctor Of Philosophy (Civil Engineering)

CANDIDATE: TILAL MOHAMMED AHMED AGEEB

SUPERVISOR: PROF. DR. AWAD SAAD HASSAN

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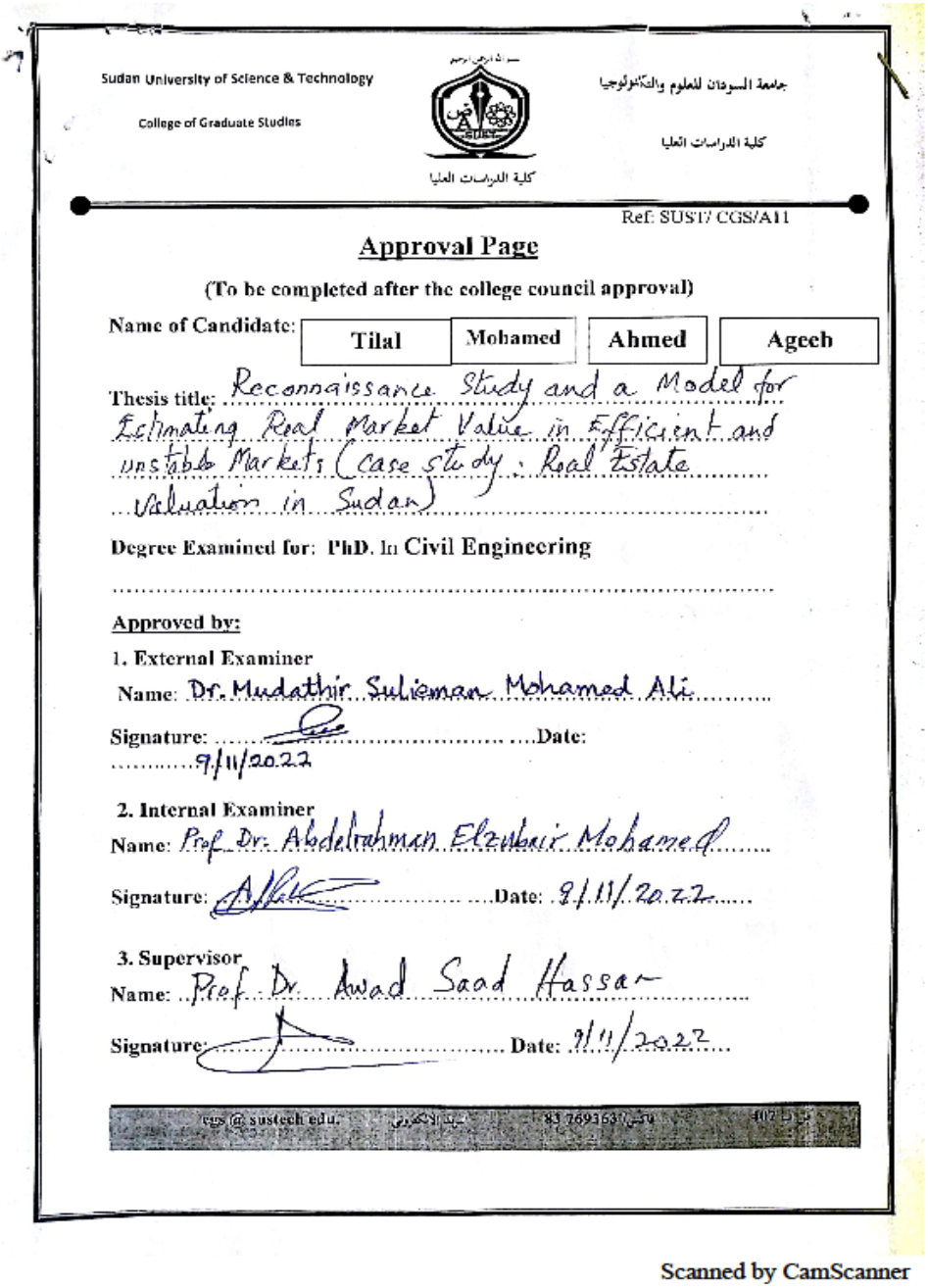

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Name of Candidate: | Tilal | Mohamed | Ahmed | Ageeb |

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Degree Examined for: PhD. In Civil Engineering

Approved by:

1. External Examiner

Name: Dr. Mudathir Suleiman Mohamed Ali

Signature: ..... Date: 9/11/2022

2. Internal Examiner

Name: Prof. Dr. Abdelrahman Elzubair Mohamed

Signature: ..... Date: 9/11/2022

3. Supervisor

Name: Prof. Dr. Awad Saad Hassan

Signature: ..... Date: 9/11/2022

بسم الله الرحمن الرحيم

قال تعالى:

{ أَلَمْ يَأْنِ لِلَّذِينَ آمَنُوا أَن تَخْشَعَ قُلُوبُهُمْ لِذِكْرِ اللَّهِ وَمَا نَزَلَ مِنَ الْحَقِّ وَلَا يَكُونُوا كَالَّذِينَ أُوتُوا الْكِتَابَ مِن قَبْلُ فَطَالَ عَلَيْهِمُ الْأَمَدُ فَقَسَتْ قُلُوبُهُمْ ۖ وَكَثِيرٌ مِّنْهُمْ فَاسِقُونَ}

[سورة الحديد الآية : 16]

Dedication

I would like to dedicate my dissertation to my parents, may family and friends.

Acknowledgement

Praise is to **ALLAH**, the almighty, who graciously favoured me to get over this work and enable me to accomplish this achievement.

I would like to express my sincere gratitude to my supervisor Prof. **AWAD SAAD HASSAN** for the continuous support of my Ph.D. study and related research, for his patience, motivation, and immense knowledge. His guidance helped me in all the time of research and writing of this dissertation. I could not have imagined having a better supervisor and mentor for my Ph.D. study.

Abstract

Asset valuation is the backbone of the money lending process, it allows banks and financial institutions to inject money into all sectors of the economy, where the proper valuation processes based on professional standards ensure that banks get back their money in the case of a borrower default and re-inject the money back again into the of the economy.

Uncertainty is one of the features of the valuation process. Valuation uncertainty is inversely proportional to the market activity: the more active the market, the more credible the conclusion of the valuation.

Currently, the market performance in Sudan could be classified as an unstable market. This study sought to identify the sources of uncertainty in the asset valuation process in Sudan and to compare the local professional practice with internationally adopted standards. This comparison was conducted through inspection and examination of a number of local valuation reports against the fundamental requirement of the International Valuation Standards (IVS 2017). I also conducted a survey questionnaire to measure the public trust in valuation professionals in Sudan.

The study recommends that local valuation experts should improve their skills in professional reporting, while authorities should constitute a regulatory body to organize the assets valuation profession and to develop national valuation practice standards or adopt any of the international standards.

In this study, a mathematical model was developed based on the construction cost approach to estimate the market value of the real estate in Khartoum city in the case of an unstable and inefficient market. This model is a spreadsheet model.

The most valuable feature of the model developed in this study is its ability to save time. The model can be used to generate market value for real estate in significantly less time than the classical manual method. It can be used to calculate quantities of construction materials and workmanship for the category of buildings that the model supports. Also, contractors can depend on the model to estimate contract values, especially in lump sum contracts.

المستخلص

تعتبر عملية التقييم العمود الفقري في عملية إقراض البنوك ومؤسسات التمويل المال لضخه في عجلة الإقتصاد بكل قطاعاته، حيث تضمن عمليات التقييم القائمة على معايير وقواعد سليمة إسترداد البنوك لإموالها في حالة تعثر العميل وإعادة ضخها من جديد في عجلة الإقتصاد.

إن عدم اليقين هو سمة من سمات عملية تقييم الأصول، ويتناسب عدم اليقين عكسياً مع درجة إستقرار وكفاءة السوق فكلما زاد إستقرار السوق زادت الثقة في مخرجات عملية التقييم.

في الوقت الحالي يتصف أداء السوق في السودان بعدم الإستقرار، يهدف هذا البحث الى معدرفة مصادر عدم الثقة في عمليات تقييم الأصول في السودان ومقارنة أداء خبراء تقييم الأصول في السودان بمعايير تقييم الأصول الدولية المعتمدة من خلال فحص تقارير التقييم ومعرفة مدى إستيفائها للمتطلبات الأساسية للمعايير الدولية.

كما أجرى الباحث إستبياناً لقياس درجة ثقة المجتمع في أداء خبراء التقييم في السودان، كما سعى الباحث أيضاً الى دارسة إمكانية تطبيق النماذج الحسابية التي تعتمد طريقة تكلفة الإنشاء لتقدير القيمة السوقية للأصول العقارية في ولاية الخرطوم بالسودان وذلك في حالة السوق غير المستقر، وتمكن الباحث من إنشاء هذا النموذج بإستخدام برنامج إكسل.

أوصت الدارسة بضرورة أن يطور الخبراء السودانيون من مهاراتهم في كتابة التقارير الفنية وأن تنشئ الدولة أجهزة مختصة لتنظيم ومراقبة أعمال تقييم الأصول وأن تُصدر المعايير القومية لممارسة تقييم الأصول أو أن تتبنى أحدى المعايير المعتمدة دولياً.

بعد إختبار النموذج الحسابي وقياس درجة الثقة به تبين أن هامش الخطأ الخاص به هو ± 5% وهو هامش مقبول عملياً في عمليات تقييم الأصول، كما أن النموذج يمكن أن يُستخدم لحساب الكميات وتقدير الكُلفة للمواد الإنشائية والعمالة. أيضاً هذا النموذج يكون مفيداً للمقاولي الإنشاءات لتقدير قيمة العقود خصوصاً في مرحلة التقديم للعقود تسليم المفتاح.

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List of Abbreviations / Symbols

AQB	Appraiser Qualifications Board
ASB	Appraisal Standards Board
TIAVSC	The International Assets Valuation Standards Committee
IVSC	International Valuation Standards Committee
RICS	Royal Institute of Chartered Surveyors
USPAP	Uniform Standards of Professional Appraisal Practice
OPMs	Option Pricing Methods
PWERM	Probability-Weighted Expected-Return Methods
ANNs	Artificial Neural Networks
ARIMA	Autoregressive Integrated Moving Average
CPI	Consumer Price Index
CBOS	Central Bank of Sudan
OCCF	Organizing Council for Consultancy Firms
$\bar{A}$	Arithmetic Mean
A	Model Generated Values
n	Number of Generated Values
$\sum A$	Sum for Generated Values

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Definitions of Basic Terms

Valuation/Appraisal (Synonyms)	(Noun) The act or process of developing an opinion of value; an opinion of value. (Adjective) Of or pertaining to appraising and related functions such as appraisal practice or appraisal services
Valuation Practice	The valuation services performed by an individual acting as an appraiser, including but not limited to appraisal and appraisal review
Valuer	A "*valuer*" is an individual, group of individuals or a firm who possesses the necessary qualifications, ability and experience to execute a valuation in an objective, unbiased and competent manner. In some jurisdictions, licensing is required before one can act as a valuer
Valuation Review	The act or process of developing and communicating an opinion about the quality of another valuer's work that was performed as

	part of a valuation or valuation review assignment
Assignment	1. An agreement between a valuer and a client to provide a valuation service. 2. The valuation service that is provided as a consequence of such an agreement
Assignment Results	A valuer's opinions or conclusions, developed specifically for an assignment
Assumption	That which is taken to be true
Bias	A preference or inclination that precludes a valuer's impartiality, independence, or objectivity in an assignment
Client	The party or parties who engage, by employment or contract, a valuer in a specific assignment
Cost	The amount required to create, produce, or obtain a property, Cost is either a fact or an estimate of fact.

Price	The amount asked, offered, or paid for a property.
Value	The monetary relationship between properties and those who buy, sell, or use those properties.
Bases of Value	Bases of value (sometimes called standards of value) describe the fundamental premises on which the reported values will be based. It is critical that the basis (or bases) of value be appropriate to the terms and purpose of the valuation assignment, as a basis of value may influence or dictate a valuer's selection of methods, inputs and assumptions, and the ultimate opinion of value.
The Market	A market is the environment in which goods and services are traded between buyers and sellers through a price mechanism.
Market Value	Market value is the estimated amount for which an asset should be exchanged on the date of valuation between a willing buyer and a willing seller in an arm's-length transaction after proper marketing wherein the parties had each

	acted knowledgeably, prudently, and without compulsion.
“The estimated amount”	refers to a price expressed in terms of money payable for the asset in an arm’s-length market transaction. Market value is measured as the most probable price reasonably obtainable in the market on the date of valuation in keeping with the market value definition. It is the best price reasonably obtainable by the seller. This estimate specifically excludes an estimated price inflated or deflated by special terms or circumstances such as atypical financing, sale and leaseback arrangements, special considerations or concessions granted by anyone associated with the sale, or any element of special value.
“on the date of valuation”	requires that the estimated market value is time-specific as of a given date. Because markets and market conditions may change, the estimated value may be incorrect or inappropriate at another time. The valuation amount will reflect the actual market state and circumstances as of the effective valuation date, not as of either a past or future date. The definition also assumes simultaneous exchange and completion of the

	contract for sale without any variation in price that might otherwise be made.
“between a willing buyer”	refers to one who is motivated, but not compelled to buy. This buyer is neither over eager nor determined to buy at any price. This buyer is also one who purchases in accordance with the realities of the current market and with current market expectations, rather than in relation to an imaginary or hypothetical market that cannot be demonstrated or anticipated to exist. The assumed buyer would not pay a higher price than the market requires. The present owner is included among those who constitute “the market”.
“and a willing seller”	is neither an over-eager nor a forced seller, prepared to sell at any price, nor one prepared to hold out for a price not considered reasonable in the current market. The willing seller is motivated to sell the asset at market terms for the best price attainable in the open market after proper marketing, whatever that price may be. The factual circumstances of the actual owner are not a part of this consideration because the willing seller is a hypothetical owner.

“in an arm’s-length transaction”	is one between parties who do not have a particular or special relationship, such as parent and subsidiary companies or landlord and tenant, that may make the price level uncharacteristic of the market or inflated because of an element of special value. The market value transaction is presumed to be between unrelated parties, each acting independently.
“after proper marketing”	means that the asset would be exposed to the market in the most appropriate manner to effect its disposal at the best price reasonably obtainable in accordance with the market value definition. The method of sale is deemed to be the most appropriate to obtain the best price in the market to which the seller has access. The length of exposure is not a fixed period of time but will vary according to the type of asset and the market conditions. The only criterion is that there must have been sufficient time to allow the asset to be brought to the attention of an adequate number of market participants. The exposure period occurs prior to the valuation date.

“wherein the parties had each acted knowledgeably, prudently”	presumes that both the willing buyer and the willing seller are reasonably informed about the nature and characteristics of the asset, its actual and potential uses and the state of the market as of the date of valuation. Each is further presumed to act for self-interest with that knowledge and prudently seek the best price for their respective positions in the transaction. Prudence is assessed by referring to the state of the market at the date of valuation, not with benefit of hindsight at some later date. For example, it is not necessarily imprudent for a seller to sell assets in a market with falling prices at a price that is lower than previous market levels. In such cases, as is true for other exchanges in markets with changing prices, the prudent buyer or seller will act in accordance with the best market information available at the time.
“and without compulsion”	establishes that each party is motivated to undertake the transaction, but neither is forced or unduly coerced to complete it.
Exposure time	This is the estimated length of time that the property interest being appraised would have been offered on the market prior to the

	hypothetical consummation of a sale at market value on the effective date of the appraisal.
Extraordinary Assumption	This is an assumption, directly related to a specific assignment, as of the effective date of the assignment results, which, if found to be false, could alter the appraiser's opinions or conclusions.
Intended Users	The client and any other party identified, by name or type, as users of the appraisal or appraisal review report by the appraiser on the basis of communication with the client at the time of the assignment.
Real Estate	An identified parcel or tract of land, including improvements, if any.
Real Property	The interests, benefits, and rights inherent in the ownership of real estate.
Report	Any communication, written or oral, of an appraisal or appraisal review that is transmitted to the client upon completion of an assignment.
Participant	Refers to the relevant participants pursuant to the basis (or bases) of value used in a valuation

	engagement (see IVS 104 Bases of Value). Different bases of value require valuers to consider different perspectives, such as those of "market participants" (e.g., Market Value, Fair Value IFRS – International Financial Reporting Standards) or a particular owner or prospective buyer (e.g., Investment Value).

CHAPTER Ⅰ

INTRODUCTION

1.1 General Introduction

There is no doubt that economic growth is strongly related to the money available for creating business and thus wealth. One of the most valuable tools to make this money available is bank loans, but in order to keep the monetary cycle working efficiently, loans must be paid back. This will never be achieved unless there is a clear, real and dependable process for appraisal and valuation of the collateral. This highlights the vital role of appraisers in economic growth.

The 2008 global financial crisis was initiated by the collapse of the real estate market, with dramatic consequences. This scenario elaborates how sensitive the real estate market is. In Sudan, real estate assets play an essential role in supporting the national economy; they represent the most popular collateral for banks (lenders) to accept in order to release loans to investors (borrowers). This is the backbone of investment activities between banks and investors, which means that the whole process of loans and repayments is dependent on the credibility of the collateral. This credibility requires a fair and clear appraisal of the collateral property, which consequently requires a scientific methodology for appraisal, carried out by an expert and qualified appraiser; however, sometimes collateral is accidentally or deliberately overestimated.

Real estate appraisers are experts who are trained to apply the appraisal process to resolve property valuation problems. Appraisers play an important role in the loan underwriting process, since loan-to-value ratios depend on appraisers' opinions of the market value.

In the early 1980s, the crisis in the savings and loan industry highlighted the need to improve appraisal practices throughout the United States. The difficulties and losses experienced by many lending institutions illustrated the importance of ensuring that appraisals are based upon well established and recognized standards and free of outside pressures. In 1986, nine leading professional appraisal organizations were formed in the United States and Canada. Agreeing upon a generally accepted set of standards, the eight United States committee members adopted those standards and thereafter established the Appraisal Foundation in 1987 to implement the Professional Practice. Later on, the Appraiser Qualifications Board (AQB) and the Appraisal Standards Board (ASB) were founded, and in 1989 the Congress gave these two Boards considerable responsibilities. In some other Asian, European and African countries, related foundations and committees have issued or are developing National Appraisal Standards (Appraisal Foundation, n.d.).

Discussions between the UK and the US in the late 1970s led to the founding of the International Assets Valuation Standards Committee (TIAVSC) in 1981. The committee changed its name in 1994 to the International Valuation Standards Committee (IVSC). Until 2003, the IVSC was an unincorporated association comprising professional valuation associations from around the world, which were bound by a single constitution. In 2003, the IVSC became a not-for-profit organization in the

USA. The committee, which was founded with a membership of twenty national associations, had grown by the year 2007 to include associations with member or observer status, representing 52 countries. The first edition of International Valuation Standards (IVS) was published in 1985. The 8th and current edition was published in 2021 (International Valuation Standards, 2021).

In 2001, the Law of Real Estate Financing was issued in Egypt; some clauses of this law regulate the real estate valuation process and define the appraiser and his role (Anis, 2009).

1.2 Real Estate Valuation Process

According to the professional practice specified in valuation standards, there are three main approaches to estimate the market value of real estate. These approaches are comparison sales, construction cost and the income approach, each of which will work and give reliable results in certain market conditions. This research will examine and evaluate the results of these approaches in different market conditions, and recommend the most suitable approach for inefficient and unstable markets.

1.3 Problem Statement and Research Questions

In the absence of reliable market data, regular valuation methods stipulated in the valuation standards will not work efficiently. This problem faces appraisers in inefficient markets, and this research will suggest a practical model for this case.

Sudan is facing similar problems to those encountered in other countries regarding appraisal and valuation issues, but in most of these

countries, the professionals study, analyse, diagnose and scan their problems and build their national Standards and regulations to regulate scientifically the whole process of the appraisal. They investigate the problems in depth and identify their weaknesses; they establish a system that minimizes the risk of the lending process to a reasonable and manageable limit; and they have professional codes of ethics. In Sudan, the lenders (banks) are still suffering from losses and damages due to borrowers' failure to pay back the loans. Many reasons could cause borrower failure. Among these cases are issues related to the process of valuation of the loan collateral. This study sets out to examine the problems of the real estate appraisal practice in Sudan and the need to regulate and organize this practice.

The main objective of the valuation process is to estimate the reliable market value in order to gain public trust. An efficient market is vital to estimate the market value with reasonable credibility. However, in recent years, Sudan has started to suffer from symptoms of an inefficient market, including a turbulent economy, high inflation, and volatile exchange rates of foreign currency and interest rates.

The asset valuation process depends on the availability and quality of essential market data. The market data collected from inefficient and unstable markets is believed to be unreliable.

Most of the construction materials in Sudan are imported and connected to the exchange rate of the foreign currency. The manpower cost is also affected by the foreign currency exchange rate, using this fact, this research seeks to identify the best way to estimate the market value of real estate in an inefficient market with a reasonable level of confidence.

In sum, this research attempt to solve the problem of unreliable market data required for a trustable real estate market value and to answer the question of how to conduct a valuation process in such a case.

1.4 Significance of the Research

The Valuation Standards focus on estimating different asset values in active and stable markets. In the case of abnormal uncertainty of comparable sales data, some clauses of the standards advise adding a clear statement about the uncertainty level to the valuation report.

The valuation process is dependent on the efficiency of the market. The professional appraiser should estimate the market value whenever requested regardless of the prevailing market conditions.

Taking into consideration the current market conditions in Sudan and related uncertainties that affect the outputs of the valuation process, this research will suggest some methods and regulations to improve the quality of the valuation process and increase the Credibility of the estimated market value in inefficient markets. It will suggest a practical model, including a mathematical model for the construction cost method. The construction cost method is believed to be more reliable than other methods (i.e., comparison and capitalization methods) in the case of inefficient markets.

To achieve this objective, detailed and sensitive examinations of the applicability of the different valuation approaches in the unstable market should be conducted. This research also seeks to answer the main questions about problems of valuation practice in Sudan, and about requirements

needed to organize and regulate this profession. It will attempt to answer the following questions:

- How can we estimate a reliable market value in an inefficient market and what is the most reliable valuation approach?
- Are the appraisal processes applied by different appraisers similar?
- Why there is a significant difference in estimated market value for the same real estate when valued by different appraisers?
- Do the expert appraisers know about the uniform standards for appraisal, and do they know about the three approved methods of appraisal and Code of Ethics of the profession?
- In an inefficient market, what is the most reliable valuation method to estimate the market value?
- How can we organize this practice in Sudan?

The outcomes and answers to the above-mentioned questions will be used to develop a mathematical model using the construction cost method to estimate a reliable market value of the real estate in an inefficient market.

Generally, buildings can be categorized based on their functions (i.e. residential, public, commercial), structural systems (i.e. flat slab, slab with beams) and grade of finishing materials. Considering the quantities of construction materials, workmanship, tools and equipment needed to construct a building, buildings in the same category will fall into the same range of quantities required for each square metre of built area. The rate factor of each construction item for each square metre of a built area can be

estimated for all construction units of the building. These estimated factors will be the backbone of the mathematical model. Updated market data will be used in the model to develop the market value at the time of valuation.

In Sudan, most of the construction materials or their raw materials are imported, so the cost of construction materials is directly and dynamically connected to the foreign currency exchange rate. A construction cost model considering the effect of foreign currency exchange rate on construction materials as a driven variable and also considering other variables of the unstable market will increase the credibility of the estimated market value of a real estate.

1.5 Research Objectives

The main objective of this research is to develop a general practice including a mathematical construction cost model to estimate market value for real estate assets in inefficient and unstable markets. The model will help to absorb the effect of the uncertainty of market data collected from the inefficient market, to increase the level of confidence of estimated market value and to minimize the variance of concluded market value when a certain real estate is appraised by different appraisers. Moreover, this research seeks to examine the local valuers practice to find out the weaknesses and develop recommendations to overcome these weaknesses.

1.6 Research Hypothesis

1. The assets valuation practice in Sudan is unorganized.
2. The valuation practice in Sudan is not comply with recognized International Valuation Standards.

3. A real estate valuation model based on construction cost approach will work efficiently in inefficient and unstable market.

1.7 Research Methodology

To achieve the research objectives and to answer related questions, the following methods will be applied:

I. Study and analyse the process of valuation based on the approved three main approaches, and determine the factors affecting the accuracy of the estimated market value in the different market conditions.

II. Examine the process of real estate appraisal in Sudan and compare it with those used in other countries in the region and the world.

III. Examine the suitability and credibility of the different appraisal methods in inefficient markets by comparing the outcomes (i.e. appraiser suggested market value) of each method with the actual selling price achieved. This part of the research will focus on the construction cost method.

IV. Compare the final selling price of the collateral to that estimated by the appraiser in the appraisal report; this shall be done for at least 50 cases and different types of lenders, borrowers and appraisers, to find out the differences in these prices and the causes, if any.

V. Examine the uniformity of the methods followed in the appraisal process.

VI. Examine the compatibility of these methods with the applicable International Standards.

VII. Examine appraisers', lenders', and borrowers' knowledge about the Uniform Standard and Profession Code of Ethics, and its application limits through questionnaires.

VIII. Study the previous experiment of the Sudanese Real Estate Bank (Al–Bank Al–Aqari).

IX. Compare the responsibilities and roles of international professional regulatory bodies (i.e. authorized boards, unions, associations), regulations and laws to those in Sudan.

X. Determine the main variables of the three valuation methods and apply a parametric study to examine the relationships between these variables in unstable and inefficient markets.

1.8 Data Collection

The geographical zone of the research will be Khartoum State in Sudan. Required research data will be collected from professional appraisers using well-designed questionnaires, valuation reports, historical market data for construction materials and real estate sales price and historical exchange rate for USD.

1.9 Data Analysis

Questionnaires data will be analysed using statistical software (SPSS and MaxStat). The valuation practice of appraisers, as concluded from the questionnaires, will be examined for compatibility with professional standards of valuation practice.

Reported values generated from the three valuation methods will be compared with the actual selling price. To estimate precise construction cost value, a construction cost approach model will be built. The statistical distribution of these values will be examined using measures of statistical dispersion.

The importance of the construction cost model comes from the fact that the construction materials are instantly affected by the USD exchange rate, whilst the other two methods need some time to react to USD exchange rate fluctuations.

1.10 Interpretation

The questionnaire's design shall be based on the research questions, and the scientific results will evaluate appraisers' practice in Sudan based on the IVS. It is expected that the comparison of the results of the three methods of valuation will support the credibility of the construction cost approach for estimating real estate market value in inefficient markets.

1.11 Expected Results

The expected outcomes of this research will be a guideline or professional manual for the estimation of the market value of real estate in an inefficient and unstable market, and the basis of a construction cost approach mathematical model to estimate market value for real estate.

1.12 The Organization of the Thesis

The study is divided into six chapters, each of which is dedicated to one topic and comprises smaller sub-chapters to elaborate the main idea of the chapter.

Chapter One provides a description of the whole thesis. It contains a general introduction to the research, the real estate valuation process, research questions, the significance of the study, research methodology, expected results and organization of the study.

Chapter Two is the Literature Review chapter. It reviews and discusses in detail the real estate valuation concepts and approaches, applicable standards, definitions and terminology used in the profession, professional ethics, valuation practice in standard conditions, market efficiency and valuation uncertainty. Also, this chapter includes International Valuation Practice and Challenges, with a general review of valuation methods, this chapter discusses international valuation practice under the applicable common standards and the challenges facing appraisers while performing their assignments. Also, it summarizes applicable standards and recommendations to deal with the valuation uncertainty and advanced valuation methods developed to minimize the influence of uncertainty.

Chapter Three is dedicated to real estate valuation practice in Sudan, and is the case study chapter. In this chapter, the researcher will discuss how valuation practice was developed in Sudan, governing regulations, the methodologies and approaches applied, output reliability, public trust and customer satisfaction, and the compatibility of local practice standards with the applicable international standards. To achieve these objectives, the

researcher will depend on reviews of valuation reports and survey questionnaires.

The core of the study is this chapter, chapter Four, and it is dedicated to the Construction Cost Approach Model to estimate real estate market value in inefficient markets.

It answers the following questions about the model:

- The Need for Mathematical Modelling in Sudan.
- Why the Construction Cost Model?
- Model Purpose and Limitations.
- Model Variables.
- Model Philosophy.
- Model Structure.
- How does the Model Work?
- Using the Model.

Chapter Five is titled ‘Model Testing.’ The researcher designed this chapter to test and assess the performance of the suggested mathematical model. Furthermore, in this chapter, the researcher will estimate the degree of confidence in the model results. The chapter elaborates the methodology of the test and test results.

And finally, Chapter Six provides the findings, conclusions and recommendations.

CHAPTER II

Literature Review

2.1 Valuation

Valuation is known as the process of concluding the price of an asset. In practice, it contains elements of both objectivity and subjectivity. Valuation is often said to be “an art, not a science” but this relates to the techniques employed to calculate the value, not to the underlying concept itself (French, 2004).

The valuation process is the process of developing an opinion about the value of the asset under consideration. It is an opinion of an expert, who is known as an ‘appraiser’ or a ‘valuer’.

Valuation, in itself, is nothing more than an expert opinion of an asset’s value. It may contain some level of subjectivity; this subjectivity depends on the extent to which the valuer is certain or uncertain when the process of valuation takes place. The accuracy of the estimated value could be measured against the supporting evidence from which it was derived. This value should reflect the rational behaviour in the asset’s market. Certainly, the accuracy of this value is fully contingent upon the ability of the expert to recognize the

quality of the market information and to interpret that information into an indication of value.

Considering the uncertainty about the overall process of valuation inherent in factors affecting methodologies, market data, market activity and asset type, public trust in the valuation profession is likely to be in doubt. Because of this ambiguity, Damodoran (2006) argues that valuation does not lead to true value, because “all valuations are biased”, The only questions are "how much?" and "in which direction?" It has also been stated that, “Valuation is not a fact; it is an estimate” (RICS Professional Standards 2017). This research will discuss the quality of estimated market values in different market conditions and suggest a model for market value estimation in the inefficient market to increase public trust in the profession.

Valuation is an important aspect of economic life. It is one of the market tools used to facilitate and inject money into business, trading and manufacturing activities. To play their role, banks and other financial institutions have to lend money to business firms, but they need to ensure that this money will be paid back. To ensure that their loans will be repaid, financial institutions and banks will not release the loan unless the borrowers put the collateral property under their legal control, and in case of borrower delinquency, lenders will liquidate the collateral and collect the money to recoup their losses.

2.2 Real Estate Valuation in Standard Conditions

Valuation is an important component in the financing system and plays a key role in providing the required money to market activities. Adequate valuation of the collateral property will minimize the risk of the financing.

Standards have been set up to organize the valuation profession for different asset types, such as Business Valuation, Personal Property, Mass Appraisal and Real Property Valuation. Considering the market in Sudan, the most commonly used collateral is real property.

2.3 Applicable Standards

There are a series of important valuation standards developed and promulgated by professional councils and boards, as shown in Table (2-1):

Table 2-1: Main Valuation Standards

#	Standards	Issued By
1	International Valuation Standards (IVS)	International Valuation Standards Council
2	Uniform Standards of Professional Appraisal Practice (USPAP)	Appraisal Standards Board (ASB) - Appraisal Foundation (IVSC)
3	RICS Valuation – Global Standards (The Red Book)	Royal Institution of Chartered Surveyors (RICS)

To standardize the professional terms in valuation, the applicable standards have agreed on specific definitions of terms. This research will use the valuation terms as they are specified in the IVS and USPAP.

2.4 Professional Ethics

The IVS (2017) set forth the requirements for integrity, impartiality, objectivity, independent judgment, and ethical conduct. The Valuer must promote and preserve the public trust inherent in appraisal practice by observing the highest standards of professional ethics. The Valuer must comply with the professional standards when obligated by law or regulation, or by agreement with the client or intended users.

Professional Ethics are divided into three sections – Conduct, Management, and Confidentiality – which apply to all valuation practice. To comply with the ethical conduct, the Valuer:

- Must not perform an assignment with bias.
- Must not advocate the cause or interest of any party or issue.
- Must not accept an assignment that includes the reporting of predetermined opinions and conclusions.
- Must not misrepresent his or her role when providing valuation services that are outside of appraisal practice.
- Must not communicate assignment results with the intent to mislead or to defraud.
- Must not use or communicate a report that is known by the appraiser to be misleading or fraudulent.
- Must not knowingly permit an employee or other person to communicate a misleading or fraudulent report.
- Must not use or rely on unsupported conclusions relating to characteristics such as race, colour, religion, national origin, gender, marital status, familial status, age, receipt of public assistance income, handicap, or an unsupported conclusion that homogeneity of such characteristics is necessary to maximize value.
- Must not engage in criminal conduct.
- Must not wilfully or knowingly violate the requirements of the Record Keeping Rule.
- Must not perform an assignment in a grossly negligent manner.

- If known prior to accepting an assignment, and/or if discovered at any time during the assignment, the valuer must disclose to the client, and in each subsequent report certification:

    - Any current or prospective interest in the subject property or parties involved.
    - Any services regarding the subject property performed by the appraiser within the three-year period immediately preceding acceptance of the assignment, as an appraiser or in any other capacity.

To comply with the ethical management, the valuer:

- Must disclose that he or she paid a fee or commission, or gave a thing of value, in connection with the procurement of an assignment.
- Must not advertise for or solicit assignments in a manner that is false, misleading, or exaggerated.

  Must not affix the signature of another appraiser without his or her consent.

To maintain confidentiality, the valuer:

- Must protect the confidential nature of the appraiser-client relationship.
- Must act in good faith with regard to the legitimate interests of the client in the use of confidential information and in the communication of assignment results.

- Must be aware of, and comply with, all confidentiality and privacy laws and regulations applicable in an assignment.
- Must not disclose: (1) confidential information; or (2) assignment results to anyone other than:
    - The client.
    - Parties specifically authorized by the client.
    - State appraiser regulatory agencies.
    - Third parties as may be authorized by due process of law.
    - A duly authorized professional peer review committee, except when such disclosure to a committee would violate applicable laws or regulations.
- Must take reasonable steps to safeguard access to confidential information and assignment results by unauthorized individuals, whether such information or results are in physical or electronic form.
- Must ensure that employees, co-workers, sub-contractors, or others who may have access to confidential information or assignment results, are aware of the prohibitions on disclosure of such information or results.

2.5 Valuation Practice in Standard Conditions

Valuation in standards condition is based on the following concepts:

Bases of value

In addition to the IVS-defined bases of value listed below, the IVS (2017) has also provided a non-exhaustive list of other non-IVS-defined bases of value prescribed by individual *jurisdictional* law or those recognised and adopted by international agreement:

IVS-defined bases of value:

1. Market Value.
2. Market Rent.
3. Equitable Value.
4. Investment Value/Worth.
5. Synergistic Value.
6. Liquidation Value.

Other bases of value (non-exhaustive list):

1. Fair Value (International Financial Reporting Standards).
2. Fair Market Value (Organisation for Economic Co-operation and Development).
3. Fair Market Value (the United States Internal Revenue Service).
4. Fair Value (Legal/Statutory):
    a. The Model Business Corporation Act.
    b. Canadian case law (Manning v Harris Steel Group Inc).

While there are many different bases of value used in valuations, most have certain common elements: an assumed transaction, an assumed date of the transaction, and the assumed parties to the transaction.

Valuers must choose the relevant basis (or bases) of value according to the terms and purpose of the valuation assignment. The valuer's choice of a basis (or bases) of value should consider instructions and input received from the client and/or its representatives. However, regardless of instructions and input provided to the valuer, the valuer should not use a basis (or bases) of value that is inappropriate for the intended purpose of the valuation (for example, if instructed to use an IVS-defined basis of value for financial reporting purposes under IFRS, compliance with IVS may require the valuer to use a basis of the value that is not defined or mentioned in the IVS.

In accordance with IVS (Standards 101 – 2017) Scope of Work, the basis of value must be appropriate for the purpose and the source of the definition of any basis of value used must be cited or the basis explained. Valuers are responsible for understanding the regulation, case law and other interpretive guidance related to all bases of value used.

2.6 Valuation Approaches – IVS (2017)

There are three main approaches for asset valuation. These three methods are applicable for real estate valuation, and are as follows:

(a) Market approach,

(b) Income approach, and

(c) Cost approach.

Each of these valuation approaches includes different, detailed methods of application. The goal in selecting valuation approaches and methods for an asset is to find the most appropriate method under particular circumstances. No one method is suitable in every possible situation. The selection process should consider, at a minimum:

(a) The appropriate bases of value as determined by the terms and purpose of the valuation assignment;

(b) The respective strengths and weaknesses of the possible valuation approaches and methods;

(c) The appropriateness of each method in view of the nature of the asset, and the approaches or methods used by participants in the relevant market; and

(d) The availability of reliable information that is needed to apply the methods.

All valuation methods specified in professional standards depend on the market information available at the time of the valuation.

Valuers are not required to use more than one method for the valuation of an asset, particularly when the valuer has a high degree of confidence in the accuracy and reliability of a single method, given the facts and circumstances of the valuation engagement. However, valuers should consider the use of multiple approaches and methods, and more than one valuation approach or method may be used to arrive at an indication of value, particularly when there are insufficient factual or observable inputs for a single method to produce a reliable conclusion.

Where more than one approach and method are used, or even multiple methods within a single approach, the conclusion of value based on those multiple approaches and/or methods should be reasonable and the process of analysing and reconciling the differing values into a single conclusion, without averaging, should be described by the valuer in the report.

While the professional standards include discussion of certain methods within the Cost, Market and Income approaches, they do not provide a comprehensive list of all possible methods that may be appropriate. Some of the many methods not addressed in these standards include option pricing methods (OPMs), simulation/Monte Carlo methods and probability-weighted expected-return methods (PWERM). It is the valuer's responsibility to choose the appropriate method(s) for each valuation engagement. Compliance with IVS may require the valuer to use a method not defined or mentioned in the IVS.

When different approaches and/or methods result in widely divergent indications of value, a valuer should perform procedures to understand why the value indications differ, as it is generally not appropriate to simply weigh two or more divergent indications of value. In such cases, valuers should reconsider the relevant guidance in the standards to determine whether one of the approaches/methods provides a better or more reliable indication of value.

Valuers should maximise the use of relevant observable market information in all three approaches. Regardless of the source of the inputs and assumptions used in a valuation, a valuer must perform appropriate analysis to evaluate those inputs and assumptions and their appropriateness for the valuation purpose.

Although no one approach or method is applicable in all circumstances, price information from an active market is generally considered to be the strongest evidence of value. Some bases of value may prohibit a valuer from making subjective adjustments to price information from an active market. Price information from an inactive market may still be good evidence of value, but subjective adjustments may be needed.

In inactive or volatile markets, collected market information (i.e. prices) is expected to be heterogeneous and not to represent the actual market value of the asset under consideration, and extra effort is needed to increase the Credibility of the estimated market value of an asset in the inactive or unstable market.

Market Approach (Comparable Sales Method)

The market approach provides an indication of the value by comparing the asset with identical or comparable (that is, similar) assets for which price information is available. This approach should be applied and afforded significant weight under the following circumstances:

(a) The subject asset has recently been sold in a transaction appropriate for consideration under the basis of value;

(b) The subject asset or substantially similar assets are actively publicly traded; and/or

(c) There are frequent and/or recent observable transactions in substantially similar assets.

Although the above circumstances would indicate that the market approach should be applied and afforded significant weight, when the above criteria are not met, the following are additional circumstances where the market approach may be applied and afforded significant weight. When using the market approach under the following circumstances, a valuer should consider whether any other approaches can be applied and weighted to corroborate the value indication from the market approach:

(a) Transactions involving the subject asset or substantially similar assets are not recent enough, considering the levels of volatility and activity in the market.

(b) The asset or substantially similar assets are publicly traded, but not actively.

(c) Information on market transactions is available, but the comparable assets have significant differences to the subject asset, potentially requiring subjective adjustments.

(d) Information on recent transactions is not reliable (i.e., hearsay, missing information, synergistic purchaser, not arm's-length, distressed sale, etc.).

(e) The critical element affecting the value of the asset is the price it would achieve in the market rather than the cost of reproduction or its income-producing ability.

The heterogeneous nature of many assets means that it is often not possible to find market evidence of transactions involving identical or similar assets.

Even in circumstances where the market approach is not used, the use of market-based inputs should be maximised in the application of other approaches (e.g., market-based valuation metrics such as effective yields and rates of return).

When comparable market information does not relate to the exact or substantially the same asset, the valuer must perform a comparative analysis of qualitative and quantitative similarities and differences between the comparable assets and the subject asset. It will often be necessary to adjust based on this comparative analysis. Those adjustments must be reasonable, and valuers must document the reasons for the adjustments and how they were quantified.

The Main steps for the comparable sales method are:

(a) Identify the units of comparison that are used by participants in the relevant market.

(b) Identify the relevant comparable sales and calculate the key valuation metrics for those sales.

(c) Perform a consistent comparative analysis of qualitative and quantitative similarities and differences between the comparable assets and the subject asset.

(d) Make necessary adjustments, if any, to the valuation metrics to reflect differences between the subject asset and the comparable assets.

(e) Apply the adjusted valuation metrics to the subject asset.

(f) If multiple valuation metrics were used, reconcile the indications of value.

A valuer should analyse and adjust any material differences between the comparable and the subject asset. Examples of common differences that could warrant adjustments may include, but are not limited to:

(a) Material characteristics (age, size, specifications, etc).

(b) Relevant discounts and premiums (discounts for lack of marketability and premiums).

(c) Relevant restrictions on either the subject asset or the comparable assets.

(d) Geographical location of the underlying company and the related economic and regulatory environments.

(e) Profitability or profit-making capability of the assets.

(f) Historical and expected growth.

(g) Differences related to marketability and control characteristics of the comparable and the subject asset, and

(h) Type of ownership.

Income Approach

The income approach provides an indication of value by converting future cash flow to a single current value. Under the income approach, the value of an asset is determined by reference to the value of income, cash flow or cost savings generated by the asset. The income approach should be applied and afforded significant weight under the following circumstances:

(a) The income-producing ability of the asset is the critical element affecting value from a participant perspective, and/or

(b) Reasonable projections of the amount and timing of future income are available for the subject asset, but there are few, if any, relevant markets that are comparable.

Although the above circumstances would indicate that the income approach should be applied and afforded significant weight, the following are additional circumstances where the income approach may be applied and afforded significant weight. When using the income approach under the following circumstances, a valuer should consider whether any other approaches can be applied and weighted to corroborate the value indication from the income approach:

(a) The income-producing ability of the subject asset is only one of several factors affecting value from a participant perspective.

(b) There is significant uncertainty regarding the amount and timing of future income-related to the subject asset.

(c) There is a lack of access to information related to the subject asset (for example, a minority owner may have access to historical financial statements but not forecasts/budgets), and/or

(d) The subject asset has not yet begun generating income but is projected to do so.

A fundamental basis for the income approach is that investors expect to receive a return on their investments and that such a return should reflect the perceived level of risk in the investment.

Although there are many ways to implement the income approach, methods under the income approach are effectively based on discounting future amounts of cash flow to present value.

Cost Approach (Construction Cost Method)

The cost approach provides an indication of value using the economic principle that a buyer will pay no more for an *asset* than the cost to obtain an *asset* of equal utility, whether by purchase or by construction, unless undue time, inconvenience, risk or other factors are involved. The approach provides an indication of value by calculating the current replacement or reproduction cost of an *asset* and making deductions for physical deterioration and all other relevant forms of obsolescence.

The cost approach should be applied and afforded significant weight under the following circumstances:

(a) Participants would be able to recreate an asset with substantially the same utility as the subject asset, without regulatory or legal restrictions, and the asset could be recreated quickly enough that a participant would not be willing to pay a significant premium for the ability to use the subject asset immediately.

(b) The asset is not directly income-generating, and the unique nature of the asset makes using an income approach or market approach unfeasible, and/or

(c) The basis of value being used is fundamentally based on replacement cost, such as replacement value.

Although the above-mentioned circumstances would indicate that the cost approach should be applied and afforded significant weight, the following are additional circumstances where the cost approach may be applied and afforded significant weight. When using the cost approach under the following circumstances, a valuer should consider whether any other approaches can be applied and weighted to corroborate the value indication from the cost approach:

(a) Participants might consider recreating an asset of similar utility, but there are potential legal or regulatory hurdles or significant time involved in recreating the asset.

(b) When the cost approach is being used as a reasonableness check to other approaches (for example, using the cost approach to confirm whether a business valued as a going-concern might be more valuable on a liquidation basis), and/or

(c) The asset was recently created, such that there is a high degree of reliability in the assumptions used in the cost approach.

Broadly, there are three cost approach methods:

(a) Replacement cost method: a method that indicates value by calculating the cost of a similar asset offering equivalent utility.

(b) Reproduction cost method: a method under the cost that indicates value by calculating the cost to recreating a replica of an asset, and

(c) Summation method: a method that calculates the value of an asset by the addition of the separate values of its component parts.

Cost Considerations (IVS -2017)

The cost approach should capture all of the costs that would be incurred by a typical participant.

The cost elements may differ depending on the type of the asset and should include the direct and indirect costs that would be required to replace/recreate the asset as of the valuation date. Some common items to consider include:

Direct costs

1. Materials.
2. Labour.

Indirect costs

1. Transport costs.
2. Installation costs.
3. Professional fees (design, permit, architectural, legal, etc.).
4. Other fees (commissions, etc.).
5. Overheads.
6. Taxes.
7. Finance costs (e.g., interest on debt financing).
8. Profit margin/entrepreneurial profit to the creator of the asset (e.g., return to investors).

2.7 Valuation process in Standards Conditions

IVS, similarly to the other valuation standards, organizes the valuation process in clear functional steps. The following flow chart from IVS (eighth edition) describes the necessary steps to develop market value of a real estate in normal market conditions.

Guidance Note Figure 1-1,
The Valuation Process

Definition of the Assignment

Identify Real Estate	Identify Property Rights	Use of the Valuation	Define Value	Date of Value	Scope of the Assignment	Other Limiting Conditions

Preliminary Analysis and Data Selection and Calculation

General (Regional, city and neighborhood) Social, Economic, Governmental, Environmental	Specific (Subject and comparable data), Cost & Depreciation Income & Expenses, Capitalization Rate, History of Ownership, Use of Property	Competitive Supply and Demand (The subject market), Inventory and competitive Properties, Sales & Listings, Vacancies and Offerings Demand Studies, Absorption Rate

Highest & Best Use, Land as though Vacant, Property as improved, Specified terms of use, Time & Market Participants

Land Value Estimate

Definition of the Assignment

Sales Comparison Approach	Income Capitalization Approach	Cost Approach

Reconciliation of Value Indications and Final Value Estimate

Report of Defined Value

Figure 2-1: The Valuation Process - IVS 8th Edition

2.8 Valuation Approaches vs. Market Conditions

All main valuation standards set forth guidelines for the asset valuation process and requirements for each phase of the process. They organize valuation practice in relatively stable market conditions where the collected information is reliable enough to establish a credible asset market value. Valuation standards did not determine a specific methodology or calculation model to apply when an unstable market acts catastrophically and market information becomes unreliable. In such a case, the valuation standards enforce the valuer to disclose the market conditions and the quality of the collected information.

The most important fact to bear in mind is that the three valuation approaches depend on the available market information, the reliability of which is directly affected by the prevailing market conditions. Considering real estate valuation, table 2-2 shows how the three valuation approaches depend on the market information:

Table 2-2 : Valuation Approaches & Market Information

Valuation Method	Information Required	Source of Information
Market Approach - Comparable Sales Method	Sales Prices, asset properties	Real Estate Market
Income Approach	Asset's produced income (i.e. rental)	Real Estate Market
Cost Approach – Construction Method	Construction Materials Prices, Workforce Cost, etc.	Construction Industry Market

2.9 Inflation

The word inflation raises a lot of confusion among people and is associated in their minds with the decrease of value of their money, but asset valuators must realize that a moderate inflation is good for the health of the economy as it constitutes a good stimulus for the market and helps buying and selling. But high inflation disrupts the economy and creates ambiguity situation that lead to recession and inactive market.

A moderate amount of inflation is generally considered to be a sign of a healthy economy, because as the economy grows, demand for stuff increases. This increase in demand pushes prices a little higher as suppliers try to create more of the thing that consumers and businesses want to buy (Ferrell, 2019).

2.10 Unstable and Inefficient Markets

Forces that influence real property values include social trends, economic circumstances, governmental controls and regulations and environmental conditions. In Sudan, current economic circumstances (i.e. high inflation, local currency deterioration.) and unsettled government regulations lead the local market to an unstable and inefficient market situation. This inefficient market has resulted in uncertainty in the market information required to develop a dependable market value opinion of the subject real estate.

2.11 Valuation uncertainty

Many definitions have been suggested for uncertainty and its associated risks. Byrne and Cadman (1984) define uncertainty as anything

that is not known about the outcome of a venture at the time when the decision is made, and risk as the measurement of a loss identified as a possible outcome of the decision.

In all human activities, there is always inherent uncertainty and risk, which comes from the absolute fact that nobody knows everything comprehensively. The valuation process is among these activities. The backbone of the valuation process is the quality of the market information, which is significantly affected by market activity and stability. If the market fluctuates abnormally, then the market information tends to be too unreliable to develop a credible market value for the asset under consideration. Because of the inherent uncertainty, it is generally agreed that the information collected from a fluctuating market is imperfect and its outputs will be misleading.

It is generally agreed that uncertainty is due to the lack of knowledge and poor or imperfect information about all the inputs that can be used in the analysis. In the context of valuation, this refers to the input variable and the comparable information. If we are unable to confirm the veracity of the inputs, then the resulting outcomes (valuation) are partially uncertain. However, if we are able to assign a probability to the input variables, this will allow us to determine the range of possible outcomes. The output is therefore a measure of risk (Byrne, 1995).

Valuation experts agree on the existence of valuation uncertainty, but they differentiate between its levels.

French and Gabrielli (The Uncertainty of Valuation, 1994) stated that the credibility of market information is influenced by the market activity: ‘the

more active a market, the more credence will be given to the input information'.

In the valuation process, the sources of uncertainties related to the market are contrastive. They are rational and can be identified: for instance, current market conditions, future market conditions, inflation, foreign currency exchange rate, supply and demand ratio and changing governmental financial regulations.

In the UK, in 1994, the Mallinson Working Party on commercial property valuations produced its report outlining a number of initiatives that the RICS (Royal Institution of Chartered Surveyors) should undertake to help improve the standing of the valuation surveyor within the business world. The Mallinson report made 43 recommendations, 42 of which have been acted on. The remaining recommendation, recommendation 34, proposes that:

"Common professional standards and methods should be developed for measuring and expressing valuation uncertainty' '

The principal problem as argued by the Mallinson Report is that that all valuations are uncertain. A valuation figure is an individual valuer's estimate of the exchange price in the marketplace; it is an expert's opinion. Despite this, clients and third parties tend to view the valuation figure as fact. Yet, for real estate, there is a general belief that valuations are final and exact. There is very little understanding of the uncertainty pertaining to them and that the uncertainty will vary according to market conditions and property type (French, 2004).

Valuation professionals and professional standards organizing the valuation process consider the valuation activity as a professional opinion on value based on the market information available at the time of valuation and assumptions adopted to develop the value. In cases where there is a lack of reliable market information, to overcome this challenge the valuer tends to adopt assumptions and extraordinary assumptions.

Kucharska-Stasiak (2013), stated the following: “A valuation is a professional opinion on value formulated on the basis of the assumptions adopted. An important issue here is the degree of certainty that a given valuation reflects the market realities as well as the features and potential of the property, or that it corresponds to the price that would be obtained on the day of valuation in an arm’s length transaction. Uncertainty of valuation may be regarded not only as uncertainty concerning a single valuation but also as the difference between multiple valuations of the same property conducted at the same time and for the same purpose.”

Overall, the above discussions and statements indicate that there is an unambiguous relationship between the quality of the valuation process outcomes and the market activity.

2.12 Active / Inactive market Standards Practice

The valuation process, by its nature, contains remarkable uncertainty. All of the valuation standards were created on the basic assumption of an active market: they thus assume all features of an active and stable market. A credible market value can be developed only in an active and efficient market that can provide reasonably reliable information.

Experts and market participants define the market activity for the real estate market in different ways. An active market is a market characterized by growing demand, a corresponding lag of supply, and an increase in prices. Sometimes experts define an active market as a seller's market because of the remarkable number of sellers of available assets that can obtain higher prices. An inactive market is a market where a drop in demand is accompanied by a relative oversupply and a decline in prices (Appraisal Institute of Canada, 2002).

Valuation Standards were designed to organize the valuation process in active markets where reliable information is available. On the other hand, in the case of inactive/unstable markets where reliable information does not exist, standards ask the valuer to disclose the prevailing market conditions when market information is collected.

Fluctuation is a normal feature for markets, as the degree of activity in any market will change over time. Although it may be possible to identify a normal level of activity over an extended period, in most markets there will be a time when activity is significantly higher or lower than this norm. Activity levels can only be described in relative terms: for example, by stating that the market is more or less active than it was on a previous date. There is no clearly defined line between active and inactive markets (IVS, 2011).

USPAP Standards Rule 1-4 states that, "In developing a real property appraisal, an appraiser must collect, verify, and analyse all information necessary for credible assignment results."

USPAP Standards Rule 1-4(a) goes on to state: "When a sales comparison approach is necessary for credible assignment results, an

appraiser must analyse such comparable sales data as are available to indicate a value conclusion."

The term 'market value' is the most important basis of the valuation. 'Market value' is the focus of many appraisal assignments. There are many different definitions of 'market value' in use, but all exhibit common characteristics. The entry for 'market value' in the Definitions section of the Uniform Standards of Professional Appraisal Practice (USPAP) addresses these common characteristics:

MARKET VALUE: a type of value, stated as an opinion, that presumes the transfer of a property (i.e., a right of ownership or a bundle of such rights), as of a certain date, under specific conditions set forth in the definition of the term identified by the appraiser as applicable in an appraisal.

Developing an opinion of market value is the purpose of many real property valuation assignments. The conditions included in market value definitions establish market perspectives for the development of such opinion. These conditions may vary from definition to definition but generally fall into three categories:

1. The relationship, knowledge, and motivation of the parties (i.e., seller and buyer);
2. The terms of sale (e.g., cash, cash equivalent, or other terms); and
3. The conditions of sale (e.g., exposure in a competitive market for a reasonable time prior to sale).

The Appraisal Institute's Dictionary of Real Estate Appraisal (6th edition) includes the following in its entry for 'market value':

The most widely accepted components of market value are incorporated in the following definition:

The most probable price as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably and for self-interest, and assuming that neither is under duress.

The Dictionary goes on to cite the definition of 'market value' used by agencies that regulate federally insured financial institutions in the United States:

The most probable price that a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

- Buyer and seller are typically motivated;
- Both parties are well informed or well advised, and acting in what they consider their best interests;
- A reasonable time is allowed for exposure in the open market;

- The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

The common definition of ‘market value’ in all standards, as discussed above, contains some words of wide meaning, which increase the degree of uncertainty in the valuation process: “between a willing buyer”, “and a willing seller” and “after proper marketing” are examples of these broad terms.

Also, the definition of ‘market value’ assumes similarity of market conditions for both comparables and the subject property, which is unlikely to occur.

When the objective of the assignment is the market value, ideally each comparable selected for use in the sales comparison approach should have sold under the conditions specified in the definition of the market value being used. For example, the buyer and seller should have been typically motivated. The seller should not have been under any compulsion to sell, nor the buyer under any compulsion to buy. The marketing effort and exposure time on the market should have been typical for that property type in that market. Payment should have been in cash or terms equivalent to cash: that is, the seller should not have granted cash or non-cash concessions to bring a sale at the stated price.

When the conditions of the sale do not reflect the conditions outlined in the market value definition, either (1) the appraiser must consider making adjustments for such differences if it is to be used as a comparable, or (2) the sale must not be used as a comparable (IVS, 2011).

Buyer and seller motivations may vary greatly depending on their specific circumstances. Often in a distressed market, buyers expect to find ‘deals’ and will only purchase properties that they believe are ‘undervalued’. Seller motivations can vary greatly, too. Sellers with equity may be more willing to sell (even if they have lost equity because of a market decline) than sellers who have very little or no equity. On the other hand, some property owners may willingly dispose of a property – even by defaulting – if they perceive that there is little upside potential in the market and their cost for holding the property is burdensome (Guide Note 11 – USPAP).

A declining market is likely to exhibit very little sales activity. When the sales comparison approach is necessary, but there are virtually no current sales in the market area to analyse as comparables, the USPAP instruct the valuer to:

1. Develop an appraisal of real property in a declining market only after ascertaining adequate knowledge and experience to complete the assignment competently (USPAP Competency Rule).
2. Identify the market for the subject property and the economic trends within that market.
3. Understand the type and definition of value applicable to the assignment and apply a valuation methodology that is consistent with that definition.
4. When selecting comparable sales, do not exclude or include any sales solely because they occurred under distress conditions.

When adjustments cannot be quantified using paired sales, other recognized methods of supporting adjustments may be applied, such as surveying market participants, analysis of rent or net income differentials, or

cost analysis. Analysis of current listings can help to provide an indication of market conditions and trends. The volume of listings, the change over time in the volume of listings, and average days on the market should be analysed to assist in deciding about changes in market conditions.

2.13 Comparable Selection in a Declining Market

One of the main approaches of valuation is the comparable sales method. This, like the other two methods, depends on the available market information.

A declining market is generally characterized by few transactions and falling values. Declining markets reflect valuation challenges because there are fewer transactions available to analyse as comparables in the sales comparison sale method. In a declining market, transactions used in a valuation assignment require adjustments for changes in market conditions, but such adjustments are difficult to support without current transactions. Also, transactions that do occur often do so under conditions that do not align with the conditions of the value definition applicable to the assignment (USPAP, 2017).

In active markets, a reasonable number of transactions to provide reliable market information is available. In inactive markets, sufficient transactions do not exist, so assumptions, uncertainty, subjective adjustments and risk proportionally increase.

Valuers must consider all relevant transactions that have occurred in the market area and then determine which of those transactions should be used in the sales comparison analysis to arrive at a credible value opinion for

the subject property. The best comparables are those that are most similar to the subject property in terms of location, size, condition and other features that buyers and sellers believe make a difference to the price. After selecting the best comparables, the appraiser should adjust for material differences between each comparable and the subject property. The appraiser must analyse each comparable to ascertain what adjustments are needed. Factors that may require adjustment include atypical buyer/seller motivations and sales concessions (IVS, 2011).

Distressed sales such as foreclosure sales and short sales are common in a declining market. Depending on the severity of the local market downturn, some, many, or even all sales that occur do so under distressed conditions.

Appraisers cannot categorically discount foreclosures and short sales as potential comparables in the sales comparison approach. However, due to differences between their conditions of sale and the conditions outlined in the market value definition, they might not be usable as comparables.

Foreclosures and short sales usually do not meet the conditions outlined in the definition of market value. A short sale or a sale of a property that occurred prior to foreclosure might have involved atypical seller motivations (e.g., a highly motivated seller). A sale of a bank-owned property might have involved typical motivations, so the fact that it was a foreclosed property would not render it ineligible as a comparable. However, if the foreclosed property was sold without a typical marketing program, or if it had become stigmatized as a foreclosure, it might need to be adjusted if used as a comparable. Further, some foreclosed properties are in inferior condition, so adjustments for physical condition may be needed (Guide Note 11 – USPAP).

As is always the case in selecting sales to use as comparables, appraisers must investigate the circumstances of each transaction, including whether a typical motivation were involved, sales concessions were involved, the property was exposed on the market for a typical amount of time, the marketing program was typical, or the property condition was compromised. Adjustments might need to be made for these circumstances. When it is necessary to use a distressed sale as a comparable, the appraiser must carefully analyse the current local market to determine whether an adjustment for conditions of sale is needed. If no adjustment is warranted, the lack of adjustment should be explained.

Physical condition and conditions of sale are two distinctly different factors that must be considered separately. They may be related to some degree in a distressed market, but not necessarily. An appraiser must not assume, for example, that a property was in inferior condition simply because it was a foreclosure (Guide Note 11 – USPAP).

The level of investigation needed to meet the requirement for sufficient diligence is generally more than is needed in active and stable market situations.

The conclusion from the above discussion is that the comparable sales method will not lead to credible value opinion if the market is unstable.

2.14 Market Identification

Market analysis is a vital part of the process of developing a market value, disposition value, or liquidation value opinion.

The valuer must identify the subject's market and the level of confidence in market information, and must understand the supply and demand forces at work in that market. Not all markets move in the same direction at the same rate. For example, volatility may be more prevalent in case of high inflation or when the foreign currency exchange rate is fluctuating. Generalizations about macro-economic trends in the broader geographic area are not necessarily applicable to a specific market area. Similarly, trends observed for one price range or property type might not be applicable to other price ranges or property types.

In some markets, a 'two-market' phenomenon might be observed, whereby there is a measurable difference between properties selling under open market conditions in the local currency and other properties selling under closed market conditions in a foreign currency that has a fluctuating exchange rate. This phenomenon may become more prevalent as market conditions become unstable. In stable and active markets, there may be no measurable difference between properties selling under the same period of time regardless of the currency.

The valuer must remain aware of buyer and seller perceptions about how the market is likely to change in the near future. If market participants anticipate an improvement in the market or a further decline, their actions are likely to reflect that anticipation.

Clients may ask valuers to express, in the valuation report, whether markets are declining, stable, or increasing. Defining a declining market is difficult in broad contexts because there is no single accepted definition in the field. In some cases, the client may define a 'declining market' but the

valuer may not accept this definition if it is likely to produce misleading results.

Defining a market and a neighbourhood is a grey area. Some valuers may define the market and the neighbourhood as the same geographic boundaries while others will distinguish between the two. It is possible for a market to be declining while a neighbourhood is stable or even improving and vice versa (Nagy, 2012).

2.15 Real Estate Valuation Uncertainty in an Unstable and Inefficient Market

Professional standards in the issue of valuation uncertainty related to market information cover the issue of uncertainty in the aspects of clarity and transparency. Attention is drawn to the fact that valuation reporting standards may, and often do, have specific disclosure requirements in relation to valuation uncertainty, though that particular term may not be expressly used. Compliance with those requirements is mandatory in cases to which they apply.

The Red Book 2017, requests the valuer to add a comment about the existing uncertainty as follows:

Commentary on any material uncertainty in relation to the valuation where it is essential to ensure clarity on the part of the valuation user.

The valuer shall implement that as follows:

1. This requirement is mandatory only where the uncertainty is material. For this purpose, ‘material’ means where the degree

of uncertainty in a valuation falls outside any parameters that might normally be expected and accepted.

2. All valuations are professional opinions on a stated basis of value, coupled with any appropriate assumptions or special assumptions, which must also be stated (VPS 4) – a valuation is not a fact. Like all opinions, the degree of subjectivity involved will inevitably vary from case to case, as will the degree of 'certainty' – for example, the probability that the valuer's opinion of market value would exactly coincide with the price achieved were there an actual sale at the valuation date, even if all the circumstances envisaged by the market value definition and the valuation assumptions were identical to the circumstances of an actual sale. Most valuations will be subject to a degree of variation (that is, a difference in professional opinion): a principle well-recognised by the courts in a variety of jurisdictions.

3. Ensuring user understanding and confidence in valuations requires clarity and transparency: hence the general requirement under subsection (m) above for the report to refer to the approach or approaches adopted, the key inputs used and the principal reasons for the conclusions reached, thereby enabling the user to understand the valuation figure in context. How much explanation and detail are necessary concerning the supporting evidence, the valuation approach and the particular market context is a matter of judgment in individual cases.

> Normally, valuations will not require additional explanation or clarification beyond the general requirement referred to in Paragraph 3 above. However, in some cases, there may be a greater degree of uncertainty concerning the valuation figure reported than usual, and where that uncertainty is material, further proportionate commentary must be added in order to ensure that the report does not create a false impression. Valuers should not treat such a statement expressing less confidence in a valuation than usual as an admission of weakness – it is not a reflection on their professional skill or judgment, but a matter entirely proper for disclosure. Indeed, if a failure to draw attention to material uncertainty gave a client the impression that greater weight could be attached to the opinion than was warranted, the report would be misleading.

It would not usually be acceptable for a valuation report to have a standard statement to deal with material valuation uncertainty. The degree to which an opinion is uncertain will normally be unique to the specific valuation, and the use of standard clauses can devalue or bring into question the credibility of the advice given. The task is to produce authoritative and considered professional advice within the report. Issues that affect the degree of certainty should be reported in this context.

To overcome uncertainty negatives, some standards instruct the valuer to report the value opinion in terms of range, but RICS Valuation, Global Standards, (2017) argues:

Unless specifically requested, the expression of values within a stated range is not good practice and would not normally be regarded as an

acceptable form of disclosure. In most cases, the valuer has to provide a single figure in order to comply with the client's requirements and terms of engagement. Similarly, the use of qualifying words such as 'in the region of' would not normally be appropriate or adequate to convey material uncertainty without further explicit comment and is again actively discouraged. Where different values may arise under different circumstances it is preferable to provide them on stated special assumptions (RICS Valuation – Global Standards, 2017).

2.16 Cost Approach in Cases of Lack of Comparables Information

This research will investigate the suitability and reliability of results of the cost method in case of an inactive market that cannot provide dependable comparables. In Sudan, all symptoms of a declining market exist: high inflation, many exchange rates for USD, hourly-fluctuating prices in the local currency (the SDG) and monthly-changing economical regulations.

The confidence in using the cost method to develop market value is supported by the fact that all construction material and land value are directly connected to the USD exchange rate.

USPAP argues that "Appraisers must be careful not to presume that the cost approach is a superior valuation technique to the sales comparison approach when comparable sales are lacking. Proper application of the cost approach requires the use of cost data that is current as of the date of value, as well as estimation of any external obsolescence that might exist due to market conditions".

According to the International Valuation Standards (IVS), the depreciated replacement cost method means applying the cost approach to assess the value of specialized assets for financial reports, especially when access to direct market data is limited, (Zorbek, 2011) also stated that “in many countries (not ion Poland so far) cost value (depreciated replacement cost) is recognised as a method to address market value in the absence of better market data”.

2.17 International Valuation Practice and Challenges

With a general review of valuation methods, this chapter discusses international valuation practice under the applicable common standards and challenges facing appraisers while performing their assignments. Valuation standards set up general guidelines for professional practice: therefore, in some cases, appraisers may face challenges of circumstances that are not covered precisely in the standards. This chapter also discusses the types of uncertainties and uncertainties in input data and the challenges that face each standard valuation method.

Valuation uncertainty is perceived as a symptom of errors in valuation. Thus, research on uncertainty is crucial to the correct understanding of valuation reports and is of utmost importance not only for valuers (given their professional, civil, and penal liability) but also for their clients as the addressees of valuation reports (Kucharska, 2013).

The phenomena of the uncertainty of valuation have been discussed for several years among professionals, especially in the UK, where the Mallinson Report (1994) investigated these phenomena in depth and produced remarkable outcomes and recommendations.

2.18 Valuation Theory

A valuation in all cases is nothing more than a professional opinion of value. Nevertheless, this does not suggest that one appraiser's opinion is necessarily better than another's: it simply means that some appraisals are accurate and valid, while others are invalid and inaccurate.

There are some public statements about the nature of valuation among professionals: for example, valuation is not a fact, it is an estimate; valuation is an opinion of the value of the asset; valuation is no more than a justified estimate. Clients and valuers would like to believe that the reported value is precise, but this is a myth. Valuation does not lead to an exact value, because 'all valuations are biased' and the question is 'how much' and ' in which direction': valuation does not ensure an exact estimate of asset value because 'there is no precise valuation' (Damodoran, 2006).

From the valuation point of view, the value of real estate reflects all its features in the amount of money. The estimated value represents the seller's (market) opinion on the subject real estate. In other words, estimated value quantifies the properties of the asset, land size, plot zoning and neighbourhood, structural system, built area, finishing grade and all rights granted by the ownership. In sum, it is all of the quantified property features in one number, called the value opinion. To measure and quantify these features, the work of an expert is required.

2.19 Valuation Principles

The valuation theory is based on certain principles, which are fundamental to estimate the reliable value of the subject property. Valuation

principles define facts and assumptions for the real estate market at the time of value calculation and how the market will react to the valuation process (Haywood County, 2011).

Bundle of Rights

Real property ownership describes the group of rights bestowed to the owner when he purchases a property. They include possession and the right to bequeath, control and sell the property as he so chooses. The law guarantees these rights, but they are subject to certain governmental regulations: these rights will be precisely determined in the title deed.

Meaning of Value

The whole process of valuation is about the value. The concept of value is vital to understand the conclusion of the estimated value. As stated in USPAP 2018-2019, Value expresses an economic concept. As such, it is never a fact, but always an opinion of the worth of a property at a given time in accordance with a specific definition of value (USPAP, 2018, 2019).

Value in Use vs. Value in Exchange

The valuation process produces many types of required values according to the purpose of the valuation. Therefore, the appraiser needs to distinguish between all these value types. For real estate, the distinction between Value in Use and Value in Exchange is essential: the former is the actual value of construction of the real estate which may include especial unique design features that were made specifically for the current owner and may not be considered valuable for a potential buyer in the open market,

while the latter represents the justifiable price that buyers will pay in an open stable market.

The Principle of Supply and Demand

The principle of supply and demand reflects the relationship between the amount of real estate available for sale in the market and the number of potential buyers seeking to own real estate. Balance in supply and demand establishes the efficient market conditions that the appraiser needs to develop realistic market value.

The Principle of Highest and Best Use

The highest and best use for real property is the use that produces the highest market value for the land for a certain period of time, provided that this use is economically feasible, probable and legally permissible.

Competent authorities regulate land use and specify certain zones in a city for specific uses and purposes. For example, within a city, a zone could be categorized as residential, while another is categorized as commercial, industrial, or for services. Moreover, a plot itself may be dedicated to a specific community activity, such as to construct a university, a trade centre, a hospital or a cinema. To accommodate more people, cities expand, and more services are needed. To validate this expansion of services for fast-growing communities, authorities may change the category of the land use, and this new category may increase the value of the land in comparison to the value generated from the previous allowable land use. This explains the necessity of the highest and best use analysis. All valuation standards insist that valuers conduct the highest and best use analysis when valuing land.

The Principle of Change

Change is the absolute truth in humanity, and real property is no exception: everything keeps changing, including real property, market conditions and trends, people's acquisition trends, and even the highest and best use of land. That means that a real property will change accordingly, and the reliable value opinion at a certain time will not remain reliable for three years.

"The impact of change on the value of real property manifests itself in the life cycle of a neighbourhood. The cycle is characterized by three stages of evolution: the development and growth evidenced by improving values; the levelling off stage evidenced by static values; and finally, the stage of infiltration of decay evidenced by declining values" (Section B, Appraisal theory and property valuation techniques, Haywood County, 2011).

Thus, a real estate's highest and best use in the current year is not necessarily the highest and best use after five years.

To develop an asset value opinion, the appraiser is compelled to reasonably limit to anticipate future benefits, as well as the current benefits, resulting from ownership, and to appraise the property considering the quality, quantity, and duration of these benefits.

The Principle of Substitution

An estimated value opinion of real estate is the market conclusion of the physical features and the bundle of rights of that real estate in terms of money. It is a market judgement upon the real estate. If there are two real estates of equal features and benefits, the lower priced property would receive

greater demand: in a stable and efficient market, rational buyers would never pay more money for a property that costs less than its price.

2.20 Valuation Practice

Generally, the terms ‘real estate’ and ‘real property’ are interchangeable: real estate is a term pertaining to real/fixed physical improvements to the land, such as structures and other appurtenant structures, whilst real property includes all benefits, interests and rights resulting from the ownership of the property.

The practice of valuation is centuries old. People need to know the value of their assets, so this is a daily practice that is inherent in our everyday activities, and is the main component in business and the economy. It is believed that methods and techniques for asset valuation are generally similar throughout the world.

The valuation process is characteristic of any other process, as it includes inputs that are analysed under standard and recognized procedures to conclude the targeted outcomes. Valuing a real property, like solving any problem, is an assignment of reasoning; it is based on fundamental economic and social principles, with cultural aspects, to justify and understand the outcomes of the valuation process and to explain the reaction of the real estate market.

The valuation process can be defined as a hypothetical process of an asset transaction – in monetary terms – that considers and quantifies all influencing factors to develop the market value of the subject asset.

In essence, the purposes and objectives of valuation are primarily the same all over the world. The most common purposes of asset valuation include estimating the asset assigned value for selling, buying, loan collateral, financial reports and company mergers.

Since valuations are made for several different purposes, it is essential for the intended user to clarify the specific purpose of the valuation and the type of value that the process seeks to develop.

Valuation service stakeholders are service providers that are the certified appraisers, and the service applicant is the asset owner, or sometimes the lender, in the case of a loan. The backbone of the service is the appraiser, who should be an expert who holds appropriate knowledge and experience and acts in compliance with the applicable standards and professional ethics. The asset owner and the lender sometimes attempt to direct the appraiser to a certain asset value, which impacts the appraiser's performance in one way or another and adds extra burden to the appraiser's work.

The service provider should prepare the valuation report in a clear and understandable way that helps the service applicant to make a safe practical decision with minimal risks.

2.21 Uncertainty - Applicable Standards

Valuation may be described as "an art, not a science", but this statement is connected to techniques applied to develop the value, not to the valuation process itself. The valuation process is a kind of research: its problem is to estimate the market value of an asset; its methodology is the valuation standard methods; and its finding is the value opinion.

In the case of material uncertainty, all value standards, without exception, ask the valuer to disclose the uncertainty in the input information and to draw attention to the risks in the outcomes: that is, the estimated value.

Valuation is surrounded by uncertainties; significant uncertainties exist in all phases of the valuation process. All of these uncertainties will accumulate in the final conclusion of the asset value and mislead the user of the valuation report.

While studying valuation uncertainty, one can highlight that the experts themselves cannot agree on a certain definition for 'uncertainty' and how to differentiate it from 'risk'. The following definitions and classifications were observed:

Uncertainty denotes what is measurable, called risk, as well as true uncertainty, which is unmeasurable (Knight, 1921).

Uncertainty is measured by the degree of belief. Risk is a state of the real world; uncertainty is a state of the mind (Pfeffer, 1956).

Risk and uncertainty are the same thing. They appear where there is more than one possible outcome. The greater the dispersion of possible outcomes, the greater the degree of uncertainty (Kucharska, 2013).

Risk is the objectivized uncertainty of the occurrence of an undesirable event, risk changes with uncertainty (Willet, 1951).

2.22 RICS Valuation – Global Standards 2017 (Red Book)

The uncertainty issues have been highlighted in part 4 of the Red Book of RICS Valuation 2017 in the section on valuation techniques and

performance standards - VPS 3. This part is dedicated to valuation reports, and this standard is classified as a mandatory standard. It states that:

"The report must:

clearly and accurately set out the conclusions of the valuation in a manner that is neither ambiguous nor misleading, and which does not create a false impression. If appropriate, the valuer should draw attention to, and comment on, any issues affecting the degree of certainty, or uncertainty, of the valuation under item (o) below".

Item (o) explains that the application of standard VPS 3 is mandatory in the case of 'material uncertainty', and defines 'material' as the situation where the degree of uncertainty in a valuation falls outside any parameters that might normally be expected and accepted.

Also, uncertainty issues have been highlighted in the advisory part 5 – Valuation Practice Guidance – Applications of the Red Book, specifically in guidance VPGA 10 (Matters that may give rise to material valuation uncertainty). In this guidance, Royal Institution of Chartered Surveyors (RICS) provides examples and additional commentary on matters that may give rise to material valuation uncertainty in accordance with VPS (RICS Valuation – Global Standards, 2017).

Mallinson Report - 1994

In response to RICS's request, Mallinson in 1994 studied the issues of uncertainty in valuation and prepared a report, in which he stated that there will always be a degree of uncertainty in any valuation.

2.23 IVS - International Valuation Standards 2017

The issues related to uncertainty in valuation were highlighted in the General Standards section (IVS 103 Reporting), which stated in para 10.2 that the valuation report must disclose any 'significant' uncertainty that directly affects the valuation (IVS - International Valuation Standards, 2017).

Discussion Paper - Valuation Uncertainty (IVSC, 2010)

In the 2010 IVSC, the International Valuation Standards Council released a discussion paper to decide whether to develop technical guidance on possible approaches to quantify valuation uncertainty or to maintain the current applicable standards, as they are fairly qualified to cover the issues of uncertainty. It was clearly concluded in that paper that an element of uncertainty is inherent in all market valuations, as there is no single price with which the valuation can be compared (Valuation Uncertainty - IVSC, 2010).

2.24 Uniform Standards of Professional Appraisal Practice, 2018-2019

In the Uniform Standards of Professional Appraisal Practice (USPSP, 2018-2019), uncertainties were mentioned in the context of sufficient care and diligence that valuers should consider throughout the entire process of the valuation.

2.25 Uncertainty Sources and Types

All aspects of the valuation process could be sources of uncertainty. This uncertainty could be classified as market uncertainty, input uncertainty or adopted model uncertainty.

According to the IVSC, there are five principal sources of valuation uncertainty:

Status of Valuer Uncertainty

This source takes place when the valuer does not have sufficient skills and experience to confidently judge the circumstances of the valuation process and the reliability of the input information.

Scope of Work Uncertainty

The uncertainty that is linked to virtually any valuation assignment will depend upon the context and the nature of the valuation task and the degree of the required investigation that should be undertaken. The more well-defined the valuation assignment, the more reliable the results that will be achieved, and the greater the depth of the investigation carried out, the greater the certainty of the valuation result.

Market Uncertainty

This arises when there is disorder in the market caused by unpredicted events such as financial and political crises, which can result in panic asset transactions or reluctance to sell or buy. In all cases of market instability, the

market data will be incomplete, and sometimes contradictory, and will negatively affect the outcomes of the valuation process.

Model Uncertainty

This source of uncertainty is linked to the characteristics of either the valuation model adopted or the method used. Depending on the asset type, different methods could be used to develop the value opinion. However, those methods may not conclude the same or similar value opinions: consequently, the selection of the most appropriate method of valuation becomes a source of uncertainty in itself.

Input Uncertainty

This arises from the degree of accuracy of the data inputs used in the valuation process. The reliability of data inputs depends upon the market efficiency and the rate of market fluctuation: the greater the fluctuation in the market, the more uncertain will be the data inputs.

Uncertainty pertaining to real estate valuation is particularly high due to both the characteristics of real estate itself (e.g., variation in structural and architectural design features, in construction materials and in the diversity of ownership rights) and the characteristics of the real estate market (e.g., economic indicators, market efficiency and stability, market dynamics, lack of uniformity, lack of reliable market information and governmental rules and regulations), as well as human social and cultural behaviours. The degree of uncertainty in real estate valuation depends on the level of market maturity in a specific country, including the land acquisition system, permissible land

use, land zone dedication, information system for registering sales and market transparency.

As discussed in previous chapters, there are three main approaches to valuation, namely the comparable sales, construction cost and capitalization methods. Each of these methods has its own techniques, but all of them have one common source of uncertainty, which is the input information required for each method.

For the comparable sales method, the sources of uncertainty include information about the comparables (i.e. the number of available reliable comparables, sale price accuracy, date of transaction, conditions of transaction, structural and architectural design features, neighbourhood and zoning, plot location and features, geographical features, environmental factors and compliance of the current use of the land with the highest and best use). Secondly, the market conditions prevailing during the time of the transaction (i.e. inflation, the supply-and-demand relationship, market efficiency and stability, foreign currency exchange rate, especially in developing countries, loan availability and personal income level) present further sources of uncertainty. Thirdly, cash flow forecasting assumptions, fluctuations of interest rate, and ambiguity about future market conditions also create uncertainty.

Uncertainty sources when applying the construction cost approach include information about real estate physical design features, the date of construction, the specification and prices of construction materials, physical depreciation, incorrect relations between highest and best use of the land and building type, fluctuating foreign exchange rates and other economic

indicators, and assumptions made to reconstruct a replica of the subject real estate.

When considering the capitalization method, uncertainty sources include all related economic parameters and indicators, inflation rate, market stability, supply and demand, approximate real estate rent value, the expected income from the chosen investment, future market conditions, inflation, foreign currency exchange rate, ambiguity about the future scenario and discounted cash flow assumptions.

Experts and professionals have not yet agreed on a specific definition for the term 'uncertainty', for which there are numerous distinct definitions; nor have they agreed on its limits or the nature of uncertainty beyond those limits. Some experts opt to use the terms 'material', 'significant' and 'abnormal' to define uncertainty beyond its hypothetical limits.

2.26 Challenges of Practicing of Valuation

The nature of the valuation process means that the whole process is surrounded by various types of uncertainties, and the hypothetical character of the valuation adds significant uncertainty to the concluded value opinion of the subject asset. The backbone of valuation of all types (fixed and intangible assets) is the theory of an efficient real estate market. This theory is based on certain assumptions, such as the rational man assumption, perfect information and profit maximization. Any ambiguity about one or all of these assumptions will result in uncertainty in the outcomes of the valuation.

As shown in the previous parts of this chapter, uncertainty is a characteristic of the valuation process. In the case of uncertain market

conditions, in order to maintain public trust in the profession and provide the service applicant with useful information to make an objective decision, valuation standards establish guidance on how to inform the intended user about the level of uncertainty and the circumstances of the valuation process. The problem with current guidance is that there is no clear classification for the uncertainty level: judgements on the degree of uncertainty are totally left to the valuer. Furthermore, standards do not determine specific methods to develop the value opinion: again, it is left to the valuer to select the valuation method that he believes to be the most appropriate.

There is uncertainty attached to each method of valuation, but all of these uncertainties are related to available market information, the methodologies adopted, and the selection of variables.

Generally, the valuation profession faces broader issues of uncertainty, which can be summarized in the limitations of standards to deal with uncertainties and the uncertainty pertaining to the valuation process itself.

Nowadays, Sudan is suffering from all symptoms of an inefficient market, such as fluctuating inflation rates, a volatile foreign currency exchange rate, and irregular supply and demand relations, which create extra burdens for valuation professionals in Sudan.

2.27 Dealing with Challenges

Valuation professionals seek to support the main objectives of the standards, namely to maintain the public trust on the profession, and thus develop new models to bridge limitations of the standards. In addition to the three main traditional methods, they have developed new models to minimize

valuation uncertainty to a reasonable degree, which are known as ‘advanced methods. In comparison with traditional methods, these advanced methods are fully automated mathematical models, based on statistical, probability and simulation models.

“Other models or methods try to analyse the market by directly mimicking the thought processes of the players in the market in an attempt to estimate the point of exchange. These models tend to be more quantitively in method and will be referred to as ‘advanced’” (Hatzichristos & French, 2004).

2.28 Advanced valuation methods

1. Artificial Neural Networks (ANNs)
2. Hedonic Pricing Method
3. Spatial Analysis Methods
4. Fuzzy Logic
5. Autoregressive Integrated Moving Average (Arima).

This chapter will study in detail only two of these methods, namely ANNs and the Hedonic Pricing Method.

2.29 Artificial Neural Networks

ANNs are one type of artificial intelligence system, comprising cognitive models of the brain. The architecture of an ANN consists of three layers: the input layer, the hidden layer, and the output layer.

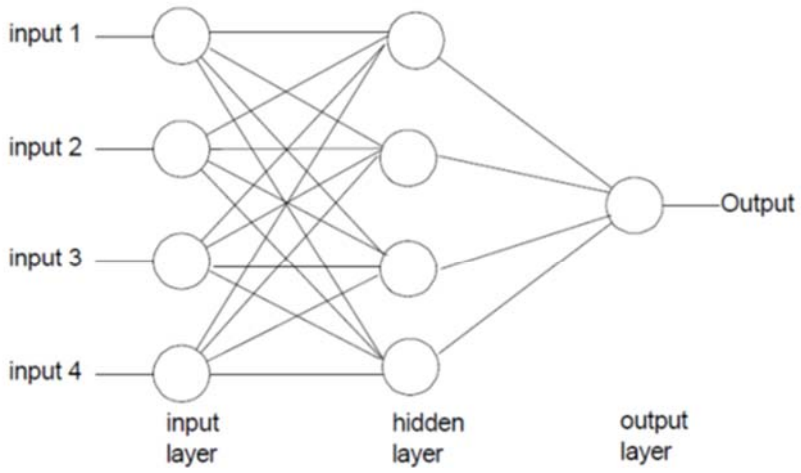

Figure 2-2: Artificial Neural Networks (Rossini, 1997)

ANNs, or, simply, neural networks, have their origin in biology, and more specifically, in the way the human brain operates (Haykin, 2008). The concept was developed by experts through the late 20th and early 21st centuries to provide more confident prediction and forecasting based on previous events and historical data of a specific phenomenon. It is widely applied in different fields, including aerospace, automotive, banking, electronics, entertainment, financial, manufacturing, medical, oil and gas, transportation, weather forecast and real estate valuation. ANN is an artificial intelligence mechanism that uses computers to analyse and simulate the subject phenomenon.

In the field of real estate, ANNs are used to analyse the market and mimic the mindset of market players. Computers are designed to model the way in which the human brain implements a particular task. The technique needs massive previous historical sales input data to process before it can come up with a credible valuation figure. The system considers the non-linear relations between all variables. Many researchers agree that use of ANNs

will produce more accurate estimates of the value of the real estate because of this use of non-linear relations between variables instead of the linear relations adopted by traditional valuation methods. Peterson (2008) stated that linear appraisal methods generate significant mispricing errors relative to a basic feed-forward nonlinear artificial neural network. Thus, the ANN method could play an essential role in developing the profession of valuation.

2.30 Hedonic Pricing Method

The hedonic pricing method is a single and multiple regression technique, the basic idea of which is to find out the relationship between a dependent variable and an independent variable/variable. It is a tool to measure the impact of an asset's attributes on its market value. It is used to estimate the prices of qualities or models that are not available on the market in particular periods.

Regression analysis and hedonic modelling are valuable tools that can be used by real estate professionals to determine the correlation between building characteristics and the transaction price, as well as to predict future transaction pricing.

Generally, the underlying goal when generating a hedonic pricing model is to create an accurate predictive model (Monson, 2009) Hedonic models can also be instrumental in answering the following questions:

- How should real estate be valued in the absence of a market information?
- How do intangible characteristics—such as proximity to a train station—affect price?

In economics, hedonic regression or hedonic pricing theory is a revealed preference method to estimate the value of an asset to the consumers. It breaks down the item being researched into its component characteristics, and concludes estimates of the contributory value of each characteristic. This requires that the asset being valued can be dismantled into its constituent parts.

Hedonic models are commonly used in real estate appraisal and real estate economics (Habibi, 2019), as houses have a variety of easily-measured traits (such as the number of rooms, overall size, or distance from certain amenities) which make them more amenable to hedonic regression models than most other goods (Li & Ching, 2008). Multiple regression analysis makes it possible to estimate coefficients and possible factor weightings using a large number of realized sales. It offers a very reliable tool to derive an accurate assessment value for any property (Branko, 2013).

Hedonic regression is also used in consumer price index (CPI) calculations, where it is used to control for the effects of changes in product quality. Price changes that are due to substitution effects are subject to hedonic quality adjustments.

The hedonic regression analysis is conducted in two steps. The first step estimates the relationship between the price of an asset (the dependent variable) and all of its various characteristics (independent variables). For example, the price of a house can be summarised using a hedonic price function as shown in equation 2.1:

$$P=f(LOC, TYPE, SIZE, VIEW, NEIGH)$$

Equation 2-1

Where the price of a house (P) is a function of its location relative to a local urban centre (LOC), the type of house (TYPE), the size of the plot (SIZE), the quality of its view (VIEW), and neighbourhood characteristics (NEIGH) such as school quality and crime.

The change in a house price resulting from the marginal change in one of these characteristics is called the hedonic price (sometimes referred to as the implicit price or rent differential). The hedonic price can therefore be interpreted as the additional cost of purchasing a house that is marginally 'better' in terms of a particular characteristic (Boardman et al., 2001).

Problems with Hedonic Models

There are a number of limitations in the use of the hedonic pricing method. These include:

1. **Information**

   The model requires that all individuals should have prior knowledge of the potential positive and negative independent variables. For example, they should have prior knowledge of the level of pollution of sewer bonds near the targeted real estate. However, in reality, this is not always the case.

2. **Measurement validity**

   The way in which the independent variables are scaled is of key importance. If proxy measures are used to measure the

building's quality, this could result in an inaccurate coefficient being generated in the regression analyses.

3. Market Limitations

The model requires huge amounts of market information with all related characteristics of the real estate, which represents the independent variables. This will be available in organized markets, but in some other markets, there may be limitations in information.

4. Multicollinearity

In some cases, the available information represents one category of real estate with one characteristic. For example, it may be the case that large houses are only found in green areas with low pollution, and small houses are only found in urban areas with high pollution. In this case, it would be impossible to separate out pollution and house size accurately.

5. Price changes

The model assumes that market prices respond immediately to changes in attributes. In reality, this is not always the situation, especially in areas where real estate sales and purchases are limited.

2.31 Conclusion

The valuation process is influenced by the uncertainties and adopted assumptions, valuation standards developed some general guidance to

minimize the effect of inherited uncertainties. In Sudan, in the current economic circumstances, there is great doubt about the market information needed to apply the comparable sales method. Most raw materials and construction materials are imported and valued at the USD exchange rate. Bearing this fact in mind, the researcher believes that the construction cost method will develop a credible market value opinion of the real estate under consideration. The rest of this research will examine scientifically this main assumption.

CHAPTER III

Assessment of Real Estate Valuation Practice in Sudan

3.1 Introduction

This chapter will study and assess in detail the current practice of real estate valuation in Sudan, covering the following areas:

- How the practice was developed.
- Governing regulations.
- Applied methodologies and approaches.
- Output reliability.
- Public trust and customer satisfaction.
- Compatibility of local practice standards with the applicable international standards.

3.2 Development of the Valuation Profession in Sudan

Sudan is an African developing country suffering from immature government institutions, lack of strategic plans, inefficient and floundering policies and an unorganized market. The development of the valuation profession is strongly connected to the maturity of financial institutions and the level of market activity.

3.3 Previous Experience

Regarding previous experience in valuation profession in Sudan, there was two bodies were involved in practicing assets valuation, Ministry of Public Works and Real Estate Commercial Bank.

Ministry of Public Works

The Ministry of Public works appeared in Sudan before the country's independence as a governmental department dedicated to engineering works all over Sudan. Those engineering duties included the design and construction of public buildings and facilities, issuance of related standards and regulations, granting approval and certificates for construction and conducting land surveys.

In 1990, the government restructured the Ministry of Public Works and renamed it the Ministry of Urban Planning and Public Utilities. At that time, in some limited cases, government sectors or private sectors requested the Ministry to perform some valuations of their assets. The Ministry accomplished those assignments, depending entirely on the assumed educational background of the assigned person (Elkhalifa & Shaddad, 2009).

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Real Estate Commercial Bank (formerly the Sudanese Real Estate Bank)

The Real Estate Commercial Bank was one of the first three specialized banks in Sudan, as it was established under the Real Estate Bank

Law No. 34 in 1966 to help people with low incomes to own and build their real estate through lending and credit.

Since the establishment of the Sudanese Real Estate Bank, the engineering department has carried out the tasks of real estate valuation for both the bank and state clients. During this long period, the engineering department has acquired more cumulative experience in real estate valuation than any other firm in Sudan (Tamim,2009).

3.4 Authorised Governmental Bodies and Laws

Historically, the government in Sudan established some institutions and adopted some laws to organize the assets valuation sector.

Central Bank of Sudan

When Sudan achieved independence in 1956, a commission of three experts from the United States Federal Reserve advised the Sudanese government to establish a central bank. The Sudanese government issued the act of the Central Bank of Sudan (CBOS) in 1959 and the bank began its operations in 1960.

In addition to the typical duties of central banks, the Central Bank of Sudan has the power to certify and license professional valuation firms in Sudan. The bank also issues regulations and orders to organize the loan process: all valuers' professional works are required to comply with these orders and regulations, and only certified valuers are permitted to perform valuation works. Moreover, the CBOS has the power to blacklist valuation firms that do not adhere to the issued regulations.

Organizing Council for Consultancy Firms

To develop the Sudanese consultancy services, the government issued the law of the Organizing Council for Consultancy Firms (OCCF) in 1999. The prime role of the council is to classify, certify, and issue licenses for consultancy firms. Firms' consultancy services can cover many specialities, including asset valuation services. Up to 2019, the council has registered and classified over one hundred firms specialized in asset valuation services.

The Property Mortgaged to Banks (Sale) Act, 1990

In response to the development of financial institutions and the availability of bank loans, the government passed the Property Mortgaged to Banks (Sale) Act. The purpose of this Act was to secure the payback of loans. The law organizes the sale of property mortgaged to banks in the case of payback delays, and guarantees banks' entitlement to sell the mortgaged property to retrieve the loan amount by way of public auction. The auction procedure shall be based on the basic price for the property. This price is virtually determined by a professional certified asset valuer.

3.5 Historical Conclusion

Given the development of financial and professional institutions in Sudan, it can be said that the profession of asset valuation has begun to find its way, but it is noted that there are no clear professional standards or ethical rules for practising this profession. In addition, it appears that all valuations of assets are based on an individual valuer approach.

3.6 Assessment of Valuation Practice in Sudan

In order to assess the professional practice of assets valuation in Sudan, the researchers examine local valuation reports in comparison to the IVS requirements, and the public trust through questionnaires.

Methodology of Assessment

The researcher will assess the valuation practice through inspection of a sufficient number of valuation reports to examine the compatibility of these reports with the IVS standards, and a questionnaire to investigate public trust and customer satisfaction.

Assessment of the Compatibility of Local Valuation Reports with IVS

The researcher designs a form to collect the desired information from local valuation reports to examine their compatibility with IVS.

Design of the Assessment Form

This inspection aims to examine the compatibility of local valuation reports with the international valuation standards. The research will consider the IVS 2017 edition as a reference to measure the compatibility of those reports with the minimum requirements of the standard valuation report as specified in IVS 2017.

General standard no. IVS 103 of the IVS 2017 sets out the minimum information that the valuation report must convey to its user. This information is essential for the proper understanding of the valuation.

The compatibility inspection form includes all items as specified in the general standards 103, which are as follows:

- Definition of the client;
- Definition of the valuer;
- Definition of the users of the report other than the client;
- Description of the asset;
- Definition of the currency of the valuation;
- Clear and accurate description of the scope of the assignment;
- The purpose and intended use of the valuation;
- Definition of the required value;
- Date of the inspection of the asset;
- Date of the valuation;
- Limitation of the report use;
- Disclosure of any assumptions and special assumptions;
- Disclosure of any uncertainties or limiting conditions that directly affect the valuation;
- The approach or approaches adopted and the method or methods applied;
- The key inputs used;
- The assumptions made;
- The conclusion(s) of the value and principal reasons for any conclusions reached;
- The date of the report (which may differ from the valuation date);
- Statement of compliance with standards;

- Statement of qualifications of the valuer;
- Signed expert certification;
- Results conciliation if more the one method is used;
- Statement of environmental and topographical hazard – if any;
- Statement of the scope of work changing – if that was requested by the client;

Also, the other sections of the IVS 2017 insist that the valuation report must reflect the following:

- Assurance of asset ownership;
- Definition of ownership type;
- Asset location;
- Description of asset zone;
- Whether the selected base of value is suitable for the asset type;
- Whether the inspection and investigation adopted are suitable for valuation purpose and base of value;
- Whether the collected data is sufficient to conclude a reliable value opinion;
- Whether the results of different valuation methods were conciliated according to the standards;
- Whether the report is clear and understandable;
- Highest and best use analysis.

Compatibility Assessment Form

The researcher used the form shown on Table 3-1 to assess the compatibility of local valuation reports with the standards ones. The form is in the Arabic language because all examined reports were in Arabic. The code number of the related standard under assessment is mentioned in a separate column.

Table 3-1Compatibility Assessment Form

Assesment of Compatibility of Local Valuation Practice with IVS 2017

1. IVS Framework					
#	Ref.	Assesment	Yes	No	Remarks
1	10	Does the report include a statement about the compatibility of the whole valuation process with adopted standards?			
2	30	Does the report include a statement about the qualifications of the valuer?			
3	40	Does the information been analysed objectively, and results concluded logically?			
4	50	In the case of outsourcing, has the valuer disclosed it?			
5	60	In the case of some IVS requirements departure to the benefit of local legislative and regulatory requirements, has the valuer disclosed it?			
6	60	In the case of departure, has the valuer disclosed the effect of the departure on the conclusions?			
2. IVS General Standards					
	(101) IVS - Scope of Work				
	20	Genral Reuierments			
7	20	Were the method of reporting and the type of results appropriate for the valuation purpose?			
8	20	Has the Valuer been identified in the valuation report?			
9	20	Has the client been identified in the report?			

Table 3-1 Cont.					
10	20	Were other users, other than the client – if any - identified in the report?			
11	20	Was the real estate subject of the valuation identified in the report?			
12	20	Was the valuation currency identified in the report?			
13	20	Was the purpose of the valuation stated in the report?			
14	20	Was the scope of work of the valuer stated in the report?			
15	20	Was the date of the real estate inspection stated in the report?			
16	20	Was the date of calculation of the market value stated in the report?			
17	20	Was the date of the report stated in the report?			
18	20	Was the adopted base of the value appropriate for valuation purpose?			
19	20	Was the source of the information identified in the report?			
20	20	Were the main assumptions of the valuation process illustrated in the report?			
21	20	Were the adopted valuation methods used in the assignment identified in the report?			
22	20	Were the requirements for the use of the valuation report indicated in the report?			
	30	Changes to Scope of Work			
23	30	In the case of the client requested to change scope of the work, was that stated in the report?			

Table 3-1 Cont.					
	IVS (102) Investigations and Compliance				
24	20	Were the main assumptions of the valuation process illustrated in the report?			
25	20	Was the collected information enough to conclude reliable results?			
	IVS (103) Reporting				
26	10	Does the report give a clear idea for the valuation process and its results?			
	IVS (104) Bases of Value				
27	30	Was the definition of the required value stated in the report?			
28	140	Was the analysis for the best and highest use conducted?			
	IVS (105) Valuation Methods				
29	10	Was the valuation method adopted appropriate for the asset under consideration?			
30	10	Was the valuation method adopted appropriate for the valuation?			
31	10	In the case of application of more than one method for the valuation, was the results reconciled?			
32	10	Was the results reconciliation carried out according to the standards?			
3. IVS (400) Real Estate Valuation Method					
33	20	Did the valuer confirm the property interest?			
34	20	Was the ownership type determined in the report?			

Table 3-1 Cont.					
35	21	Was the real estate loaction indcated in the report?			
36	21	Was the real estate location indicated in the report?			
37	21	Was the real estate inspected and described sufficiently to be perceived ?			
38	21	In the case, environmental hazards or topographical problems, was that stated clearly in the report?			
39		Was the report include a certification signed by the expert valuer?			

Implementation of the Assessment

To achieve the assessment goal, a total of 46 valuation reports were examined. Those reports were carried out over the last ten years by different assets valuation firms. The selection of the valuation firms was based on the following:

1. The firm should have at least ten years' work experience in valuation services.
2. The firm should be fully recognized by the CBOS.
3. The firm should be fully recognized by the OCCF.

Due to the sensitivity of the information in the examined reports, these reports were examined on the firms' premises.

Findings of the Assessment

The following part elaborates the findings of the examination compatibility of local reports virus IVS 2017

IVS Framework Items Compatibility

The following charts set out the results of the assessment of the compatibility of local valuation practice compared to the IVS 2017. They cover the IVS framework items that determine compliance with the statements of standards, valuer qualifications, objectivity of analysis and logicality of conclusions.

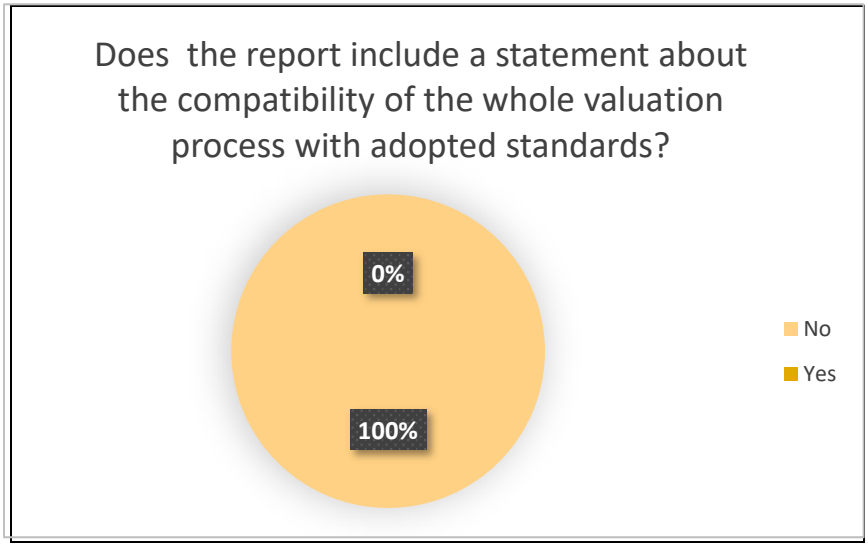


Figure 3-1: Inclusion of compatibility statement with adopted standards

Figure 3-1 Shows that in all examined reports, there was no statement indicating the level of compatibility of the valuation process with adopted standards.

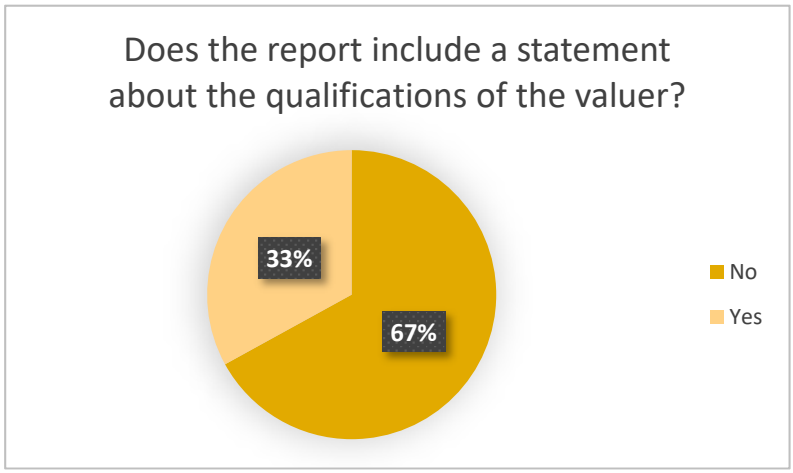


Figure 3-2: Inclusion of qualifications of the valuer

Figure 3-2 shows that only one-third of the examined valuation reports contained a statement about the qualification of the valuer who conducted the valuation.

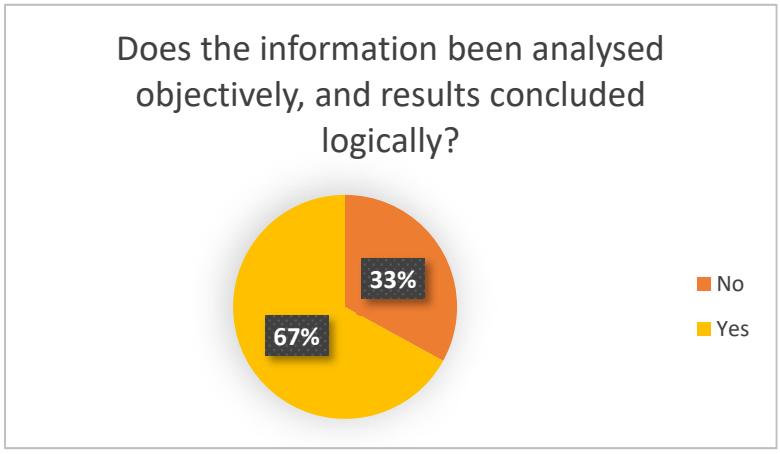


Figure 3-3: Objectivity of analysis and logicality of conclusion

As shown in Figure 3-3, almost two-thirds of the information has been analysed objectively and the same percentage of the results have been concluded logically.

IVS General Standards

The following charts illustrate the results of the assessment of the compatibility of local valuation practice compared with IVS 2017. They cover the general standards of the IVS, which report user identification, subject asset identification, currency identification, determination of the purpose of valuation, identification of the scope of work, related dates, adopted base of value, source of information, main assumptions, adopted valuation method and terms of use the report.

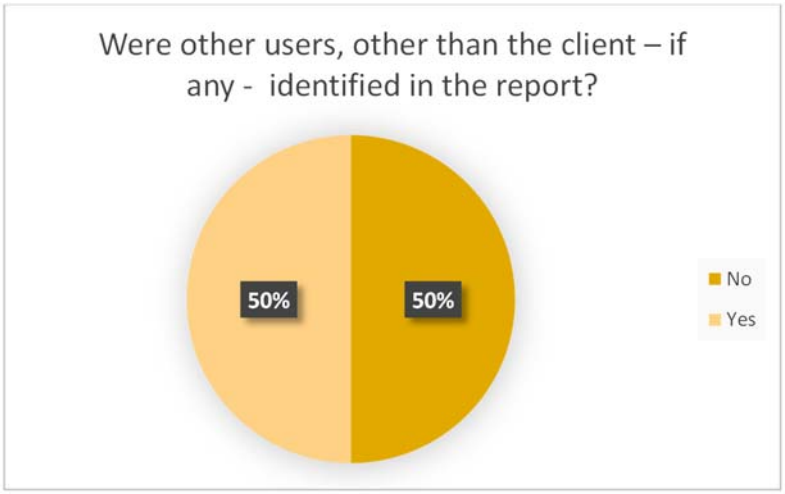


Figure 3-4: Identification of other users of the repot

As can be seen in Figure 3-4, exactly half of the reports identified the users of the report other than the applicant.

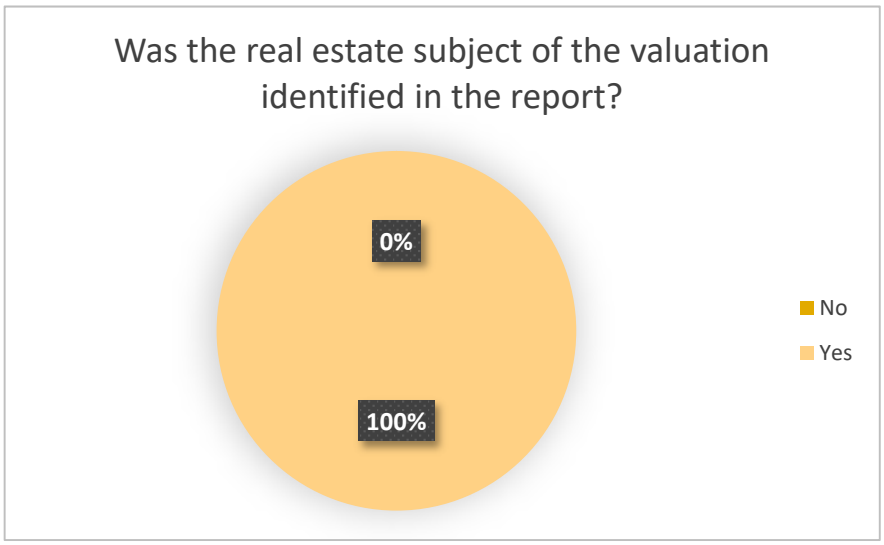


Figure 3-5: Subject real estate identification

As can be seen in Figure 3-5, all reports include identification of the real estate under valuation.

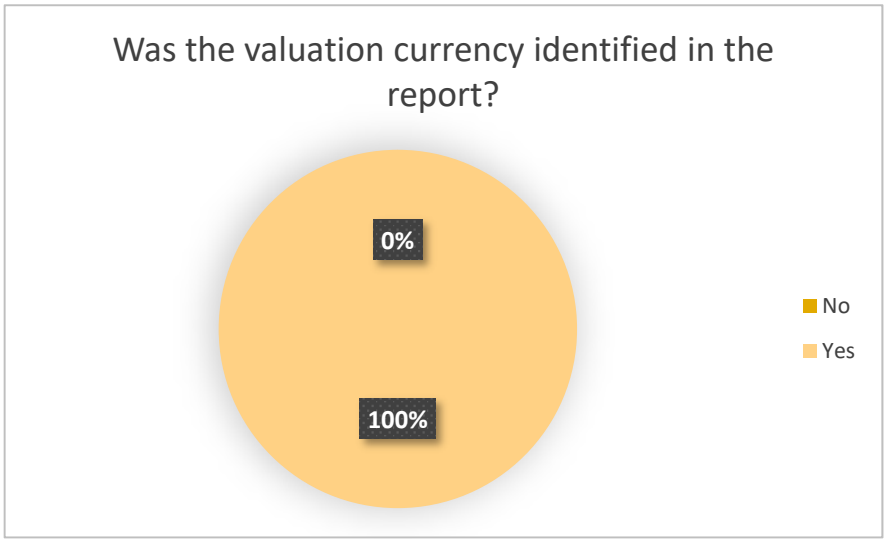


Figure 3-6: Identification of the valuation currency

Figure 3-6 indicates that all assessed valuation reports identified the valuation currency.

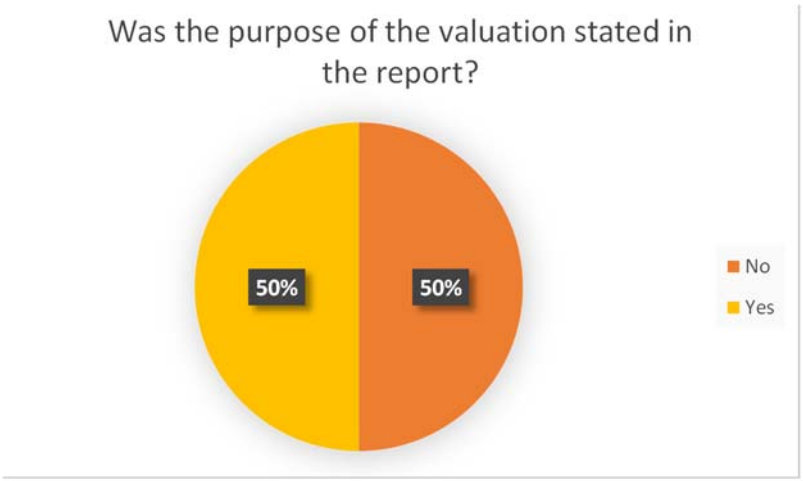


Figure 3-7: Identification of the purpose of valuation

Figure 3-7 reveals that the purpose of the valuation was not specified in half of the valuation reports.

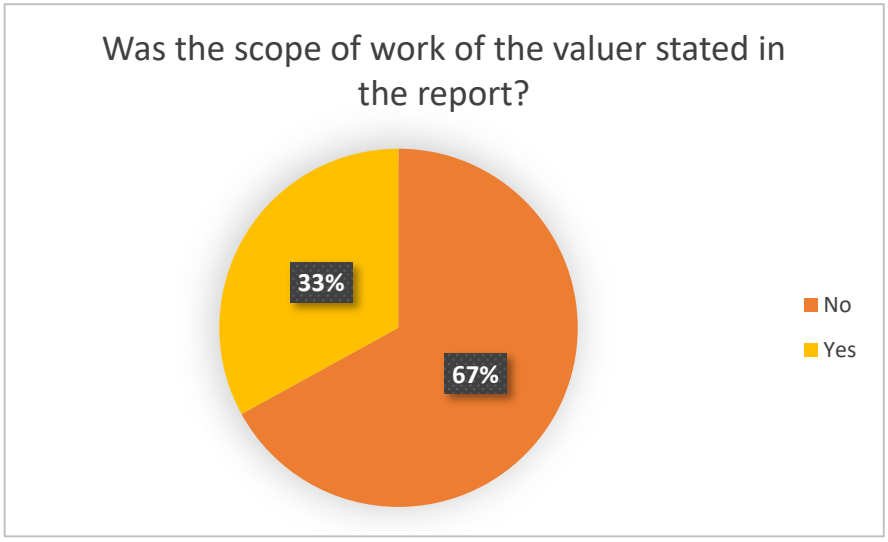


Figure 3-8: Stating scope of work of valuation in the report

Figure 3-8 shows that only one-third of valuation reports included a statement of the valuation scope of work in the reports.

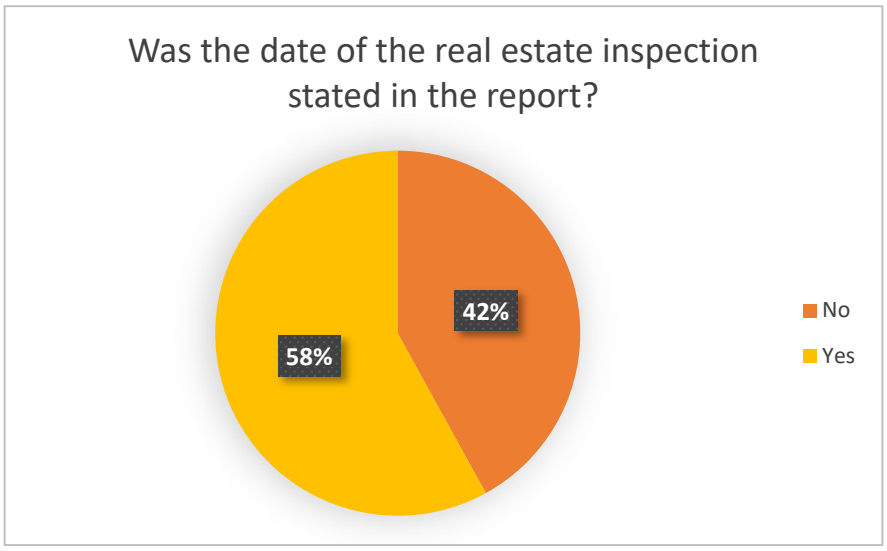


Figure 3-9: Stating inspection date in the report

Figure 3-9 illustrates that the valuers failed to mention the inspection date in the valuation report in more than 40% of the cases.

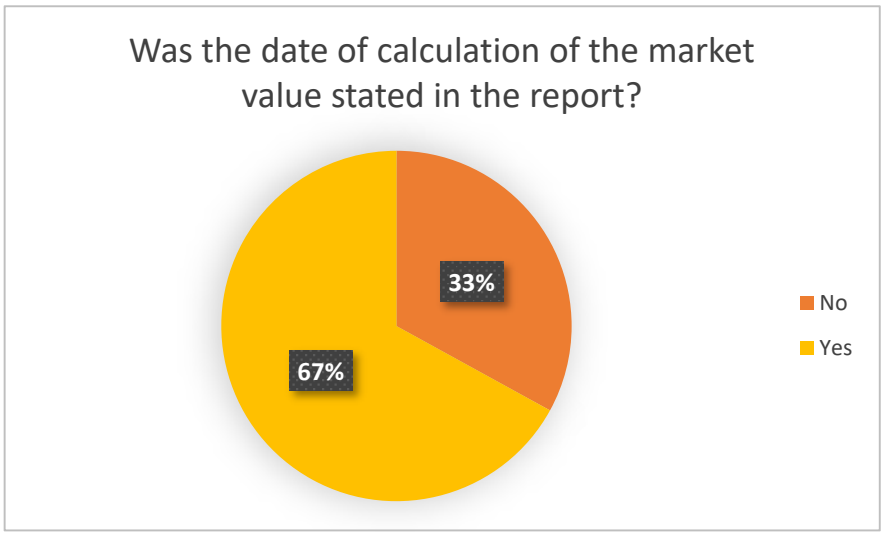


Figure 3-10: Mention of the calculation date

Figure 3-10 illustrates that the valuers failed to mention the calculation date in one-third of the valuation reports.

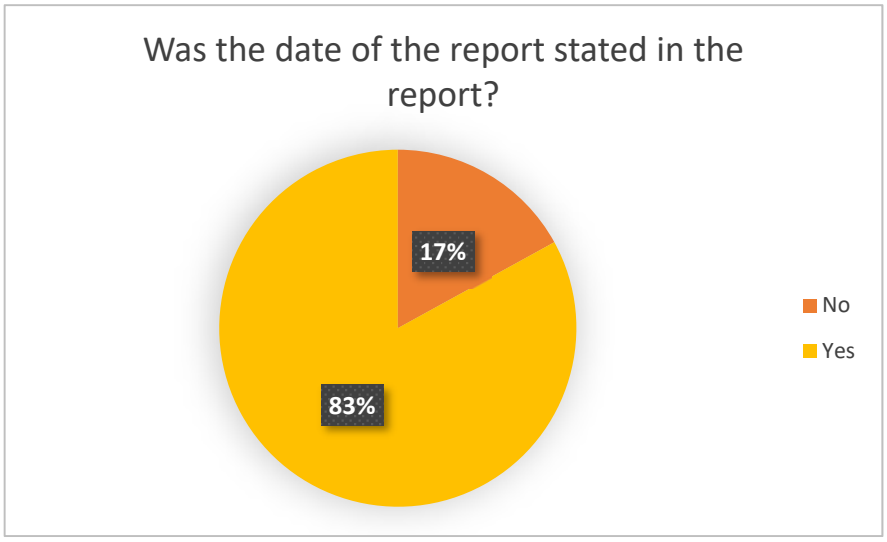


Figure 3-11: Mention of the issuance date of the report

Figure 4-11 shows that the issuance date of the report was mentioned in 83% of the valuation reports.

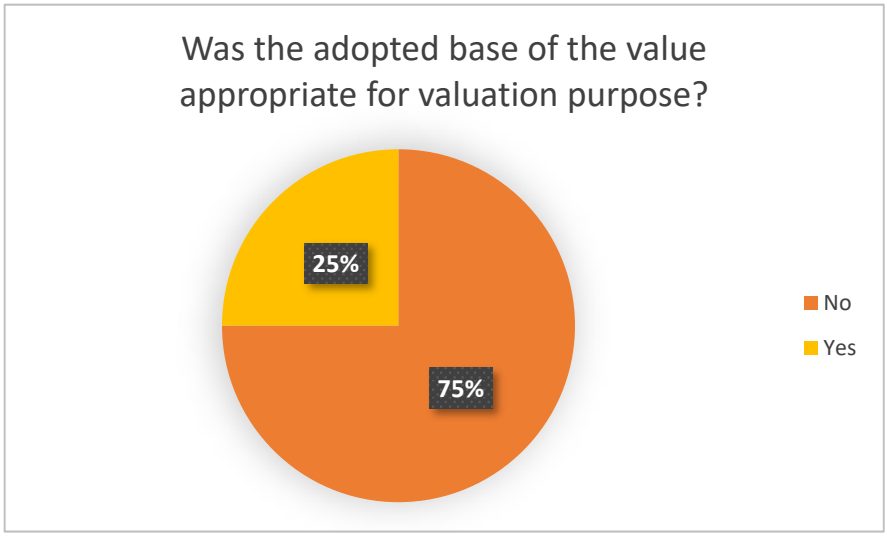


Figure 3-12: Appropriateness of base of the value

Figure 3-12 indicates that only a quarter of the adopted bases of values were appropriate to the valuation purpose.

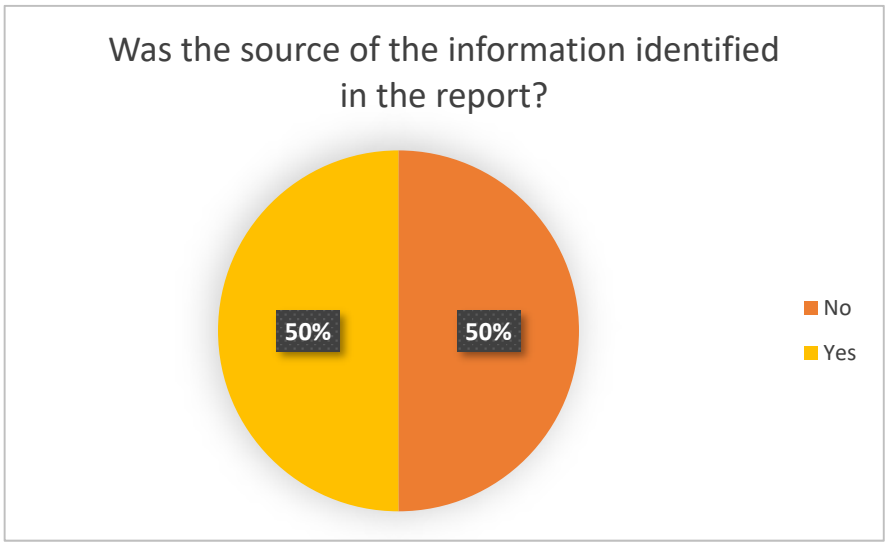


Figure 3-13: Identification of the source of information

As shown in Figure 3-13, the source of information was not identified in 50% of the valuation reports.

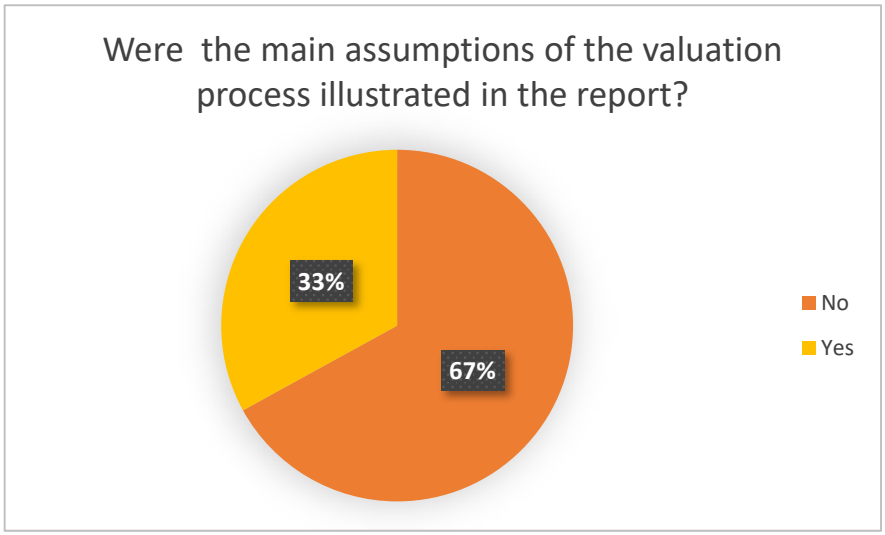


Figure 3-14: Illustration of Main Assumptions

As can be seen in Figure 3-14, in two-thirds of the reports, the main assumptions adopted while performing valuation assignments were not illustrated in the reports.

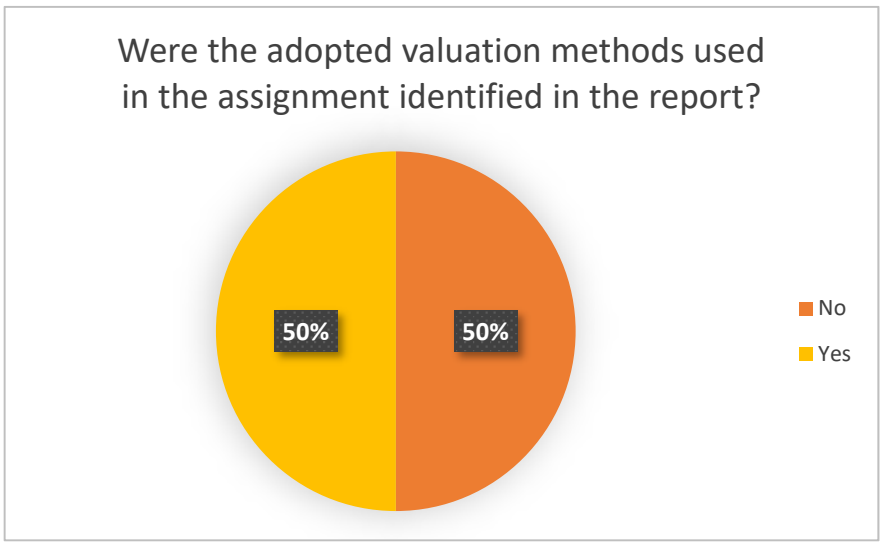


Figure 3-15: Identification of Adopted Valuation Method

Figure 3-15 shows that only half of the valuation experts had identified adopted valuation method in the reports.

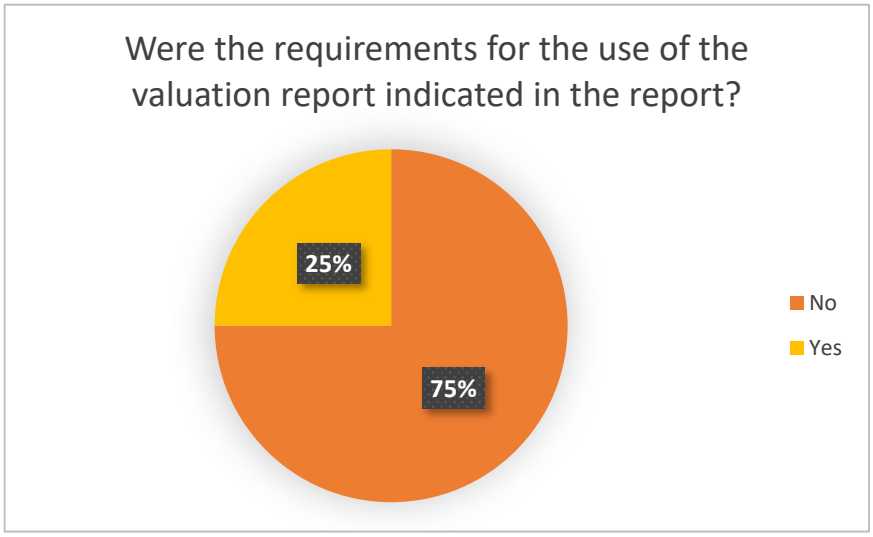


Figure 3-16: Indication of Requirements for the Use of the Report

Figure 3-16 shows that in the three-quarters of the valuation reports the requirements of using the report were indicated.

Investigations and Compliance (IVS -102)

The following charts illustrate the results of the assessment of the compatibility of local valuation practice compared to IVS 2017, covering investigations and compliance.

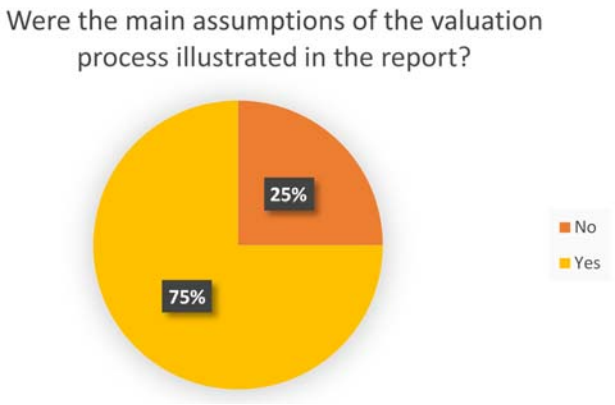


Figure 3-17: Illustration of Main Assumptions

Figure 3-17 indicates that three-quarters of the valuation reports included a statement of the main assumptions.

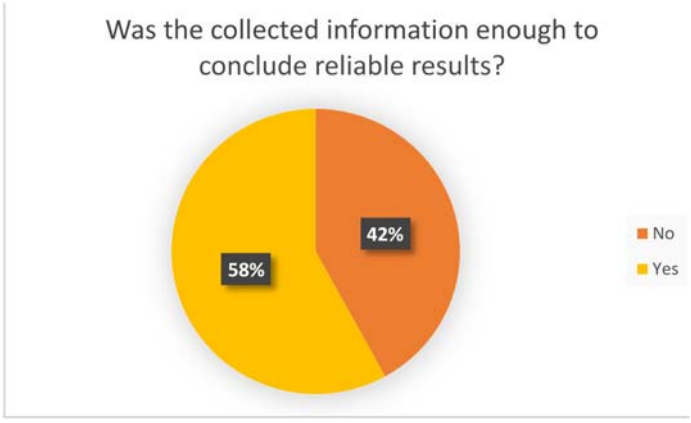


Figure 3-18: Sufficiency of Collected information

As shown in Figure 3-18, in more than 40% of cases, the collected information was not sufficient to produce reliable results.

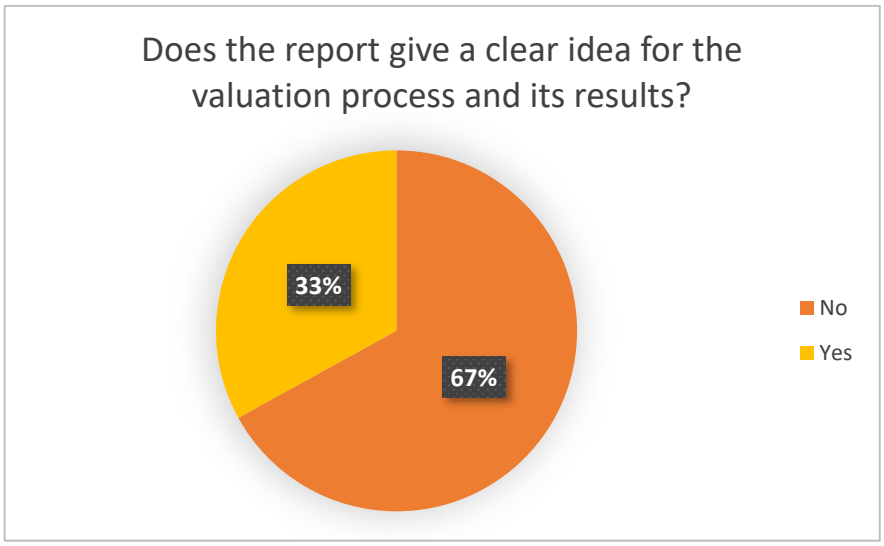


Figure 3-19: Clarity of Valuation Process and Results

As can be seen in Figure 3-19, in two-thirds of the valuation assignments, the valuation reports did not give a clear idea about the valuation process and its results.

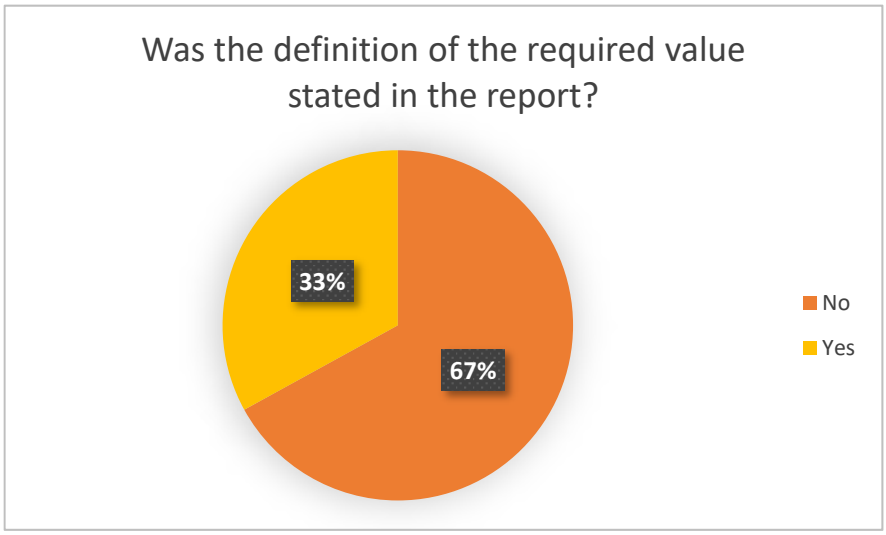


Figure 3-20: Inclusion of Definition of the Required Value

Figure 4-20 shows that only one-third of the examined reports include a definition of the required value.

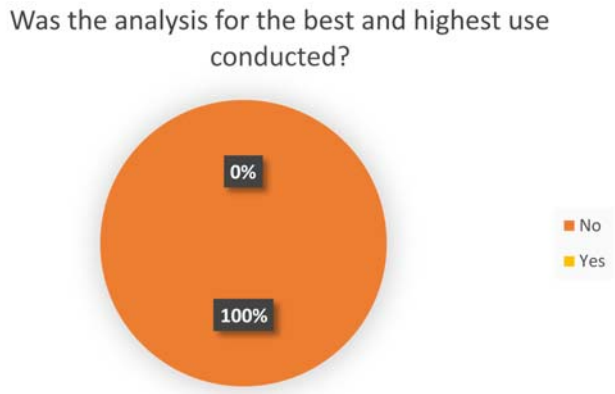


Figure 3-21: Conduction of Highest and Best Use Analysis

Figure 3-21 presents that the experts did not conduct a highest and best use analysis in any of the valuation reports.

IVS (105) Valuation Methods

The following chart illustrates the results of the assessment of the compatibility of local valuation practice compared to IVS 2017. It covers valuation methods.

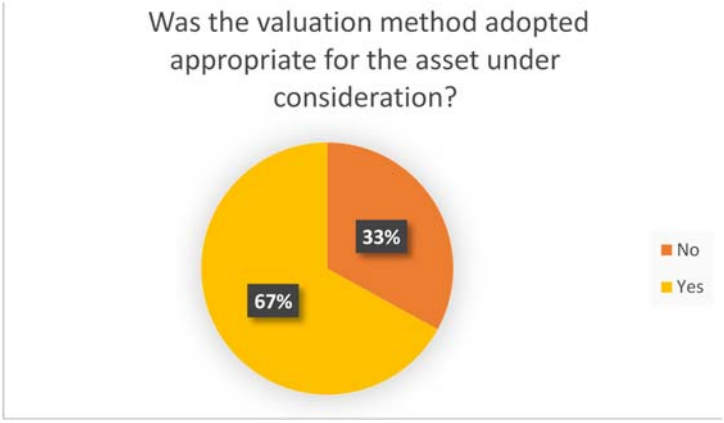


Figure 3-22: Appropriateness of Valuation Method

Figure 3-22 indicates that in 67% of the cases, the adopted valuation method was appropriate to the type of subject asset.

IVS (400) Real Estate Valuation Method

The following charts illustrate the results of the assessment of the compatibility of local valuation practice compared to IVS 2017. They cover the Real Estate Valuation Method.

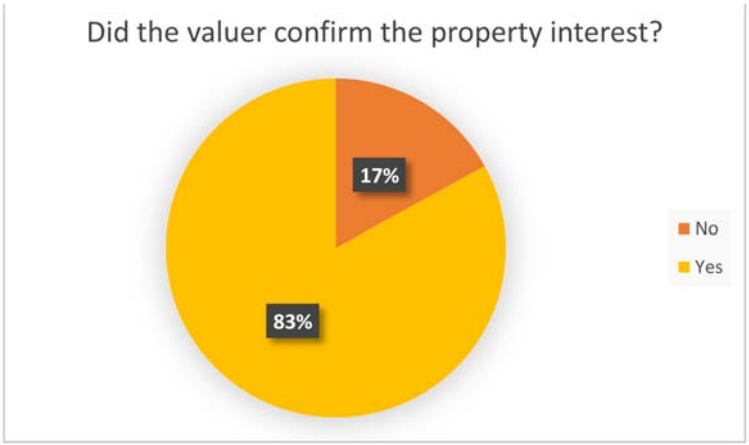


Figure 3-23: Property Interest Confirmation

As shown in Figure 3-23, in 83% of the cases, the valuer confirmed the property interest.

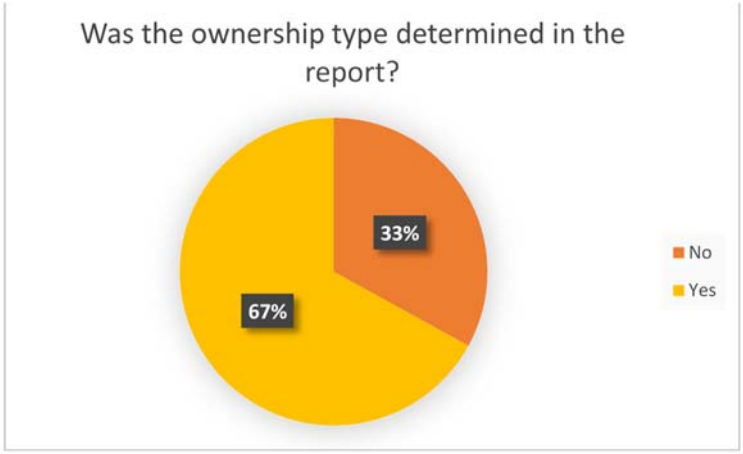


Figure 3-24: Determination of Asset Ownership Type

As can be seen in Figure 3-24, in two-thirds of the cases, the valuer determined ownership type in the report.

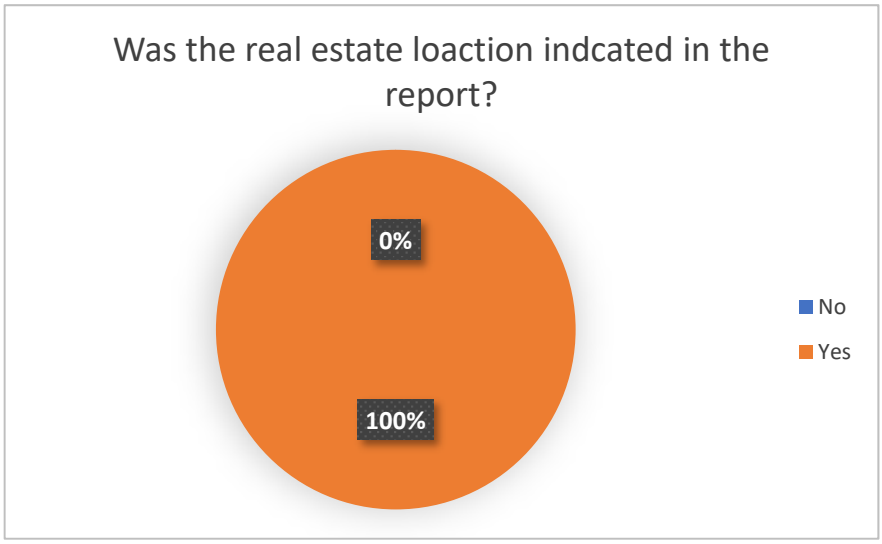


Figure 3-25: Indication of Real Estate Location

Figure 3-25 shows that in all valuation reports, the location of the real estate was indicated.

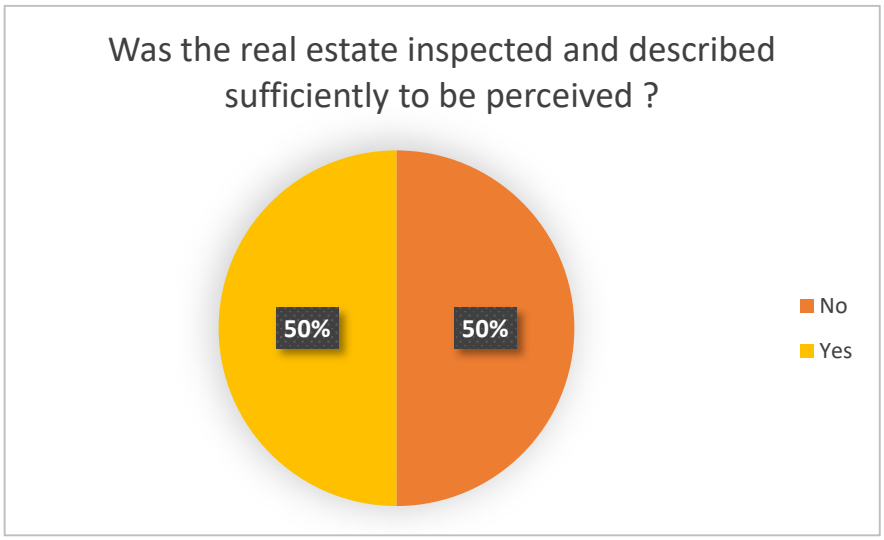


Figure 3-26: Perception of Real Estate by the end-user

Figure 3-26 presents that end-users of the valuation reports would have been able to perceive the characteristics of the real estate in only 50% of the cases.

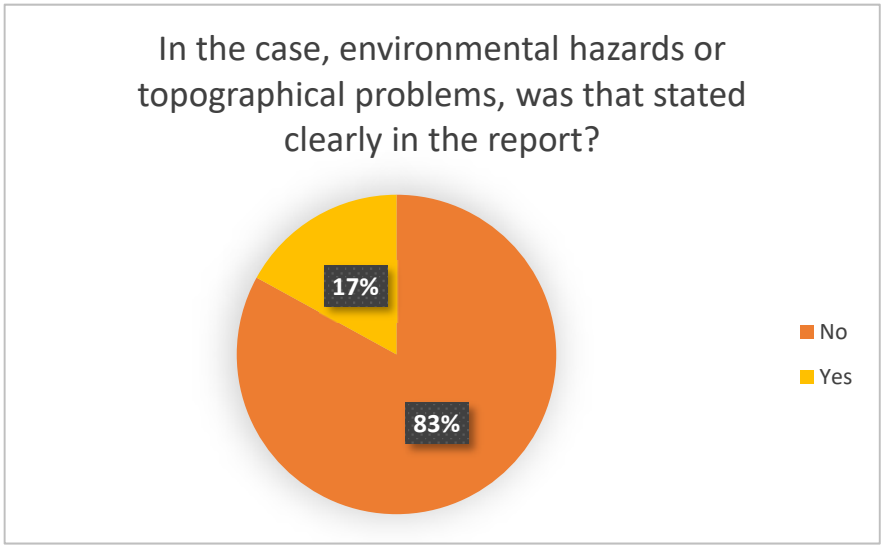


Figure 3-27: Stating Environmental Hazards & Topographical Problems

Figure 3-27 indicates that the valuation experts pointed out environmental hazards and topographical problems in only 17% of the cases examined.

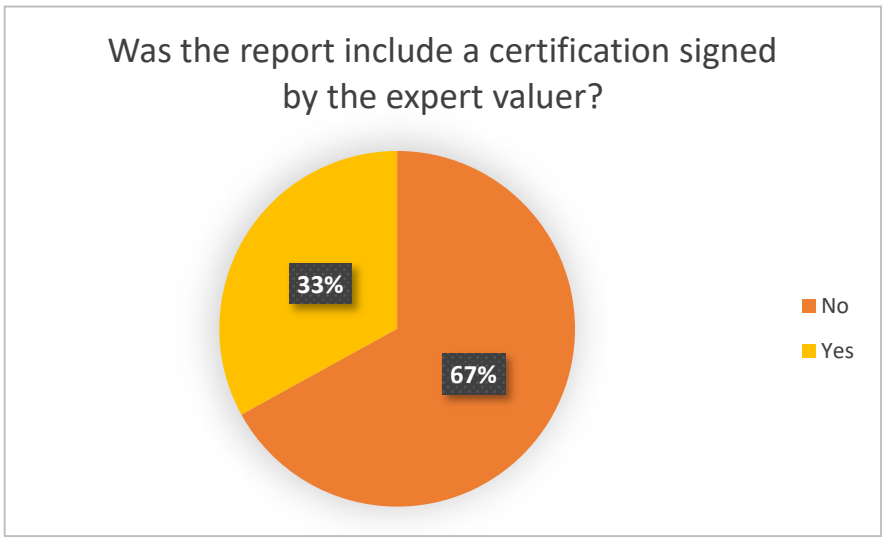


Figure 3-28: Report Certification

As shown in Figure 3-28, only one-third of the valuation reports contained certificates signed by the valuation expert.

3.7 Assessment of Public Trust - Questionnaire 1

This questionnaire is a crucial part of the research. It aims to measure the public trust in asset valuation in Sudan, and seeks to outline insufficiency – if any – in valuation practice in Sudan in order to identify ways to improve it.

The community sample for the survey comprised the end-users of the valuation reports, forty-six respondents participated in the survey. The survey sample covered the two main categories of applicants for valuation services, namely individuals and business firms.

Questionnaire Results

The following charts represent the results of the questionnaire conducted to evaluate public trust in the professin of assets valuation in Sudan.

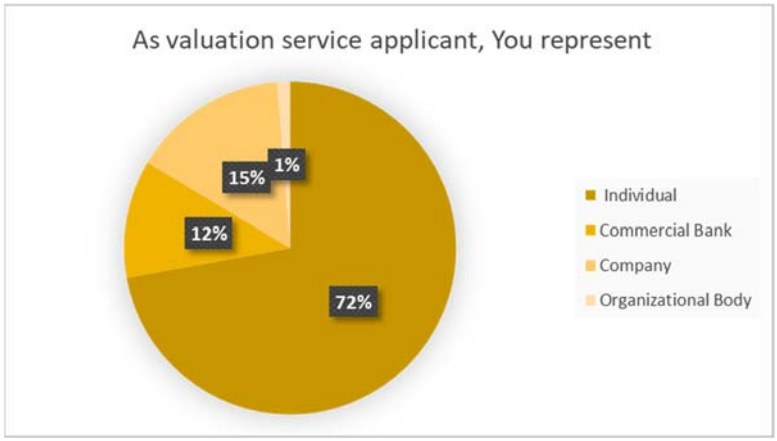


Figure 3-29 Questionnaire Participants

Figure 3-29 indicates that three-quarters of the participants were individuals.

Figure 3-30 Trust in Standardization of Valuation process

Figure 3-30 shows that most of the respondents believed that asset valuation is an organized scientific process

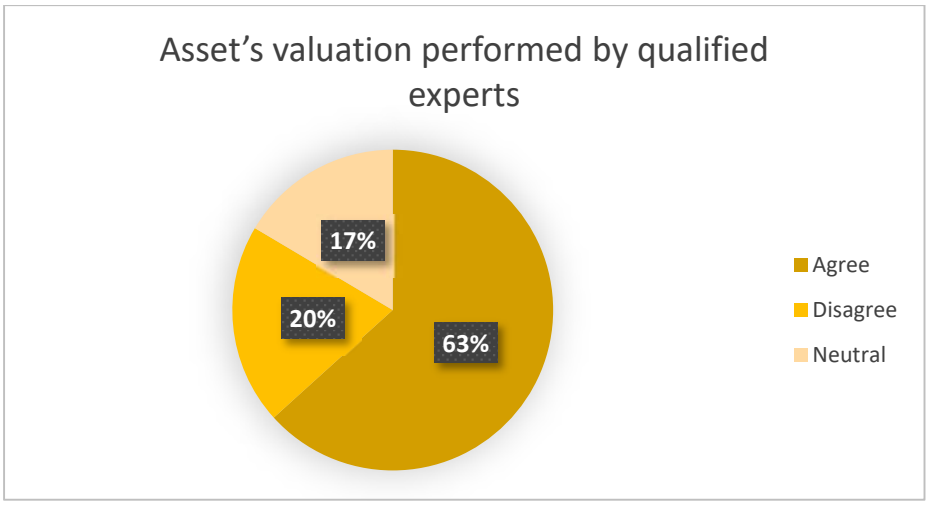


Figure 3-31 Qualification of Valuation Experts

As shown in Figure 3 -31, two-third of the respondents believed that the valuation experts were qualified.

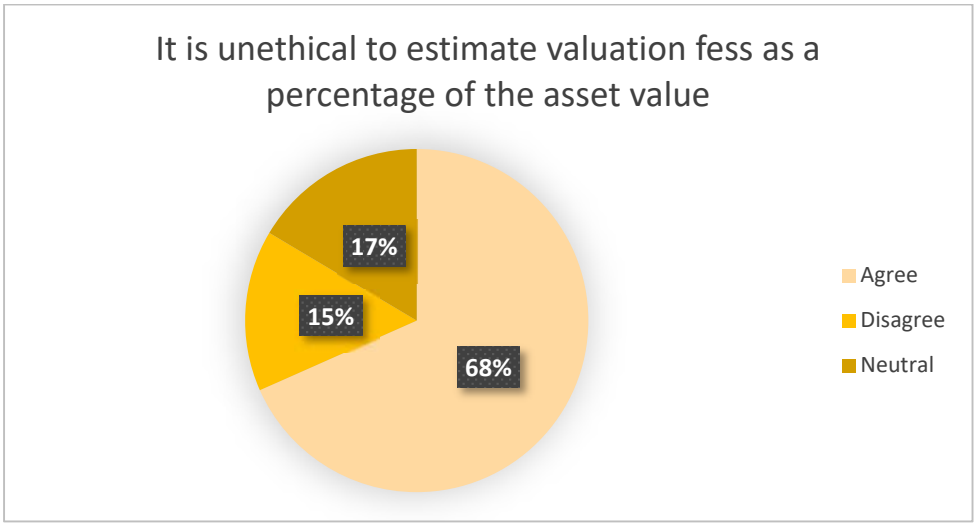


Figure 3-32 Service Professional Fees

Figure 3-32 indicates that two-third of the participants believe that professional fees should not be connected to the asset value.

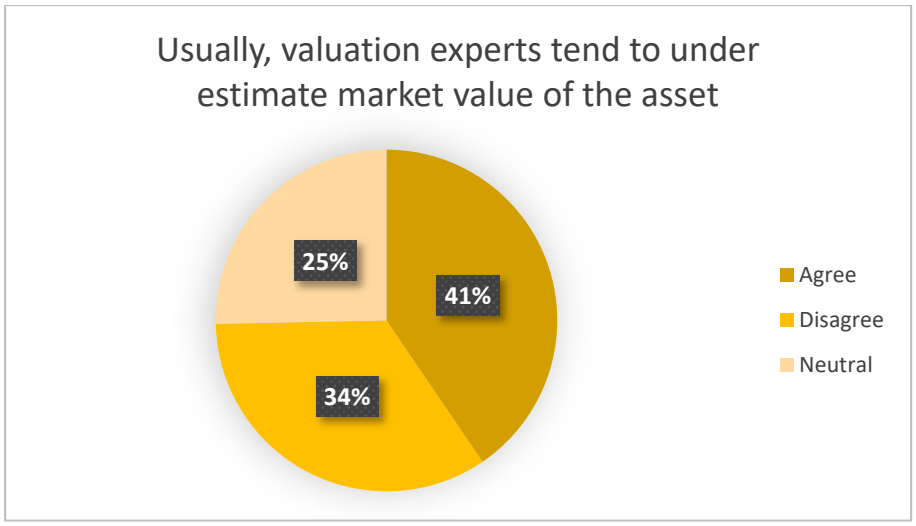


Figure 3-33 Valuers underestimate asset value

As can be seen from Figure 3- 33, about 40% of the respondents believed that valuers tend to underestimate their assets' values.

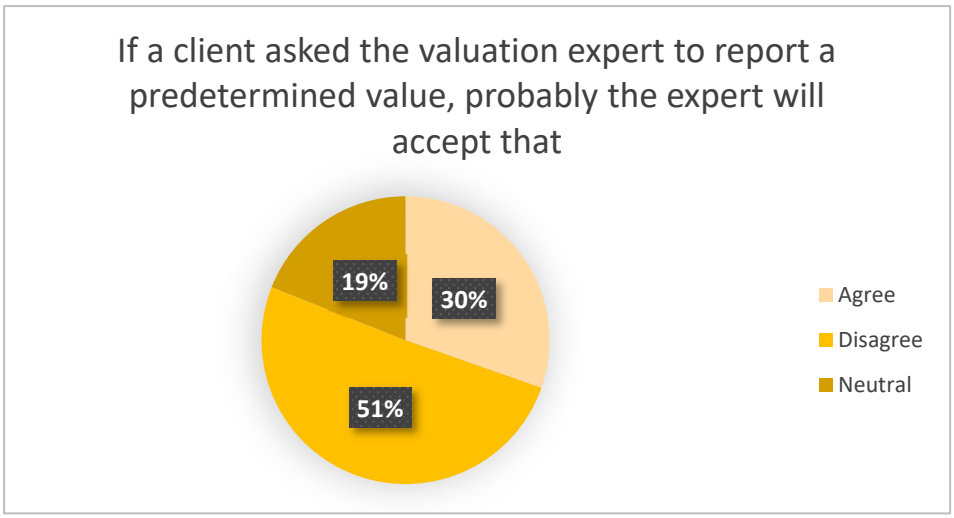


Figure 3-34 Predetermined value reporting

As shown in Figure 3-34, one-third of the respondents expected that the expert would be willing to report a predetermined value for the asset.

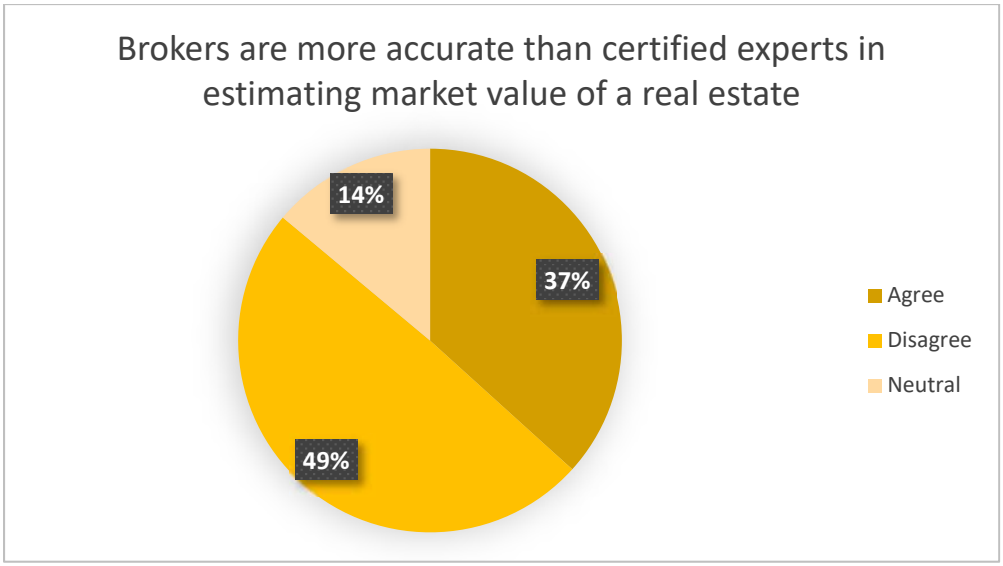


Figure 3-35 Brokers vs. certified expects

As can be seen from Figure 3 -35, more than one-third of the respondents believed that brokers are more reliable than certified experts.

3.8 Summary of the Findings

In Sudan, assets valuation practice suffers from market instability, lack of professional standards and lack of regulatory institutions. The next chapter will discuss applicability of construction cost model to estimate the market value of a real estate in unstable markets.

CHAPTER IV

Developing of a Model for Estimating Real Estate Market Value

4.1 Introduction

This chapter will focus on all aspects of the construction cost model to expedite the estimation of real estate value in Sudan. Mathematical models are useful in repetitive operations that involve multiple factors, extra parameters, regular updating of variables' values, and significant uncertainty about the inputs of the operation. These conditions are characteristic of the valuation process.

This chapter will discuss the following in detail:

1. The need for mathematical modelling in Sudan.
2. Why the construction cost model?
3. Model purpose and limitations.
4. Model variables.
5. Model structure.

6. How does the model work?
7. Using the model.
8. Model testing.
9. Findings and conclusions.

4.2 Need for Mathematical Modelling in Sudan

Uncertainty is a real and universal phenomenon in real estate valuation, and Sudan is no exception. Moreover, in Sudan, there is extra uncertainty originating from market instability, high inflation and severe fluctuations of the foreign currency exchange rate. All of these economic factors have negative effects on the efficiency of the input data required for reliable valuation outputs. The degree of reliability will vary according to the level of confidence in the market information. Therefore, there is a need to use methods and models that consider uncertainty.

The abnormal uncertainty in Sudan suggests that mathematical modelling should be used to minimize the effect of uncertainty in conclusions regarding value.

4.3 Advantages of the Construction Cost Approach

As discussed in previous chapters the three main valuation methods are:

1. Sales Comparisons
2. Construction Cost
3. Capitalization Method

The model developed in this research is based on the construction cost approach, both the Sales Comparisons and the Capitalization method depend on the availability and accuracy of market information. Market information in cases of unstable and inefficient markets is questionable, whereas the construction cost approach is based on the current cost of construction materials and workmanship, which is real-time information already affected by market conditions, and this makes this information more reliable and trustworthy.

The following table (Table 4-1) is derived from a study conducted in Poland to compare the applicability of the comparison method and the construction method in absence of reliable market data. The table shows the efficiency of the construction cost method in the absence of reliable market data (Zorbek, 2011).

Table 4-1: Cost Method Applicability

CRITERION OF COMPARISON	MARKET VALUE	COST VALUE
Object of Valuation	Real estate as a project (site or site and developments together) with its legal attributes	Real estate as objects (site and improvements separately or improvements only)
Possibility of valuation	When the market exists and this kind of value is needed	When there is either a very limited market or no evidence of sales or this kind of value is needed
Type of market and the main source of information used in valuation	Sales and lease property market (exchange sphere)	Sales property market for land (exchange sphere) and building construction market for improvements
Principle of valuation	Highest and best use of the property	Existing use of the improvements, highest and best use of the land
Methods of valuation	Comparison, income, cost approaches-IVS, EVS; comparison, income, mixed approaches: Land Management Act (Poland)	Cost approach (Depreciated Replacement cost)

4.4 Model Purpose and Limitations

The purpose of the model developed in this study is to provide a rapid, reliable real estate market value in cases of material input uncertainty. The model uses the construction cost approach as the valuation method.

The model will consider a (1+4) multi-storey reinforced concrete residential building. The researcher chose this type of building because it is widespread in the city of Khartoum.

This model is designed to provide market value for a real estate with the following specifications:

- Residential buildings
- Reinforced concrete buildings
- Buildings of up to 5 storeys.
- Located in Khartoum City.

4.5 Model Variables

The model variables are classified into two categories: variables connected to the real estate and variables related to the market.

Variables Connected to the Real Estate:

They are the characteristic features of the building and facilities of the subject real estate. The numerical value of these variables determines the market value of the real estate. Real estate variables include:

1. Built area of each floor;
2. Plot size (Length * Width);
3. Number of toilets and kitchens;
4. Number gates and doors;
5. Building age in years;
6. Number of elevators;

7. Number and type of air conditioning units;
8. Tile type for the staircases;
9. External works information (if any);
10. Buildings' current condition in percentage (%);
11. Expected construction materials waste in percentage (%).

Variables Connected to the Market:

1. Price of the construction materials and workmanship cost at the time of market value estimation.
2. The USD exchange rate at the time of market value estimation.
3. Expected profit in percentage (%).

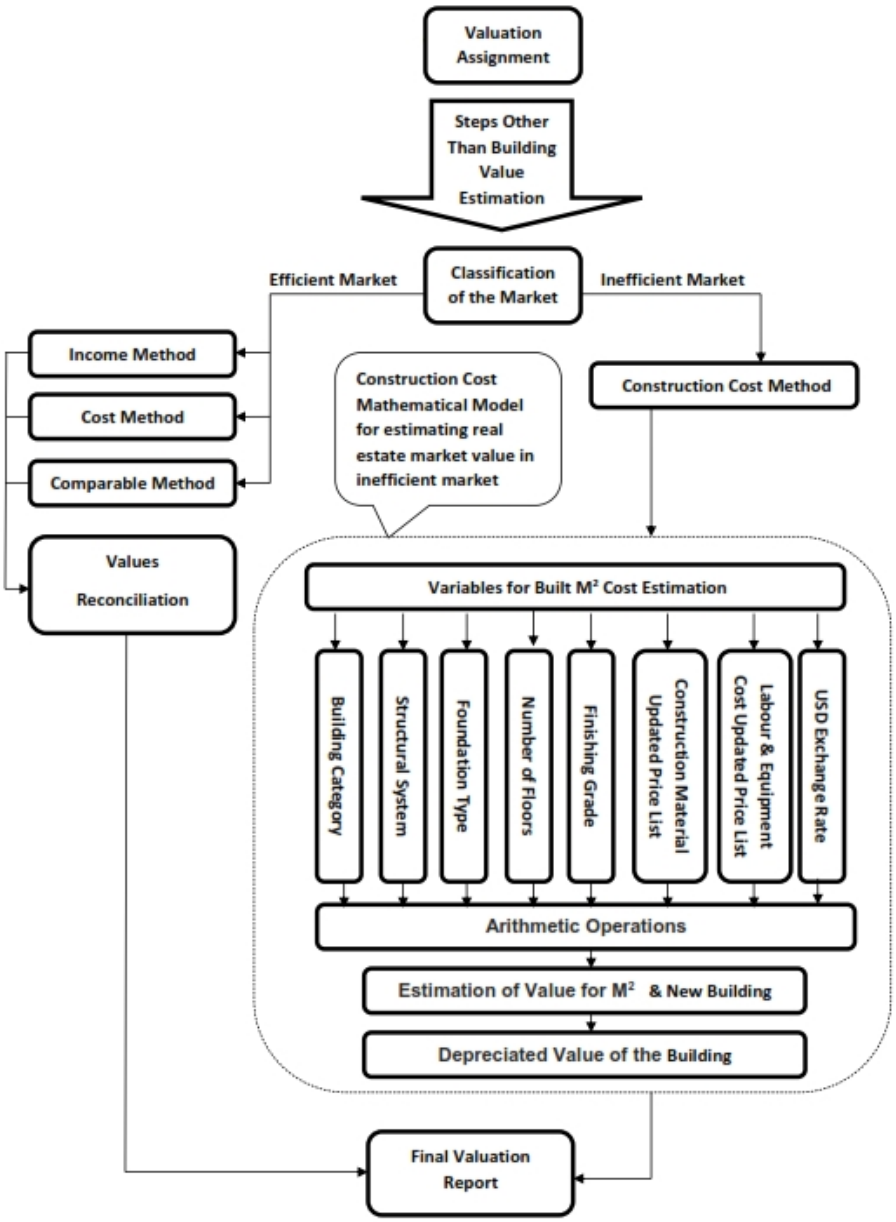
4.6 Model Philosophy

Generally, buildings can be categorized based on their functions (i.e., residential, public, commercial), structural systems (i.e., flat slab, slab with beams) and the grade of finishing materials. Considering the quantity of construction materials, workmanship, tools and equipment needed to construct a building, buildings in the same category will fall into the same range of quantities of materials required for each square metre of the built area. The rate factor of each construction item per square metre of the built area can be estimated for all construction units of the building. These estimated factors will be the backbone of the mathematical model. Updated market data will be used in the model to develop the market value at the time of valuation.

In Sudan, most of the construction materials or their raw materials are imported, meaning that the cost of construction materials is directly connected in a dynamic way to foreign currency. A construction cost model considering the effect of local currency exchange rate on construction materials as a driven variable and also considering other variables of the unstable market will increase the credibility of the estimated market value of the real estate.

The following figure explains the philosophy of the proposed construction cost model and its role within the whole process of valuation in the case of an inefficient market.

Figure 4-1: Model Flow Chart



4.7 Model Structure

The model is a spreadsheet model using MS Excel 2016. It is composed of three main sections, each of which has a different function. These sections are as follows:

Section 1: **Input Section**. This section facilitates the entry of all information about the real estate, materials' prices, workmanship costs and USD exchange rate values.

Section 2: **Processing Section**. This section is responsible for all necessary calculations using predetermined factors and variables.

Section 3: Output Section. This section displays the output, estimated quantities and values in an organized manner.

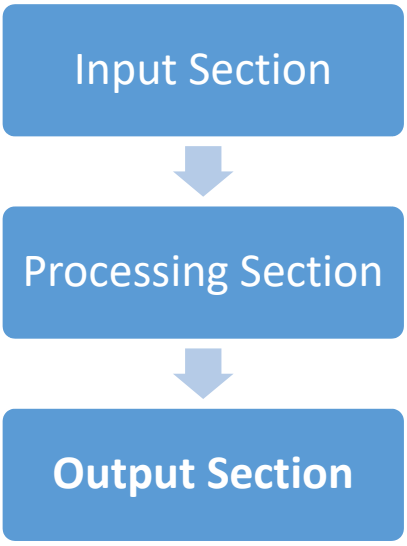


Figure 4-2: Model Structure

Section 1: Input Section

This section consists of the following sheets:

1. Real estate data, USD exchange rate information and summary of the estimated market value of the subject real estate.
2. Factors for construction items and built area.
3. Quantity for each construction item for a square metre of the built area.
4. Updated price list for construction materials and workmanship

4.7.1.1 Real Estate Data, USD Exchange Rate Information & Final Results

The valuer uses this section to insert all information about the plot, the building and the USD exchange rate information. This information includes:

1. Date of data entry;
2. Plot size, length and width;
3. Number of floors;
4. Number of elevators;
5. Number of external gates;
6. Built area for each floor;
7. Number of kitchens for each floor;
8. Number of toilets for each floor;

9. Number of doors for each floor;
10. The USD exchange rate at the time of valuation.

This section also points out the estimated market value, which is given immediately after entry of the input information, Table 4-1 shows the entry data sheet

Table 4-2 Real Estate Data, Exchange Rate & Results

Date	Plot #	Block #	City	Client	Owner

Plot Size	Length	Width	Area	Premeter M			Ex. Rate
	M	M	M^2	Regular Shape	Irregular Shape	Final	$ to SDG
	0	0	0	0	0	0	1

Building Data

Floor	M^2	T & K	Doors	Item	QTY
Ground Floor	0	0	0	Floors	0
First Floor	0	0	0	Elevators	0
Second Floor	0	0	0	Main gates	0
Third Floor	0	0	0	Building Age/ Years	Condition %
Fourth Floor	0	0	0	Staircase Tiles	No Steps Tiles
Annex	0	0	0	Air Conditioning Type & QTY	
General Works	0	0	0	Spilt / Window	0
Others	0	0	0	Water Cooling	0
Total	0				

Foundation Factor	11
No. of Foundations	0
No. of Foundations Say	0

% Profit	% Materials Waste
0%	0%
Buildings Cond. %	0%

Real Estate Estimated Market Value

Item	SDG	USD
Buildings	0	0
Land	0	0
Real Estate	0	0

4.7.1.2 Factors for Quantities for Square Meter – Breakdown:

To estimate the quantities of materials required for one square metre of built area, two breakdown factors were considered:

I. Item factor: item quantity required for one square metre;
II. Material factor: material quantity required for one square metre.

Construction Item/Built Area Factor

Quantities factors are related to each construction item, such as excavation, backfilling, concrete works, masonry works, and finishing works.

There are two types of factor:

I. Breakdown factors, which are applicable for items that could be directly estimated considering the relation between quantities of materials and the built area of the real estate.
II. Flat/fixed rate factors, which are suitable for items that are not linearly connected to the built area, namely the electrical, water supply and sewage networks.

Calculations for Breakdown Factors

The item factor is the quantity of a particular item required for one square metre of the built area. It is the mathematical relationship between a specific construction item and the built area of a building. To estimate those

factors, the researcher first studied 12 five-storey residential drawings sets. Secondly, he created the bill of quantities for the sub-structure, ground floor and typical floors, and then he calculated the built area for the ground floor and all typical floors.

To estimate a specific construction item factor for a certain floor, the total quantity of that item was divided by the built area of the subject floor:

$$\text{Item Factor} = \frac{\text{Total Item Quantity}}{\text{Total Floor Built Area}}$$

Equation 4-1

For instance, calculations suggest the factor of 11 m^2/ column for columns, which means that each 11 m^2 of the built area requires one column.

Table 4-3 Columns Factor

Built Area M2	No. of Columns	M2/No. of Columns	Ratio (Factor)
265	22	12.04545455	12
230	21	10.95238095	11
263	23	11.43478261	11
375	33	11.36363636	11
Built Area / No. of columns		=	11

Construction Factors List

The factors for the following items were estimated:

1. Reinforced concrete foundations
2. Reinforced concrete columns
3. Concrete masonry walls
4. Plaster works for walls
5. Plaster works for ceilings
6. Painting works for walls
7. Painting works for ceilings
8. Tiles work for walls (kitchens & toilets)
9. Tiles work for floors
10. Gypsum decoration works
11. Windows works
12. Boundary wall and external works

Table 4-4 shows the items factors as estimated by the study.

Table 4-4: Construction Items Factors

#	Construction Item	Factor	Unit
1	Reinforced concrete foundations /columns	11	m2 for col.

2	Concrete masonry walls – Ground Floor	2.5	m2/m2
3	Concrete masonry walls – Typical Floor	2.1	m2/m2
4	Concrete masonry walls - Average	2.3	m2/m2
5	Plaster works for walls – Ground Floor	6	m2/m2
6	Plaster works for walls – Typical Floor	5.3	m2/m2
7	Plaster works for walls - Average	5.6	m2/m2
8	Plaster works for ceilings	1	m2/m2
9	Painting works for walls – Ground Floor	6	m2/m2
10	Painting works for walls – Typical Floor	5.3	m2/m2
11	Painting works for walls - Average	5.6	m2/m2

12	Painting works for ceilings	1	m2/m2
13	Tiles for walls (kitchens & toilets) – Ground Floor	0.74	m2/m2
14	Tiles for walls (kitchens & toilets) – Typical floor	0.68	m2/m2
15	Tiles for walls (kitchens & toilets) - Average	0.71	m2/m2
16	Tiles for floors	1	m2/m2
17	Gypsum decoration works – Ground Floor	2	m/m2
18	Gypsum decoration works – Typical Floor	1.7	m/m2
19	Gypsum decoration works - Average	1.8	m/m2
20	Windows works – Ground Floor	0.1	m2/m2
21	Windows works – Typical Floor	0.11	m2/m2

22	Windows works - Average	0.1	m2/m2
23	CMU Boundary wall works/length in metres	2.5	m2/m
24	Boundary wall plaster/length in metres	5	m2/m
25	Boundary wall painting/length in metres	5	m2/m

The following are the calculation sheets for factors of different construction items.

Walls Factor – Masonry Works

Assumptions:

Ordinary cement concrete block of size = 40 * 20 * 20 cm (CMU)

Walls to built area ratio (Masonry Works)

Table 4-5 shows the items factors for masonry works.

Table 4-5 Walls Factors

Walls to Built Area Ratio (Masonry Works)

#	Floor	Built Area M2	Walls M2	Factor: Walls Area/ Built Area	Average for All	Average G. Floor	Average typical Floors
1	Ground Floor	235	531	2.260	2.223	2.407	2.039
	First Floor	235	422	1.796			
2	Ground Floor	252	663	2.631			
	First Floor	317	662	2.088			
3	Ground Floor	310	632	2.039			
	First Floor	334	639	1.913			
4	Ground Floor	272	602	2.213			
	First Floor	332	720	2.169			
5	Ground Floor	190	550	2.895			
	First Floor	232	517	2.228			
Factor					2.223	2.407	2.039

Plaster Works Factor

Assumptions:

Cement sand plaster 1:3, thickness = 4 cm, 15% added to slab area to compensate for edge beam quantity. For walls with no opening, deduction to compensate for quantity of opening edges.

Table 4-6 shows plaster works factors.

Table 4-6 Plaster Works Factors

#	Floor	Slab Area M2	15% add	Wall One Face M2	Wall Two Faces M2	Total QTY M2	Factor:Walls Area/ Built Area	Average For All	Average G. Floor	Average Typical Floors
1	Ground Floor	235	35	531	1,062	1,332	5.67	5.60	5.96	5.23
	First Floor	235	35	422	844	1,114	4.74			
2	Ground Flor	252	38	663	1,326	1,616	6.41			
	First Floor	317	48	662	1,324	1,689	5.33			
3	Ground Flor	310	47	632	1,264	1,621	5.23			
	First Floor	334	50	639	1,278	1,662	4.98			
4	Ground Flor	272	41	602	1,204	1,517	5.58			
	First Floor	332	50	720	1,440	1,822	5.49			
5	Ground Flor	190	29	550	1,100	1,319	6.94			
	First Floor	232	35	517	1,034	1,301	5.61			
							55.96			
	Wall Factor							5.60	5.96	5.23
	Ceiling Factor								1	

Panting Works Factor

Assumptions: Local paint: three coats; 15% added to slab area to compensate for edge beam quantity. Table 4-7 indicates painting works factor

Table 4-7 Painting Works Factor

#	Floor	Cover Slab Area M2	15% add	Wall one Face M2	Wall Two Faces M2	Total QTY M2	Factor:Walls Area/ Built Area	Average For All	Average G. Floor	Average Typical Floors
1	Ground Floor	235	35	531	1,062	1,332	5.67			
	First Floor	235	35	422	844	1,114	4.74			
2	Ground Flor	252	38	663	1,326	1,616	6.41			
	First Floor	317	48	662	1,324	1,689	5.33			
3	Ground Flor	310	47	632	1,264	1,621	5.23	5.60	5.96	5.23
	First Floor	334	50	639	1,278	1,662	4.98			
4	Ground Flor	272	41	602	1,204	1,517	5.58			
	First Floor	332	50	720	1,440	1,822	5.49			
5	Ground Flor	190	29	550	1,100	1,319	6.94			
	First Floor	232	35	517	1,034	1,301	5.61			
							55.96			
	Wall Factor							5.60	5.96	5.23
	Ceiling Factor								1	

4.8 Tiles Works Factor

Assumptions:

Toilets and kitchens: ceramic/porcelain tiles; sand bed = 10 cm, mortar for fixing = 5 cm. T= Toilet. K= kitchen.

Table 4-8 indicates Tiles Works Factors

Table 4-8 Tiles Works Factors

#	Floor	Floor Area M2	Toilets & Kitchen			Factor: Walls Area/ Built Area	Average For All	Average G. Floor	Average Typical Floors
			No. of T & K	Floor M2	Wall M2				
1	Ground Floor	235	2 T, 1 K	33.00	130.50	0.56	0.70	0.73	0.68
	First Floor	235	3 T, 1 K	23.00	130.50	0.56			
2	Ground Flor	252	4 T, 2 K	46.36	197.70	0.78			
	First Floor	317	4 T, 2 K	48.00	203.00	0.64			
3	Ground Flor	310	4 T, 1 K	50.30	198.60	0.64			
	First Floor	334	4 T, 2 K	43.70	197.40	0.59			
4	Ground Flor	272	4 T, 1 K	46.50	177.00	0.65			
	First Floor	332	5 T, 2 K	54.00	232.00	0.70			
5	Ground Flor	190	4 T, 2 K	43.70	196.80	1.04			
	First Floor	232	4 T, 2 K	46.40	207.60	0.89			
						7.05			
	Wall Factor						0.70	0.73	0.68
	Floor Factor							1	

4.9 Gypsum Decoration Works

Assumptions:

Gypsum work includes the wall cornices and spotlight boxes (add 30% for the box, using the same rate for the cornice).

The total length of the cornice equals the total wall area/wall height (H = 3).

Table 4-9 exposes gypsum cornice factor

Table 4-9 Gypsum Cornice Factor

#	Floor	Cover Slab Area M2	Wall One Face M2	Wall Two Faces M2	Wall Height M	Cornice Length M	Add 50% for Gypsum Box	Total Cornice Length M	Factor: Cornice Length/ Built Area	Average For All	Average G. Floor	Average Typical Floors
1	Ground Floor	235	531	1,062	3	354.00	70.80	424.80	1.81	1.78	1.93	1.63
	First Floor	235	422	844	3	281.33	56.27	337.60	1.44			
2	Ground Flor	252	663	1,326	3	442.00	88.40	530.40	2.10			
	First Floor	317	662	1,324	3	441.33	88.27	529.60	1.67			
3	Ground Flor	310	632	1,264	3	421.33	84.27	505.60	1.63			
	First Floor	334	639	1,278	3	426.00	85.20	511.20	1.53			
4	Ground Flor	272	602	1,204	3	401.33	80.27	481.60	1.77			
	First Floor	332	720	1,440	3	480.00	96.00	576.00	1.73			
5	Ground Flor	190	550	1,100	3	366.67	73.33	440.00	2.32			
	First Floor	232	517	1,034	3	344.67	68.93	413.60	1.78			
						3,958.67						
	Cornice Factor									1.78	1.93	1.63

Windows Works Factors

Assumptions:

The architectural design satisfies the applicable standards.

Table 4-10 exposes windows factors

Table 4-10 Windows Factors

#	Floor	Built Area M2	Windows m2	Factor:Windows Area/ Built Area	Average For All	Average G. Floor	Average Typical Floors
1	Ground Floor	235	13.8	0.06	0.10	0.09	0.10
	First Floor	235	13.8	0.06			
2	Ground Floor	252	23.52	0.09			
	First Floor	317	41.55	0.13			
3	Ground Floor	310	23.76	0.08			
	First Floor	334	26.2	0.08			
4	Ground Floor	272	28.35	0.10			
	First Floor	332	38.25	0.12			
5	Ground Floor	190	23.7	0.12			
	First Floor	232	29.1	0.13			
				0.97			
	Factor				0.1	0.09	0.10

4.10 Boundary Wall Works Factors:

Assumptions:

Reinforced Concrete and Cement Masonry Units Boundary wall, H=2.5 m, footing 1.2 * 1.2 * 0.4 m @ 4 m, G. beam 0.4 * 0.2 m, RC column 0.3 * 0.2 m

Table 4-11 shows boundary wall works factors.

Table 4-11 Boundary Wall Works Factors

Item	Factor for meter length
Wall	2.5
Plaster	5
Painting	5

4.11 Materials Quantities for each construction item per square metre of built area

This sheet specifies materials quantities for all construction items in appropriate units. It is a comprehensive breakdown of all construction items. This breakdown defines numerically the material quantities of all item components required for one square metre of the built area, taking into consideration the construction factor for that item.

For instance, the following sheet runs calculations for reinforced concrete foundations as follows:

4.12 Materials Quantities for Reinforced Concrete Foundation

The conclusions are:

Table 4-12 indicates material quantities and factors for reinforced concrete foundation.

Table 4-12 Material Quantities for Reinforced Concrete Foundation

Assumptions	each 11 m^2 need one foundation, Ø 16 @ 15 cm				
Ratio M2/ No. of founadtion	=	11			
Foundation R conc. Size					
L	=	2.4			
W	=	2.4			
D	=	0.5			

Conc. Volume	=	2.88						
Conc. Foundation/M^2	=	0.261818182						
No. of Foundation	=	11						
Say No. of Foundation		11						
Rebar				Shape				
Ø	=	16			0.3			
Kg/m	=	1.6		2.3				
spacing 15 cm	=	0.15		L = 2.3+0.3+0.3	=	2.9	m	
Total Weight of rebar	=	163.2	Kg	say	=	3	m	including waste
for 1 m^2		14.83636364						
Say		15	Kg/m^2					
Tie Wiers	=	1	bundle for each 300 m2					
Factor		0.003333333						

4.13 Construction Items Included in Breakdown Sheets

Table 5-13 shows the items included in the breakdown sheets:

Table 4-13 Construction Items Included in Breakdown Sheets

#	Construction Item
Sub-Structure	
1	Excavation
2	Backfill
3	Lean Concrete
4	Foundation Reinforced Concrete
5	Short Columns Reinforced Concrete
6	Suspended Slab Reinforced Concrete
Ground Floor	
7	Columns
8	Cover Slab
9	Walls
10	Plaster Works
11	Painting Works
12	Tiling Works
13	Doors Works
14	Windows Works
15	Electrical Works
16	Toilets & Kitchen Works
Typical Floors	
17	Columns
18	Cover Slab
19	Walls
20	Plaster Works
21	Painting Works
22	Tiling Works
23	Doors Works
24	Windows Works
25	Electrical Works
26	Toilets & Kitchen Works

4.14 Construction items of Sub-structure

The following are the breakdown factors calculations sheets for the construction items of the sub-structure, those factors were shown in tables 4-14, 4-15, 4-16, 4-17 and 4-18.

Table 4-14 Breakdown for Earth Work

Earth Work			
Excavation			
Assumptions		each 11 m^2 need one foundation	
Ratio Built Area : M^2/ No. of foundation	=	11	
Excavation : Foundation Size			
L	=	2.4	
W	=	2.4	
D	=	2	
Excavation Volume	=	11.52	M^3
Excavation Volume/M^2	=	1.047272727	
Excavation Factor		1.047272727	
Backfill local material			
Total Excavation for M^2	=	1.047272727	
Foundation Lean Conc.	=	0.061454545	
Foundation R. Conc.	=	0.261818182	
Total Conc.	=	0.323272727	
Backfill Factor	=	0.724	
Backfill local selected material			
assumption		each m^2 of GF area need 0.2 m thick layer of selected material of backfill	
Backfill local selected material factor	=	0.2	

Table 4-15 Lean Concrete Factor for Foundation

Assumptions		each 11 m^2 need one foundation
Ratio M^2/ No. of foundation	=	11
Foundation Lean conc. Size		
L	=	2.6
W	=	2.6
D	=	0.1
Conc. Volume	=	0.676
Factor for Lean Conc. Foundation/M^2	=	0.061454545

Table 4-16 Reinforced Concrete Foundation

Foundation Reinforced Concrete								
Concrete								
Assumptions		each 11 m2 need one foundation, Ø 16 @ 15 cm						
Ratio M^2/ No. of foundation	=	11						
Foundation R conc. Size								
L	=	2.4						
W	=	2.4						
D	=	0.5						
Conc. Volume	=	2.88						
Conc. Foundation/M^2	=	0.261818182						
No. of Foundation	=	11						
Say No. of Foundation		11						
Rebar				Shape				
Ø	=	16			0.3			
Kg/m	=	1.6		2.3				
spacing 15 cm	=	0.15		L = 2.3+0.3+0.3	=	2.9	m	
Total Weight of rebar	=	163.2	Kg	say	=	3	m	including waste
for 1 m^2		14.83636364						
Say		15	Kg/m^2					
Tie Wiers	=	1	for each 300 m2					
Factor		0.003333333						

Table 4-17 Reinforced Concrete for Short Columns

Short Columns Reinforced Concrete									
Concrete									
Assumptions		each 11 m^2 need one short column, 10 Ø 16							
Ratio M^2/ No. of founadtion	=	11							
Short column . Size (meter)									
L	=	0.6							
W	=	0.3							
H	=	2.7							
Conc. Volume	=	0.486							
Conc. Short column/M^2	=	0.044181818	m^3/m^2						
Say		0.05							
Rebar						0.6	overlap		
						0.2	sus. Slab		
Ø	=	16				1.2	above ground level		
Kg/m	=	1.6				1.5	under ground level		
no. of bars	=	10				0.45	inside footing		
Total Weight of rebar	=	96				0.5	anchorage		
for 1 m^2		8.727272727		Total length		4.45			
Say		9	Kg/m^2	say		6			
Links		Ø 8 @ 15 cm							
Ø	=	8				0.55			
Kg/m	=	0.395					0.25		
Spacing	=	0.15	cm						
Total Weight of rebar	=	18.17	Kg	length		2.15			
for 1 m^2	=	1.651818182		length /column		45.86667	m		
Say Ø 8	=	1.7	Kg/m^2	say		46	m		
Tie Wiers	=	1	bundle	for each 300 m2					
Factor		0.003333333							

Table 4-18 Reinforced Concrete Suspended Slab

Suspended Slab Reinforced Concrete						
Concrete						
Assumptions		Flat slab, 20 cm thick, edge beam for 2 sides of 50 m total including staircase beams.				
Slab Area	=	280	m			
Slab Thickness	=	0.2	m			
Slab Volume	=	56	m^3			
Edge Beam Size (meter)						
B	=	0.5	m			
D	=	0.25	m			
Total Length	=	50	m			
Edge beam Conc. Volume	=	6.25	m^3			
Concrete Volume Total	=	62.25	m^3			
Concrete for m^2	=	0.222321429	m^3/m^2			
Say	=	0.23	m^3/m^2			
Rebar						
Slabs						
Assumptions		Ø 16 & 12 @ 15 cm top and				
Rebar for m^2	=	35	Kg/m^2	including beams and staircase		
% of Ø 16	=	60%	1.6			
% of Ø 12	=	40%				
Weight of Ø 16 / m^2	=	21	Kg/m^2			
Weight of Ø 12 / m^2	=	14	Kg/m^2			
Beams Rebar		4 Ø 16 all through the section				
No. of Bars	=	5				
Weight of Ø 16	=	400	kg			
Weight of Ø 16 / m^2	=	1.428571429	kg/m^2			
Say	=	1.5	kg/m^2			
Links		Ø 8 @ 15 cm				
Ø	=	8			0.45	
Kg/m	=	0.395				0.20
Spacing	=	0.15	cm			
Total Weight of links	=	231.1079167	Kg	length	1.75	
for 1 m^2	=	0.825385417				
Say Ø 8	=	0.9	Kg/m^2			
Tie Wiers	=	2	bundle	for each 300		
Factor		0.006666667				

4.15 Construction items for ground floor

The following are the breakdown calculation sheets for the factors of the construction items of the ground floors, tables from 4-19 to table 4-26 show those factors.

Table 4-19 Reinforced concrete Columns

Columns					
Concrete					
Assumptions		each 11 m^2 need one one column, 10 Ø 16			
Ratio M^2/ No. of founadtion	=	11			
Short column . Size (meter)					
L	=	0.6			
W	=	0.3			
H	=	3.2			
Conc. Volume	=	0.576			
Conc. column/M^2	=	0.052364	M^3/M^2		
Say		0.06			
Rebar					
Main Rebar					
Ø	=	16			0.6
Kg/m	=	1.6			0.2
no. of bars	=	10			3.2
Total Weight of rebar	=	64	Kg	Total length	4
for 1 m2	=	5.818182		say	4
Say Ø 16	=	6	Kg/m2		
Links		Ø 8 @ 15 cm			
Ø	=	8			0.55
Kg/m	=	0.395			
Spacing	=	0.15	cm		
Total Weight of rebar	=	18.17	Kg	length	2.15
for 1 m^2	=	1.651818		length /column	45.867
Say Ø 8	=	1.7	Kg/m^2	say	46
Tie Wiers	=	1	bundle		

Table 4-20 Reinforced concrete cover slab

Cover Slab						
Concrete						
Assumptions		Flat slab, 20 cm thick, edge beam for 2 sides of 50 m total including staircase beams.				
Slab Area	=	280	m			
Slab Thickness	=	0.2	m			
Slab Volume	=	56	m^3			
Edge beam Size (meter)						
B	=	0.5	m			
D	=	0.25	m			
Total Length	=	50	m			
Edge Beam Conc. Volume	=	6.25	m^3			
Concrete Volume Total	=	62.25	m^3			
Concrete for m2	=	0.222321	m^3/m^2			
Say	=	0.23	m^3/m^2			
Rebar						
Slabs						
Assumptions		Ø 16 & 12 @ 15 cm top and bottom both ways				
Rebar for m2	=	35	Kg/m	including beams and staircase		
% of Ø 16	=	60%	1.6			
% of Ø 12	=	40%				
Weight of Ø 16 / m^2	=	21	Kg/m^2			
Weight of Ø 12 / m^2	=	14	Kg/m^2			
Beams Rebar		4 Ø 16 all through the section				
No. of Bars	=	5				
Weight of Ø 16	=	400	kg			
Weight of Ø 16 / m^2	=	1.428571	Kg/m^2			
Say Ø 16 / m^2	=	1.5	Kg/m^2			
Links		Ø 8 @ 15 cm				
Ø	=	8			0.45	
Kg/m	=	0.395				
Spacing	=	0.15	cm			
Total Weight of links	=	231.1079	Kg	length	1.75	
for 1 m2	=	0.825385				
Say Ø 8	=	0.9	Kg/m^2			
Tie Wiers	=	3	bundle	for each 300 m^2		
Factor	=	0.01				

Table 4-21 CMU Walls

CMU Walls					
Assumptions		CMU wall 20 cm thick, each 1m^2 built area needs 6 m^2 walls			
Wall factor	=	2.5			
Masonry Walls : M^2					
Materials for M^2					
Assumptions		CMU/ red brick wall, 20 cm thick			
Concrete Masonry Unit	=	15	unit		
Cement	=	0.012	Ton		
Sand	=	0.05	m^3		
Materials for1 M^2 built area					
Concrete Masonry Unit	=	37.5	unit		
Cement	=	0.03	Ton		
Sand	=	0.125	m^3		

Table 4-22 Plaster Works

Plaster Works					
Plaster Ceilings & Walls					
Assumptions		plaster 4 cm thick,			
Wall factor	=	6			
Ceiling Factor	=	1			
Plaster works : M2					
Materials for M2					
Assumptions		Cement sand 1:3, 4 cm thick			
Cement	=	0.014	Ton	rate =14 kg /m^2	
Sand	=	0.05	M^3	rate = 50 kg /m^2	
Materials for1 M2 built area Ceiling					
Cement	=	0.014	Ton		
Sand	=	0.05	m^3		
Materials for1 M2 built area Wall					
Cement	=	0.084	Ton		
Sand	=	0.3	m^3		

Table 4-23 Painting Works

Painting Works						
Painting Ceilings & Walls						
Assumptions		local oil paint 3 coats, 3 coats surface smoothing ,15% add. To slab area to compensate edge beam qty.				
Wall factor	=	6				
Ceiling Factor	=	1				
Painting works : M^2						
Materials for M^2						
Assumptions						
Surface smoothing paste	=	0.2	kg /m^2			
Painting - oil	=	0.33	kg /m^2	barell= 20 kg		
Materials for1 M^2 built area Ceiling						
Surface smoothing paste	=	0.2	kg /m^2			
Painting	=	0.33	kg /m^2			
Materials for1 M^2 built area Wall						
Surface smoothing paste	=	1.2	kg /m^2			
Painting	=	1.98	kg /m^2			

Table 4-24 Tiles Works

Tiles Works			
Factors for Tiles floor & Walls			
Assumptions		Ceramic/ Porclain tiles	
Wall factor	=	0.74	
Floor Factor	=	1	
Tiles works : M^2			
Materials for M^2			
Assumptions			
Tiles	=	1	m^2/m^2
Cement	=	0.01	Ton $/m^2$
Sand	=	0.1	m^3/m^2
Materials for1 M^2 built area Floor			
Tiles	=	1	m^2/m^2
Cement	=	0.01	Ton $/m^2$
Sand	=	0.1	m^3/m^2
Materials for1 M^2 built area Wall			
Tiles	=	0.74	m^2/m^2
Cement	=	0.0074	Ton $/m^2$
Sand	=	0.074	m^3/m^2

Table 4-25 Doors & Windows

Doors Works
Note: Insert Doors quantity directly in Real Estate data sheet

Windows Works			
Aluminum/PVC Windwos			
Assumptions		Aluminum or PVC Windwos	
Factor for M^2	=	0.10	

Table 4-26 Gypsum Decoration Works

Gypsum Decoration Works	
Factor for M^2	2

4.16 Construction Items for Typical Floors

Tables from table 4-27 to table 4-33 point out the factors for the construction items for typical floors:

Table 4-27 Reinforced Concrete Columns

Columns						
Concrete						
Assumptions		each 11 m^2 need one one column, 10 Ø 16				
Ratio M2/ No. of foundation	=	11				
Short column . Size (meter)						
L	=	0.6				
W	=	0.3				
H	=	3.2				
Conc. Volume	=	0.576				
Conc. column/M^2	=	0.052364	M^3/M^2			
Say		0.06				
Rebar						
Main Rebar						
Ø	=	16			0.6	Overlap
Kg/m	=	1.6			0.2	GF Cover Slab
no. of bars	=	10			3.2	Floor height
Total Weight of rebar	=	64	Kg	tal length	4	
for 1 m2	=	5.818182		say	4	
Say Ø 16	=	6	Kg/m^2			
Links		Ø 8 @ 15 cm				
Ø	=	8			0.55	
Kg/m	=	0.395				0.25
Spacing	=	0.15	cm			
Total Weight of rebar	=	18.17	Kg	length	2.15	
for 1 m^2	=	1.651818		length /column	45.86667	m
Say Ø 8	=	1.7	Kg/m^2	say	46	m
Tie Wiers	=	1	bundle	for each 300 m^2		
Factor	=	0.003333				

Table 4-28 Reinforced concrete cover slab

Cover Slab						
Concrete						
Assumptions		Flat slab, 20 cm thick, edge beam for 2 sides of 50 m total including staircase beams.				
Slab Area	=	280	m			
Slab Thickness	=	0.2	m			
Slab Volume	=	56	m^3			
Edge Beam Size (meter)						
B	=	0.5	m			
D	=	0.25	m			
Total Length	=	50	m			
Edge beam Conc. Volume	=	6.25	m^3			
Concrete Volaume Total	=	62.25	m^3			
Concrete for m2	=	0.222321	m^3/m^2			
Say	=	0.23	m^3/m^2			
Rebar						
Slabs						
Assumptions		Ø 16 & 12 @ 15 cm top and bottom both ways				
Rebar for m^2	=	35	Kg/m	staircase		
% of Ø 16	=	60%	1.6			
% of Ø 12	=	40%				
Weight of Ø 16 / m^2	=	21	Kg/m			
Beams Rebar		4 Ø 16 all through the section				
No. of Bars	=	5				
Weight of Ø 16	=	400	kg			
Weight of Ø 16 / m^2	=	1.428571	Kg/m^2			
Say Ø 16 / m^2	=	1.5	Kg/m^2			
Links		Ø 8 @ 15 cm				
Ø	=	8			0.45	
Kg/m	=	0.395				0.20
Spacing	=	0.15	m			
Total Weight of links	=	231.1079	Kg	length	1.75	
for 1 m2	=	0.825385				
Say Ø 8	=	0.9	Kg/m^2			
Tie Wires	=	2	bundle for each 300 m^2			
Factor	=	0.006667				

Table 4-29 CMU Walls

Walls					
CMU Walls					
Assumptions		CMU wall 20 cm thick, each 1m^2 built area needs 6 m^2 walls			
Wall Factor	=	2.1			
Masonry Walls : M^2					
Materials for M^2					
Assumptions		CMU/ red brick wall, 20 cm thick			
Concrete Masonry Unit	=	15	unit		
Cement	=	0.012	Ton		
Sand	=	0.05	m^3		
Materials for1 M^2 built area					
Concrete Masonry Unit	=	31.5	unit		
Cement	=	0.0252	Ton		
Sand	=	0.105	m^3		

Table 4-30 Plaster Works

Plaster Works					
Plaster Ceilings & Walls					
Assumptions		plaster 4 cm thick,			
Wall factor	=	5.3			
Ceiling Factor	=	1			
Plaster works : M^2					
Materials for M^2					
Assumptions		Cement sand 1:3, 4 cm thick			
Cement	=	0.014	Ton	rate =14 kg /m^2	
Sand	=	0.05	m^3	rate = 50 kg /m^2	
Materials for1 M^2 built area Ceiling					
Cement	=	0.014	Ton		
Sand	=	0.05	m^3		
Materials for1 M^2 built area Wall					
Cement	=	0.0742	Ton		
Sand	=	0.265	m^3		

Table 4-31 Painting Works

Painting Works					
Painting Ceilings & Walls					
Assumptions		Local oil paint 3 coats, 3 coats surface smoothing ,15% add. To slab area to compensate edge beam qty.			
Wall factor	=	5.3			
Ceiling Factor	=	1			
Painting works : M^2					
Materials for M^2					
Assumptions					
Surface smoothing paste	=	0.2	Kg/m^2		
Painting - oil	=	0.33	Kg/m^2	barell= 20 kg	
Materials for1 M^2 built area Ceiling					
Surface smoothing paste	=	0.2	Kg/m^2		
Painting	=	0.33	Kg/m^2		
Materials for1 M^2 built area Wall					
Surface smoothing paste	=	1.06	Kg/m^2		
Painting	=	1.749	Kg/m^2		

Table 4-32 Tiling Works

Tiles Works			
Factors for Tiles floor & Walls			
Assumptions		Ceramic/ porcelain tiles	
Wall factor	=	0.68	
Floor Factor	=	1	
Tiles works : M^2			
Materials for M^2			
Assumptions			
Tiles	=	1	m^2/m^2
Cement	=	0.01	Ton $/m^2$
Sand	=	0.1	m^3/m^2
Materials for1 M^2 built area Floor			
Tiles	=	1	m^2/m^2
Cement	=	0.01	Ton $/m^2$
Sand	=	0.1	m^3/m^2
Materials for1 M^2 built area Wall			
Tiles	=	0.68	m^2/m^2
Cement	=	0.0068	Ton $/m^2$
Sand	=	0.068	m^3/m^2

Table 4-33 Doors & Windows

Doors Works
Note: Insert Doors quantity directly in Real Estate data sheet

Windows Works			
Aluminum/PVC Windwos			
Assumptions		Aluminum or PVC Windwos	
Factor for M^2	=	0.11	

4.17 Updated Price List for Construction Materials & Workmanship

The updated price list is a set of spreadsheets designed to be updated regularly for both construction materials and workforce prices. Model users should update the prices regularly according to the market conditions.

Tables 4-34 & 4-35 show two samples of the price lists:

Table 4-34 Updated Price List for Construction Materials

Materials					
#	Item	Unit	Price SDG	USD /SDG Ex. Rate	Price USD
1	Cement	Ton	0	1.00	0.00
2	Sand	M^3	0	1.00	0.00
3	Gravel	M^3	0	1.00	0.00
4	Backfill Selected Material	M^3	0	1.00	0.00
5	R. Mix Lean Concrete	M^3	0	1.00	0.00
6	R. Mix Reinforced Concrete	M^3	0	1.00	0.00
7	Reinforcement Ø 16 mm	Kg	0	1.00	0.00
8	Reinforcement Ø 12 mm	Kg	0	1.00	0.00
9	Reinforcement Ø 8 mm	Kg	0	1.00	0.00
10	Tie Wire	Bundel	0	1.00	0.00
11	Concrete Masonry Unit CMU	Unit	0	1.00	0.00
12	Surface smoothing paste	Kg	0	1.00	0.00
13	Painting	Kg	0	1.00	0.00
14	Floor Tiles	M^2	0	1.00	0.00
15	Wall Tiles	M^2	0	1.00	0.00
16	Gates Exterior	Unit	0	1.00	0.00
17	Doors Interior	Unit	0	1.00	0.00
18	Aluminum Windows inc. installation	M2	0	1.00	0.00
19	Toilets set	Set	0	1.00	0.00
20	Marble Steps (going & rise)	Step	0	1.00	0.00
21	Granite Steps (going & rise)	Step	0	1.00	0.00
22	Gypsum Cornice & other gypsum decoration - material cost incl. in workmanship unit price	M	0	1.00	0.00
23	Gypsum Cornich & other gypsum decoration - material cost incl. in workmanship unit price	M	0	1.00	0.00

Table 4-35 Updated Price List for Workmanship

Workmanship					
#	Item	Unit	Price SDG	USD /SDG Ex. Rate	Price USD
1	Design Cost	L.S	0	1.00	0.00
2	Governmental Fees	L.S	0	1.00	0.00
3	Site Cleaning	JOB	0	1.00	0.00
4	Survey Work	JOB	0	1.00	0.00
5	Backfill Selected Material / per site	JOB	0	1.00	0.00
6	Backfill Local Material / per site	JOB	0	1.00	0.00
7	Excavation	M^3	0	1.00	0.00
8	Cast Lean, R.C for Foundation & Short Column	M^3	0	1.00	0.00
9	R. Mix Reinforced Concrete Cast	M^3	0	1.00	0.00
10	Formwork & Rebar for Foundation &	M^3	0	1.00	0.00
11	Formwork & Rebar for Floor Column	M^3	0	1.00	0.00
12	Formwork & Rebar for Slab	M^3	0	1.00	0.00
13	Formwork & Rebar Staircase	JOB	0	1.00	0.00
14	Masonry Wall	M^2	0	1.00	0.00
15	Plaster Work for Wall	M^2	0	1.00	0.00
16	Plaster Work for Celing	M^2	0	1.00	0.00
17	Painting Work Wall	M^2	0	1.00	0.00
18	Painting Work Ceiling	M^2	0	1.00	0.00
19	Installation Floor Tiles	M^2	0	1.00	0.00
20	Installation Wall Tiles	M^2	0	1.00	0.00
21	Installation Gates Exterior	Unit	0	1.00	0.00
22	Installation Doors Interior	Unit	0	1.00	0.00
23	Toilets Set installation	Unit	0	1.00	0.00
24	Gypsum Cornice & Other Gypsum Decoration - Material Cost Included	M	0	1.00	0.00

Section 2: Processing Section

This section is responsible for all necessary calculations using predetermined factors and variables. It is a protected file, and the user cannot change its contents or reformulate any pre-entered values.

This section of the model uses all factors and values that the user entered in section 1 to generate quantities for the required construction materials and workforce cost estimation. This is the first step, and the second step is to multiply these quantities by the unit rate mentioned in the updated list price. The summation of the multiplication results is the construction cost of the building.

The real estate market value is the summation of the construction cost and land value.

Real estate market Value = Construction cost + Land value

Equation 4-2

The proceeding section comprises the following spreadsheets:

1. Material quantities for sub-structure and ground floor
2. Material quantities for the first floor
3. Material quantities for the second floor
4. Material quantities for the third floor
5. Material quantities for the fourth floor
6. Material quantities for annexe
7. Material quantities for boundary wall

8. Materials cost for sub-structure and ground floor
9. Materials cost for the first floor
10. Materials cost for the second floor
11. Materials cost for the third floor
12. Materials cost for the fourth floor
13. Materials cost for annexe
14. Materials cost for boundary wall
15. Workmanship cost for sub-structure and ground floor
16. Workmanship cost for the first floor
17. Workmanship cost for the second floor
18. Workmanship cost for the third floor
19. Workmanship cost for the fourth floor
20. Workmanship cost for annexe
21. Workmanship cost for boundary wall

4.18 Materials Quantity Calculation Sheet

Table 4-36 indicates the materials quantity calculation sheet

Table 4-36: Materials Quantity Calculation Sheet

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1	Earth Work							
1	Excavation	0	1.05	M3	0	10%	0.00	0
2	Backfill Local Material	0	0.72	M3	0	10%	0.00	0
3	Backfill Selected Material	0	0.20	M3	0	10%	0.00	0
2	R.C. Sub-structure							
	Foundation							
1	Lean Concete	0	0.06	M3	0	10%	0.00	0
2	Concete Foundations	0	0.26	M3	0	10%	0.00	0
3	Reinforcement Ø 16 mm	0	15.00	Kg	0	10%	0.00	0
4	Tie Wire	0	0.00	Bundel	0	0%	0.00	0
	Short Columns							
1	Concete Short Columns	0	0.05	M3	0	10%	0.00	0
2	Reinforcement Ø 16 mm	0	9.00	Kg	0	10%	0.00	0
3	Links Ø 8 mm	0	1.70	Kg	0	10%	0.00	0
4	Tie Wire	0	0.00	Bundel	0	0%	0.00	0
	Suspended Slab							
1	Concete Suspended Slab	0	0.23	M3	0	10%	0.00	0
2	Reinforcement Ø 16 mm	0	21.00	Kg	0	10%	0.00	0
3	Reinforcement Ø 12 mm	0	14.00	Kg	0	10%	0.00	0
4	Beams Reinforcement Ø 16 mm	0	1.50	Kg	0	10%	0.00	0
5	Beams links Ø 8 mm	0	0.90	Kg	0	10%	0.00	0
6	Tie Wire	0	0.01	Bundel	0	0%	0.00	0

Mathematical operation:

For each specific construction item:

Total material quantity = Floor area * Item Factor * (100% + Waste %)

Equation 4-3

4.19 Materials Cost Calculation Sheet

Table 4-37 shows the Materials cost calculation Sheet

Table 4-37: Materials cost calculation Sheet

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Earth Work						
1.1	Backfill Selected Material	0	M3	0	0.00	1	0.00
2	R.C. Sub-structure						
	Foundation						
2.1	Lean Concete	0	M3	0	0.00	1	0.00
2.2	Concete Foundations	0	M3	0	0.00	1	0.00
2.3	Reinforcement Ø 16 mm	0	Kg	0	0.00	1	0.00
2.4	Tie Wire	0	Bundel	0	0.00	1	0.00
3	Short Columns						
3.1	Concete Short Columns	0	M3	0	0.00	1	0.00
3.2	Reinforcement Ø 16 mm	0	Kg	0	0.00	1	0.00
3.3	Links Ø 8 mm	0	Kg	0	0.00	1	0.00
3.4	Tie Wire	0	Bundel	0	0.00	1	0.00
4	Suspended Slab						
4.1	Concete Suspended Slab	0	M3	0	0.00	1	0.00
4.2	Reinforcement Ø 16 mm	0	Kg	0	0.00	1	0.00
4.3	Reinforcement Ø 12 mm	0	Kg	0	0.00	1	0.00
4.4	Beams Reinforcement Ø 16 mm	0	Kg	0	0.00	1	0.00
4.5	Beams links Ø 8 mm	0	Kg	0	0.00	1	0.00
4.6	Tie Wire	0	Bundel	0	0.00	1	0.00

Mathematical operation:

For each specific construction item:

Item Cost in SDG = Item Total Quantity * Unit Cost

Equation 4-4

Item Cost in USD = Item Total Quantity * Unit Cost * Exchange rate

Equation 4-5

4.20 Workmanship Cost calculation Sheet

Table 4-38 shows the workmanship cost calculation sheet

Table 4-38: Workmanship Cost Calculation Sheet

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Engineering & Approval						
1.1	Design Cost	1	L.S	0	0	1	0.00
1.2	Governmental Fees	1	L.S	0	0	1	0.00
2	Site Preparation				0	1	0.00
2.1	Site Cleaning	1	L.S	0	0	1	0.00
2.2	Survey Work	1	L.S	0	0	1	0.00
3	Earth Work					1	0.00
3.1	Excavation	0	M3	0	0	1	0.00
3.2	Backfill Local (per site)	0	L.S	0	0	1	0.00
3.3	Backfill Selected	0	M3	0	0	1	0.00
4	Concrete Sub-structure				0	1	0.00
4.1	Foundation				0	1	0.00
4.2	Cast Lean, R.C for foundation & Short Column	0	M3	0	0	1	0.00
4.3	Formwork & rebar for foundation & Short Column	0	M3	0	0	1	0.00
5	Suspended Slab				0	1	0.00
5.1	Formwork & rebar for Slab	0	M2	0	0	1	0.00
6	Ground Floor				0	1	0.00
	Skeleton				0	1	0.00
6.1	Formwork & rebar for floor	0	M3	0	0	1	0.00
6.2	Slab Concrete including beams	0	M2	0	0	1	0.00
6.3	Formwork & rebar staircase	0	Unit	0	0	1	0.00
7	Masonry Work				0	1	0.00
7.1	Install Concrete Masonry Unit w	0	M2	0	0	1	0.00
8	Plaster Work				0	1	0.00
8.1	Install plaster for Walls	0	M2	0	0	1	0.00
8.2	Install plaster for Ceiling	0	M2	0	0	1	0.00
9	Painting Work				0	1	0.00
9.1	Install Painting for Walls	0	M2	0	0	1	0.00
9.2	Install Painting for Ceiling	0	M2	0	0	1	0.00
10	Tiles Works				0	1	0.00
10.1	Install Tiles for Floor	0	M	0	0	1	0.00
10.2	Install Tiles for Walls	0	M	0	0	1	0.00
11	Staircase Works						
11.1	Steps Tiles (going & rise)	0	Step	1	0	1	0.00
11.2	Handrail	0	M	1	0	1	0.00
12	Doors Works				0	1	0.00
12.1	Install Exteriors Gates	0	Unit	0	0	1	0.00
12.2	Install Interior Doors	0	Unit	0	0	1	0.00
13	Windows Works				0	1	0.00
13.1	Installation cost incl. in material unit price	0	M2	0	0	1	0.00

Mathematical operation:

For a specific construction item:

Item Workmanship Cost in SDG = Item Total Quantity * Unit Cost

Equation 4-6

Item Workmanship Cost in USD = Item Total Quantity * Unit Cost * Exchange rate

Equation 4-7

Table 4-39 Shows floor cost calculation sheet

Table 4-39 Floor cost calculation Sheet

#	Item	SDG	USD
1	Materials Cost	0.00	0.00
2	Workmanship Cost	0.00	0.00
	Sub -Total	0.00	0.00
	Total Cost	0.00	0.00

Mathematical operation:

For a specific floor:

Construction cost of the floor = Materials Cost + Workmanship Cost

Equation 4-8

Section 3: Output Section

This part of the model displays outputs, estimated quantities and values in an organized manner. It includes in detail all cost calculation results

for each construction item, and the result of the summation of these costs is the total construction cost of the building.

This section contains the following sheets:

1. Sub-structure and ground floor cost summary
2. First floor cost summary
3. Second floor cost summary
4. Third floor cost summary
5. Fourth floor cost summary
6. Annexe cost summary
7. Boundary Wall cost summary
8. Building cost summary
9. Land Valuation
10. Real estate market value

Table 4-40 shows ground floor cost summary sheet

Table 4-40 Ground Floor Cost Summary Sheet

Item	SDG	USD
Engineering & Approval Fees	0.00	0.00
Materials Cost	0.00	0.00
Workmanship Cost	0.00	0.00
Sub -Total	0.00	0.00
Total Cost	0.00	0.00

Table 4-41 Shows building cost summary and value

Table 4-41 Building Cost Summary and Value

	Item	Area M	Cost SDG	Cost USD
1	Ground Floor	0	0.00	0.00
2	First Floor	0	0.00	0.00
3	Second Floor	0	0.00	0.00
4	Third Floor	0	0.00	0.00
5	Fourth Floor	0	0.00	0.00
6	External Works			0.00
	Total Estimated Buildings Cost		0.00	0.00
	Profit %		0%	0%
	Profit Amount		0	0
	New Constructed Buildings Value		**0.00**	**0.00**
	Current Buildings Conditiuons %		**0%**	
	Current Constructed Buildings Value		**0.00**	**0.00**

4.21 Land Valuation

The market value of a real estate is the algebraic sum of the land value and the cost of construction of the buildings and development. Therefore, it is essential to estimate a reliable market value for the plot on which the buildings were constructed.

The core of land value estimation is the comparable sales approach. In brief, it estimates the market value of the subject land depending on the price and features of similar sold plots in the same zone as the subject plot.

The valuer analyses the features of all comparable sales and makes necessary adjustments to develop the market value of the plot under consideration.

The next table (Table 4-42) represents the matrix applied for the comparable sales method.

Table 4-42Land Valuation

Date	Plot #	Block #	Area M^2	Neighborhood	City	Owner	
02/03/22	0	0	0		0	0	
Characteristics	Normal	$ Ex. Rate	450	Currency	SDG		
Comparable #	Subject Land	1	2	3	4	5	6
Characteristics	Excellent	Excellent			Normal		
Area M^2	400	500	400	450	380	420	400
Sale Value	-	0	0	0	0	0	0
M^2 Price	-	0	0	0	0	0	0
Today	02/03/2022	02/03/2022	02/03/2022	02/03/2022	02/03/2022	02/03/2022	02/03/2022
Sale Date	02/03/2022	16/03/2021	21/02/2021	05/06/2021	08/07/2021	12/12/2020	1/1/2021
Time Lag	0	11	12	8	7	14	5
$ Ex. Rate	450	410	400	420	450	380	390
$ Ex. Rate Diff.	0	40	50	30	0	70	60
$ Ex. Rate Diff. %	0.00%	9.76%	12.50%	7.14%	0.00%	18.42%	15.38%
M^2 Adjustments							
Sale Time Adjust		0	0	0	0	0	0
Average		0			0		
Subject Land Estimated Market Value							
Characteristics		If Excellent			If Normal		
M^2 Estimated Value		0			0		
Plot Estimated Value		0					
Plot Estimated Value Rounded		0					

4.22 Real Estate Market Value Report

The main objective of the model is to find out the market value of the subject real estate. After the user has finished entering the input information, the model automatically develops the targeted value. The following table (Table 4-43) represents the final estimated market value of the real estate, including separate values for the buildings and the land.

Table 4-43 Real Estate Market Value

Item	SDG	USD
Buildings Value	0.00	0.00
Land Value	0.00	0.00
Real Estate	0.00	0.00

4.23 Using the Model

The model is designed to be simple and easy to use. The user only needs to enter data into two spreadsheets:

1. Real estate information and the USD exchange rate.
2. Updated price list of construction materials

After the user enters the input information, the model automatically generates the construction materials quantity list and calculates the cost of the materials and workmanship.

Table 4-44 elaborates the process followed by the model to conclude the market value of the subject real estate.

Table 4-44 Model Steps

#	Operator	Process	Sheet
1	User	Enter real estate information and current USD exchange rate	Real estate data and exchange rate
2	User	Enter updated prices for construction materials and workmanship costs	Updated Prices
3	Model	The model calculates construction items quantities for each floor using pre-determined factors	QTY - Floor
4	Model	The model calculates construction cost for all items of the real estate	Material cost Workmanship cost
5	Model	The model summarizes the construction cost for each floor	Floor - value
6	Model	The model calculates the market value of the real estate	Real estate market value
7	User	User prints market value report	Computer command

4.24 Findings & Conclusions

I. Mathematical models can be used in the valuation process.

CHAPTER V

Model Testing

5.1 Introduction

The researcher designed this chapter to test and assess the performance of the suggested mathematical model. Furthermore, in this chapter, the researcher will estimate the degree of confidence in the model results.

5.2 Test Methodology

The researcher conducted the test using the following steps:

1. Randomly selected five real estates whose market value had recently been estimated. These selected real estates must meet the specification for which the model is designed.
2. The selected real estate for the test must be:
    1. Residential buildings;
    2. Reinforced concrete skeleton;
    3. In the state of Khartoum;
    4. Their market value was estimated in the last three months.
3. Use the drawings/bill of quantities of the selected real estate to specify the required data to run the model.

4. Update the model price list of the materials and workmanship.
5. Run the model to calculate the market value of the selected real estate.
6. Compare the model results with the reported values in the valuation reports of the selected real estates.
7. Report the comparison result and estimate the degree of confidence in the model results.

5.3 Selected Real Estates Information

The researcher selected five real estates based on the above-mentioned criteria.

The following table 5-1 represents all information for the real estates used in the test of the model.

Table 5-1 Data for Model Test

#	Test No.	Land Information (M2, M)			Floor No.	Floor Built Area M2					Condi.
		Area	Length	Width		GF	1st F	2nd F	3th F	4th F	%
1	Test 1	500	25	20	5	350	380	380	340	320	90
2	Test 2	500	25	20	2	310	330	0	0	0	80
3	Test 3	400	20	20	3	300	330	315	0	0	85
4	Test 4	300	20	15	1	225	0	0	0	0	95
5	Test 5	300	20	15	3	210	210	235	0	0	70

5.4 Model Tests Results

The test was conducted following the methodology described in Section 1.1. In this section, the researcher will set out all spreadsheets for test 1 (i.e., first real estate example) including calculation sheets as an

example for the test process, and only data entry and market value sheets for the other tests to avoid unnecessary repetition.

The following tables from table 5-2 to table 5-26 show all spreadsheets for test 1.

Table 5-2 Test 1, Data Entry and Market Value

Date	Plot #	Block #	City	Client	Owner

Plot Size	Length	Width	Area	Premeter M			Ex. Rate
	M	M	M^2	Regular Shape	Irregular Shape	Final	$ to SDG
	25	20	500	90	0	90	450

Building Data

Floor	M^2	T & K	Doors	Item	QTY
Ground Floor	350	4	8	Floors	4
First Floor	380	6	9	Elevators	0
Second Floor	380	6	8	Main gates	0
Third Floor	340	6	0	Building Age/ Years	Condition %
Fourth Floor	320	5	0	Staircase Tiles	No Steps Tiles
Annex	0	0	0	Air Conditioning Type & QTY	
General Works	0	0	0	Spilt / Window	0
Others	0	0	0	Water Cooling	0
Total	1,770				

Foundation Factor	11		% Profit	% Materials Waste
No. of Foundations	31.818		10%	10%
No. of Foundations Say	32		Buildings Cond. %	90%

Real Estate Estimated Market Value

Item	SDG	USD
Buildings	**290,956,442**	**663,943**
Land	**143,000,000**	**317,778**
Real Estate	**433,956,442**	**981,721**

Table 5-3 Sub-Structure & GF Materials Quantity

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1	Earth Work							
1	Excavation	350	1.05	M^3	367	10%	36.65	403
2	Backfill Local Material	350	0.72	M^3	253	10%	25.34	279
3	Backfill Selected Material	350	0.20	M^3	70	10%	7.00	77
2	R.C. Sub-structure							
	Foundation							
1	Lean Concete	350	0.06	M^3	22	10%	2.15	24
2	Concete Foundations	350	0.26	M^3	92	10%	9.16	101
3	Reinforcement Ø 16 mm	350	15.00	Kg	5,250	10%	525.00	5,775
4	Tie Wire	350	0.00	Bundel	1	0%	0.00	1
	Short Columns							
1	Concete Short Columns	350	0.05	M3	18	10%	1.75	19
2	Reinforcement Ø 16 mm	350	9.00	Kg	3,150	10%	315.00	3,465
3	Links Ø 8 mm	350	1.70	Kg	595	10%	59.50	655
4	Tie Wire	350	0.00	Bundel	1	0%	0.00	1
	Suspended Slab							
1	Concete Suspended Slab	350	0.23	M^3	81	10%	8.05	89
2	Reinforcement Ø 16 mm	350	21.00	Kg	7,350	10%	735.00	8,085
3	Reinforcement Ø 12 mm	350	14.00	Kg	4,900	10%	490.00	5,390
4	Beams Reinforcement Ø 16 mm	350	1.50	Kg	525	10%	52.50	578
5	Beams links Ø 8 mm	350	0.90	Kg	315	10%	31.50	347
6	Tie Wire	350	0.01	Bundel	2	0%	0.00	2
3	Ground Floor							
	Skeleton							
1	Columns Concrete	350	0.06	M^3	21	10%	2.10	23
2	Columns Reinforcement Ø 16 mm	350	6.00	Kg	2,100	10%	210.00	2,310
3	Columns Links Ø 8 mm	350	1.70	Kg	595	10%	59.50	655
4	Columns Tie Wire	350	1.00	Bundel	350	10%	35.00	385
5	Slab Concrete including beams	350	0.23	M3	81	10%	8.05	89
6	Reinforcement Ø 16 mm	350	21.00	Kg	7,350	10%	735.00	8,085
7	Reinforcement Ø 12 mm	350	14.00	Kg	4,900	10%	490.00	5,390
8	Beams Reinforcement Ø 16 mm	350	1.50	Kg	525	10%	52.50	578
9	Beams links Ø 8 mm	350	0.90	Kg	315	10%	31.50	347
10	Tie Wire	350	0.01	Bundel	4	0%	0.00	4

4	Masonry Work							
1	Concrete Masonry Unit	350	37.50	Unit	13,125	10%	1,312.50	14,438
2	Cement	350	0.03	Ton	11	10%	1.05	12
3	Sand	350	0.13	M^3	44	10%	4.38	48
5	Plaster Work							
	Ceiling							
1	Cement	350	0.01	Unit	5	10%	0.49	5
2	Sand	350	0.05	M^3	18	10%	1.75	19
	Walls							
3	Cement	350	0.08	Ton	29	10%	2.94	32
4	Sand	350	0.30	M^3	105	10%	10.50	116
6	Painting Work							
	Ceiling							
1	Surface smoothing paste	350	0.20	Kg	70	10%	7.00	77
2	Painting	350	0.33	Kg	116	10%	11.55	127
7	Walls							
1	Surface smoothing paste	350	1.20	Kg	420	10%	42.00	462
2	Painting	350	1.98	Kg	693	10%	69.30	762
8	Tiles Works							
	Floor							
1	Tiles	350	1.00	M^2	350		0.00	350
2	Cement	350	0.01	Ton	4		0.00	4
3	Sand	350	0.10	M^3	35		0.00	35
	Walls							
1	Tiles	350	0.74	M2	259	10%	25.90	285
2	Cement	350	0.01	Ton	3	10%	0.26	3
3	Sand	350	0.07	M^3	26	10%	2.59	28

9	Doors Works							
1	Gates Exterior	350	0.00	Unit	0	10%	0.00	0
2	Doors Interior	350	8.00	Unit	0	10%	0.00	0
10	Windows Works							
1	PVC / Aluminium windows	350	0.10	M^2	35	10%	3.50	39
11	Electrical Works							
	Electrical works by flat rate for m2	350	1.00	M^2	350	10%	35.00	385
12	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	4	1.00	Unit	4	10%	0.40	4
2	External Water supply & Sewage networks for floor including cost of material & workmanship	350	1.00	M^2	350	10%	35.00	385
13	Staircase							
1	Steps Tiles (going & rise) marble or granite	20	1.00	Step	20	10%	2.00	22
2	Handrail	7	1.00	M	7	10%	0.70	8
14	Elevator							
1	Elevator including installation	0	1.00	Unit	0	10%	0.00	0
15	Gypsum Work & Decoration							
1	Cornice length + 20% for other gypsum decoration	350	2.00	M	700	10%	70.00	770
16	Air conditioning Works							
1	Split / Window Type	0	1.00	Unit	0	10%	0.00	0
2	Water Cooler (Evaporators)	0	1.00	Unit	0	10%	0.00	0

Table 5-4 Basic Materials Updated Price List

Materials			Date	9/10/21	
#	Item	Unit	Price SDG	USD /SDG Ex. Rate	Price USD
1	Cement	Ton	80,000	450.00	177.78
2	Sand	M^3	4,700	450.00	10.44
3	Gravel	M^3	4,500	450.00	10.00
4	Backfill Selected Material	M^3	4,800	450.00	10.67
5	R. Mix Lean Concrete	M^3	43,000	450.00	95.56
6	R. Mix Reinforced Concrete	M^3	52,000	450.00	115.56
7	Reinforcement Ø 16 mm	Kg	400	450.00	0.89
8	Reinforcement Ø 12 mm	Kg	400	450.00	0.89
9	Reinforcement Ø 8 mm	Kg	455	450.00	1.01
10	Tie Wire	Bunde	17,000	450.00	37.78
11	Concrete Masonry Unit CMU	Unit	195	450.00	0.43
12	Surface smoothing paste	Kg	210	450.00	0.47
13	Painting	Kg	650	450.00	1.44
14	Floor Tiles	M^2	7,000	450.00	15.56
15	Wall Tiles	M^2	5,000	450.00	11.11
16	Gates Exterior	Unit	320,000	450.00	711.11
17	Doors Interior	Unit	150,000	450.00	333.33
18	Aluminum Windows inc. installation	M2	30,000	450.00	66.67
19	Toilets set	Set	150,000	450.00	333.33
20	Marble Steps (going & rise)	Step	100	450.00	0.22
21	Granite Steps (going & rise)	Step	100	450.00	0.22
22	decoration - material cost incl. in	M	0	450.00	0.00
23	Gypsum Cornich & other gypsum decoration - material cost incl. in workmanship unit price	M	0	450.00	0.00

Table 5-5Workmanship Updated Unit Cost

Workmanship			Date	9/10/22	
#	Item	Unit	Price SDG	USD /SDG Ex. Rate	Price USD
1	Design Cost	L.S	300,000	450.00	666.67
2	Governmental Fees	L.S	120,000	450.00	266.67
3	Site Cleaning	JOB	150,000	450.00	333.33
4	Survey Work	JOB	200,000	450.00	444.44
5	Backfill Selected Material / per site	JOB	90,000	450.00	200.00
6	Backfill Local Material / per site	JOB	90,000	450.00	200.00
7	Excavation	M^3	2,500	450.00	5.56
8	Cast Lean, R.C for foundation & Short Column	M^3	200	450.00	0.44
9	R. Mix Reinforced Concrete Cast	M^3	200	450.00	0.44
10	Formwork & rebar for foundation &	M^3	45,000	450.00	100.00
11	Formwork & rebar for floor Column	M^3	40,000	450.00	88.89
12	Formwork & rebar for Slab	M^3	12,000	450.00	26.67
13	Formwork & rebar staircase	JOB	80,000	450.00	177.78
14	Masonry Wall	M^2	2,000	450.00	4.44
15	Plaster work wall	M^2	1,000	450.00	2.22
16	Plaster work Celing	M^2	1,100	450.00	2.44
17	Painting work wall	M^2	1,000	450.00	2.22
18	Painting work Celing	M^2	1,100	450.00	2.44
19	Installation Floor Tiles	M^2	2,000	450.00	4.44
20	Installation Wall Tiles	M^2	2,200	450.00	4.89
21	Installation Gates Exterior	Unit	20,000	450.00	44.44
22	Installation doors Interior	Unit	15,000	450.00	33.33
23	Toilets set installation	Unit	50,000	450.00	111.11
24	Gypsum Cornich & other gypsum decoration - material cost included	M	3,000	450.00	6.67

Table 5-6 Sub-Structure & GF Materials Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Earth Work						
1.1	Backfill Selected Material	77	M^3	4,800	369,600.00	450	821.33
2	R.C. Sub-structure						
	Foundation						
2.1	Lean Concete	24	M^3	43,000	1,017,380.00	450	2,260.84
2.2	Concete Foundations	101	M^3	52,000	5,241,600.00	450	11,648.00
2.3	Reinforcement Ø 16 mm	5,775	Kg	400	2,310,000.00	450	5,133.33
2.4	Tie Wire	1	Bundel	17,000	19,833.33	450	44.07
3	Short Columns						
3.1	Concete Short Columns	19	M^3	52,000	1,001,000.00	450	2,224.44
3.2	Reinforcement Ø 16 mm	3,465	Kg	400	1,386,000.00	450	3,080.00
3.3	Links Ø 8 mm	655	Kg	455	297,797.50	450	661.77
3.4	Tie Wire	1	Bundel	17,000	19,833.33	450	44.07
4	Suspended Slab						
4.1	Concete Suspended Slab	89	M^3	52,000	4,604,600.00	450	10,232.44
4.2	Reinforcement Ø 16 mm	8,085	Kg	400	3,234,000.00	450	7,186.67
4.3	Reinforcement Ø 12 mm	5,390	Kg	400	2,156,000.00	450	4,791.11
4.4	Beams Reinforcement Ø 16 mm	578	Kg	400	231,000.00	450	513.33
4.5	Beams links Ø 8 mm	347	Kg	455	157,657.50	450	350.35
4.6	Tie Wire	2	Bundel	17,000	39,666.67	450	88.15
5	Ground Floor						
	Skeleton						
5.1	Columns Concrete	23	M^3	52,000	1,201,200.00	450	2,669.33
5.2	Columns Reinforcement Ø 16 mm	2,310	Kg	400	924,000.00	450	2,053.33
5.3	Columns Links Ø 8 mm	655	Kg	455	297,797.50	450	661.77
5.4	Columns Tie Wire	385	Bundel	17,000	6,545,000.00	450	14,544.44
5.5	Slab Concrete including beams	89	M^3	52,000	4,604,600.00	450	10,232.44
5.6	Reinforcement Ø 16 mm	8,085	Kg	400	3,234,000.00	450	7,186.67
5.7	Reinforcement Ø 12 mm	5,390	Kg	400	2,156,000.00	450	4,791.11
5.8	Beams Reinforcement Ø 16 mm	578	Kg	400	231,000.00	450	513.33
5.9	Beams links Ø 8 mm	347	Kg	455	157,657.50	450	350.35
5.10	Tie Wire	4		17,000	59,500.00	450	132.22
6	Masonry Work						
6.1	Concrete Masonry Unit	14,438	Unit	195	2,815,312.50	450	6,256.25
6.2	Cement	12	Ton	80,000	924,000.00	450	2,053.33
6.3	Sand	48	M^3	4,700	226,187.50	450	502.64
7	Plaster Work						
	Ceiling						
7.1	Cement	5	Ton	80,000	431,200.00	450	958.22
7.2	Sand	19	M3	4,700	90,475.00	450	201.06
	Walls				0.00	450	
7.3	Cement	32	Ton	80,000	2,587,200.00	450	5,749.33
7.4	Sand	116	M^3	4,700	542,850.00	450	1,206.33
8	Painting Work						
	Ceiling						
8.1	Surface smoothing paste	77	Unit	210	16,170.00	450	35.93
8.2	Painting	127	Kg	650	82,582.50	450	183.52
	Walls						
8.3	Surface smoothing paste	462	Unit	210	97,020.00	450	215.60
8.4	Painting	762	Kg	650	495,495.00	450	1,101.10

Table 5-6 Cont.

9	Tiles Works						
	Floor						
9.1	Tiles	350	M^2	7,000	2,450,000.00	450	5,444.44
9.2	Cement	4	Ton	80,000	280,000.00	450	622.22
	Sand	35	M^3	4,700	164,500.00	450	365.56
	Walls						
9.3	Tiles	285		5,000	1,424,500.00	450	3,165.56
9.4	Cement	3	Ton	80,000	227,920.00	450	506.49
	Sand	28	M^3	4,700	133,903.00	450	297.56
10	Doors Works						
10.1	Gates Exterior	1	Unit	320,000	320,000.00	450	711.11
10.2	Doors Interior	8	Unit	150,000	1,200,000.00	450	2,666.67
11	Windows Works						
11.1	PVC / Aluminium windows	39	M^2	30,000	1,155,000.00	450	2,566.67
12	Electrical Works						
12.1	Electrical Work for floor including cost of material & workmanship	350		8,100	2,835,000.00	450	6,300.00
13	Toilets & Kitchens Plumbing Works : no. of all for floor						
13.1	Internal plumbing works	4	Unit	150,000	660,000.00	450	1,466.67
13.2	External Water supply & Sewage networks for floor including cost of material & workmanship	350		2,700	945,000.00	450	2,100.00
14	Staircase						
14.1	No Steps Tiles	22	Step	0	0.00	450	0.00
14.2	Handrail	8	M	1	7.70	450	0.02
15	Elevator						
15.1	Elevator including installation	0	Unit	1	0.00	450	0.00
16	Gypsum Work & Decoration						
16.1	Cornice length + 20% for other gypsum decoration	770	M	1	770.00	450	1.71
17	Air conditioning Works						
17.1	Split / Window	0	Unit		0.00	450	0.00
17.2	Water Cooling	0	Unit		0.00	450	0.00
	Total				61,601,816.53		136,892.93

Table 5-7 Workmanship Cost for Sub-Structure & GF

#	Item	QTY	Unit	Unit Cost	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Engineering & Approval						
1.1	Design Cost	1	L.S	300,000	300,000	450	666.67
1.2	Governmental Fees	1	L.S	120,000	120,000	450	266.67
2	Site Preparation				0	450	0.00
2.1	Site Cleaning	1	L.S	150,000	150,000	450	333.33
2.2	Survey Work	1	L.S	200,000	200,000	450	444.44
3	Earth Work					450	0.00
3.1	Excavation	403	M^3	2,500	1,008,000	450	2,240.00
3.2	Backfill Local (per site)	1	L.S	90,000	90,000	450	200.00
3.3	Backfill Selected	1	M^3	90,000	90,000	450	200.00
4	Concrete Sub-structure						
4.1	Foundation						
4.2	Cast Lean, R.C for Foundation & Short Column	144	M^3	200	28,742	450	63.87
4.3	Formwork & Rebar for Foundation & Short Column	144	M^3	45,000	6,466,950	450	14,371.00
5	Suspended Slab						
5.1	Formwork & Rebar for Slab	350	M^2	12,000	4,200,000	450	9,333.33
6	Ground Floor						
	Skeleton						
6.1	Formwork & Rebar for Floor Column	23	M^3	40,000	924,000	450	2,053.33
6.2	Slab Concrete Including Beams	350	M2	12,000	4,200,000	450	9,333.33
6.3	Formwork & Rebar Staircase	1	Unit	80,000	80,000	450	177.78
7	Masonry Work						
7.1	Install Concrete Masonry Unit wall	875	M^2	2,000	1,750,000	450	3,888.89
8	Plaster Work						
8.1	Install Plaster for Walls	2100	M^2	1,000	2,100,000	450	4,666.67
8.2	Install Plaster for Ceiling	380	M^2	1,100	418,000	450	928.89
9	Painting Work						
9.1	Install Painting for Walls	2100	M^2	1,000	2,100,000	450	4,666.67
9.2	Install Painting for Ceiling	380	M^2	1,100	418,000	450	928.89
10	Tiles Works						
10.1	Install Tiles for Floor	350	M	2,000	700,000	450	1,555.56
10.2	Install Tiles for Walls	259	M	2,200	569,800	450	1,266.22
11	Staircase Works						
11.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
11.2	Handrail	8	M	1	8	450	0.02
12	Doors Works						
12.1	Install Exterior gates	1	Unit	20,000	20,000	450	44.44
12.2	Install Interior Doors	8	Unit	15,000	120,000	450	266.67

Table 5-7 Cont.

13	Windows Works						
13.1	Installation cost incl. in Material Unit Price	39	M^2	0	0	450	0.00
14	Electrical Works				0	450	0.00
14.1	Installation Cost incl. in Material Unit Price	385	M^2	0	0	450	0.00
15	Toilets & Kitchens Plumbing Works						
15.1	Internal Plumbing Works (per unit)	4	Unit	50,000	200,000	450	444.44
15.2	External Water Supply & Sewage Networks for Floor Including Cost of Material & Workmanship included in the unit price of the item in the material cost sheet	385	M^2	0	0	450	0.00
16	Sewage Well						
16.1	Sewage Well Works	1	Unit	0	0	450	0.00
17	Gypsum Work & Decoration						
17.1	Cornice & Other Gypsum Decoration - Material Cost Included	700	M	3,000	2,100,000	450	4,666.67
18	Elevator Work						
18.1	Installation Cost incl. in Material Unit Price	0	Unit	0	0	450	0.00
	Total				28,353,521.70		63,007.83

Table 5-8 First Floor Materials Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Columns Concrete	25	M^3	52,000	1,304,160	450	2,898.13
1.2	Columns Reinforcement Ø 16 mm	2,508	kg	400	1,003,200	450	2,229.33
1.3	Columns Links Ø 8 mm	711	kg	455	323,323	450	718.50
1.4	Columns Tie Wire	1	kg	17,000	23,687	450	52.64
1.5	Slab Concrete including beams	96	kg	52,000	4,999,280	450	11,109.51
1.6	Reinforcement Ø 16 mm	8,778	kg	400	3,511,200	450	7,802.67
1.7	Reinforcement Ø 12 mm	5,852	kg	400	2,340,800	450	5,201.78
1.8	Beams Reinforcement Ø 16 mm	627	kg	400	250,800	450	557.33
1.9	Beams links Ø 8 mm	376	kg	455	171,171	450	380.38
1.10	Tie Wire	1	Bund	17,000	21,533	450	47.85
2	Masonry Work						
2.1	Concrete Masonry Unit	13,167	Unit	195	2,567,565	450	5,705.70
2.2	Cement	11	kg	80,000	842,688	450	1,872.64
2.3	Sand	44	M^3	4,700	206,283	450	458.41
3	Plaster Work						
	Ceiling						
3.1	Cement	6	TON	80,000	468,160	450	1,040.36
3.2	Sand	21	M^3	4,700	98,230	450	218.29
4	Walls						
4.1	Cement	31	TON	80,000	2,481,248	450	5,513.88
4.2	Sand	111	M^3	4,700	520,619	450	1,156.93
5	Painting Work						
	Ceiling						
5.1	Surface smoothing paste	84	Kg	210	17,556	450	39.01
5.2	Painting	138	kg	650	89,661	450	199.25
	Walls				0	450	0.00
5.3	Surface smoothing paste	443		210	93,047	450	206.77
5.4	Painting	731		650	475,203	450	1,056.01
6	Tiles Works						
	Floor						
6.1	Tiles	418	M^2	7,000	2,926,000	450	6,502.22
6.2	Cement	4	Ton	80,000	334,400	450	743.11
6.3	Sand	42	M^3	4,700	196,460	450	436.58
	Walls						
6.4	Tiles	284	M^2	5,000	1,421,200	450	3,158.22
6.5	Cement	3	Ton	80,000	227,392	450	505.32
6.6	Sand	28	M^3	4,700	133,593	450	296.87
7	Doors Works				0	450	0.00
7.1	Doors Interior	9	Unit	150,000	1,350,000	450	3,000.00
8	Windows Works						
8.1	PVC / Aluminium windows	46	M^2	30,000	1,379,400	450	3,065.33
9	Electrical Works						
9.1	Electrical Work for floor including cost of material & workmanship	380	L.S	8,100	3,078,000	450	6,840.00
10	Toilets & Kitchens Plumbing Works : no. of all for floor						
10.1	Internal plumbing works	7	Unit	150,000	990,000	450	2,200.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship	380	L.S	2,700	1,026,000	450	2,280.00
11	Staircase						
11.1	No Steps Tiles	22	Set	0	0	450	0.00
11.2	Handrail	22	M		0	450	0.00
12	Gypsum Work & Decoration						
12.1	Cornice lengt + 20% for other gypsum decoration	836	M		0	450	0.00
	Total				34,871,859		77,493.02

Table 5-9 First Floor Workmanship Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	25	Unit	40,000	1,003,200	450	2,229.33
1.2	Slab Concrete including beams	380	M^2	12,000	4,560,000	450	10,133.33
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	798	M^2	2,000	1,596,000	450	3,546.67
3	Plaster Work						
3.1	Install plaster for Walls	2014	M^2	1,000	2,014,000	450	4,475.56
3.2	Install plaster for Ceiling	380	M^2	1,100	418,000	450	928.89
4	Painting Work						
4.1	Install Painting for Walls	2014	M^2	1,000	2,014,000	450	4,475.56
4.2	Install Painting for Ceiling	380	M^2	1,100	418,000	450	928.89
5	Tiles Works						
5.1	Install Tiles for Floor	380	M^2	2,000	760,000	450	1,688.89
5.2	Install Tiles for Walls	258.4	M^2	2,200	568,480	450	1,263.29
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
6.2	Handrail	22	M	1	22	450	0.05
7	Doors Works						
7.1	Install Interior Doors	9	Unit	15,000	135,000	450	300.00
8	Windows Works						
8.1	Installation cost incl. in material unit price	46	M^2	0	0	450	0.00
9	Electrical Works						
9.1	Installation cost incl. in material unit price	418	M^2	0	0	450	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	6	Unit	1	6	450	0.01
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	418	M^2	0	0	450	0.00
11	Gypsum Work & Decoration						
11.1	Cornice & other gypsum decoration	646	M	1	646	450	1.44
	Total				13,567,376.00		30,149.72

Table 5-10 Second Floor Material Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Columns Concrete	25	M^3	52,000	1,304,160.00	450	2,898.13
1.2	Columns Reinforcement Ø 16 mm	2,508	KG	400	1,003,200.00	450	2,229.33
1.3	Columns Links Ø 8 mm	711	KG	455	323,323.00	450	718.50
1.4	Columns Tie Wire	418	Bund	17,000	7,106,000.00	450	15,791.11
1.5	Slab Concrete including beams	96	M^3	52,000	4,999,280.00	450	11,109.51
1.6	Reinforcement Ø 16 mm	8,778	KG	400	3,511,200.00	450	7,802.67
1.7	Reinforcement Ø 12 mm	5,852	KG	400	2,340,800.00	450	5,201.78
1.8	Beams Reinforcement Ø 16 mm	627	KG	400	250,800.00	450	557.33
1.9	Beams links Ø 8 mm	376	KG	455	171,171.00	450	380.38
1.10	Tie Wire	1	Bund	17,000	21,533.33	450	47.85
2	Masonry Work				0.00	450	0.00
2.1	Concrete Masonry Unit	13,167	Unit	195	2,567,565.00	450	5,705.70
2.2	Cement	11	Ton	80,000	842,688.00	450	1,872.64
2.3	Sand	44	M^3	4,700	206,283.00	450	458.41
3	Plaster Work				0.00	450	0.00
	Ceiling				0.00	450	0.00
3.1	Cement	6	Ton	80,000	468,160.00	450	1,040.36
3.2	Sand	21	M^3	4,700	98,230.00	450	218.29
4	Walls				0.00	450	0.00
4.1	Cement	31	Ton	80,000	2,481,248.00	450	5,513.88
4.2	Sand	111	M^3	4,700	520,619.00	450	1,156.93
5	Painting Work				0.00	450	0.00
	Ceiling				0.00	450	0.00
5.1	Surface smoothing paste	84	KG	210	17,556.00	450	39.01
5.2	Painting	138	KG	650	89,661.00	450	199.25
	Walls				0.00	450	0.00
5.3	Surface smoothing paste	443	KG	210	93,046.80	450	206.77
5.4	Painting	731	KG	650	475,203.30	450	1,056.01
6	Tiles Works				0.00	450	0.00
	Floor				0.00	450	0.00
6.1	Tiles	418	M2	7,000	2,926,000.00	450	6,502.22
6.2	Cement	4	Ton	80,000	334,400.00	450	743.11
6.3	Sand	42	M^3	4,700	196,460.00	450	436.58
	Walls				0.00	450	0.00
6.4	Tiles	284	M^2	5,000	1,421,200.00	450	3,158.22
6.5	Cement	3	Ton	80,000	227,392.00	450	505.32
6.6	Sand	28	M^3	4,700	133,592.80	450	296.87
7	Doors Works				0.00	450	0.00
7.1	Doors Interior	6	Unit	150,000	900,000.00	450	2,000.00
8	Windows Works				0.00	450	0.00
8.1	PVC / Aluminium windows	46	M^2	30,000	1,379,400.00	450	3,065.33
9	Electrical Works				0.00	450	0.00
9.1	Electrical Work for floor including cost of material & workmanship	380	L.S	8,100	3,078,000.00	450	6,840.00
10	Toilets & Kitchens Plumbing Works : no. of all for floor				0.00	450	0.00
10.1	Internal plumbing works	7	Unit	150,000	990,000.00	450	2,200.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship	380	L.S	2,700	1,026,000.00	450	2,280.00
11	Staircase				0.00	450	0.00
11.1	No Steps Tiles	22	Step	0	0.00	450	0.00
11.2	Handrail	22	Step		0.00	450	0.00
12	Gypsum Work & Decoration				0.00	450	0.00
	Cornice lengt + 20% for other gypsum decoration	836	M^2		0.00	450	0.00
	Total				41,504,172.23		92,231.49

Table 5-11 Second Floor Workmanship Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	32	Unit	40,000	1,280,000	450	2,844.44
1.2	Slab Concrete including beams	380	M^2	12,000	4,560,000	450	10,133.33
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	798	M^2	2,000	1,596,000	450	3,546.67
3	Plaster Work						
3.1	Install plaster for Walls	2014	M^2	1,000	2,014,000	450	4,475.56
3.2	Install plaster for Ceiling	380	M^2	1,100	418,000	450	928.89
4	Painting Work						
4.1	Install Painting for Walls	2014	M^2	1,000	2,014,000	450	4,475.56
4.2	Install Painting for Ceiling	380	M^2	1,100	418,000	450	928.89
5	Tiles Works						
5.1	Install Tiles for Floor	380	M^2	2,000	760,000	450	1,688.89
5.2	Install Tiles for Walls	258	M^2	2,200	568,480	450	1,263.29
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
6.2	Handrail	22	M	1	22	450	0.05
7	Doors Works						
7.1	Install Interior Doors	8	Unit	15,000	120,000	450	266.67
8	Windows Works						
8.1	Installation cost incl. in material unit price	46	M^2	1	46	450	0.10
9	Electrical Works						
9.1	Installation cost incl. in material unit price	418	M^2	0	0	450	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	6	Unit	50,000	300,000	450	666.67
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	380	M2	0	0	450	0.00
11	Gypsum Work & Decoration						
11.1	Cornice & other gypsum decoration	646	M	1	646	450	1.44
	Total				14,129,215.98		31,398.26

Table 5-12 Third Floor Materials Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Third Floor						
	Skeleton						
1.1	Columns Concrete	22	M^3	52,000	1,166,880	450	2,593.07
1.2	Columns Reinforcement Ø 16 mm	2,244	Kg	400	897,600	450	1,994.67
1.3	Columns Links Ø 8 mm	636	Kg	455	289,289	450	642.86
1.4	Columns Tie Wire	374	Bund	17,000	6,358,000	450	14,128.89
1.5	Slab Concrete including beams	86	M^3	52,000	4,473,040	450	9,940.09
1.6	Reinforcement Ø 16 mm	7,854	Kg	400	3,141,600	450	6,981.33
1.7	Reinforcement Ø 12 mm	5,236	Kg	400	2,094,400	450	4,654.22
1.8	Beams Reinforcement Ø 16 mm	561	Kg	400	224,400	450	498.67
1.9	Beams links Ø 8 mm	337	Kg	455	153,153	450	340.34
1.10	Tie Wire	1	Bund	17,000	19,267	450	42.81
2	Masonry Work				0	450	0.00
2.1	Concrete Masonry Unit	11,781	Unit	195	2,297,295	450	5,105.10
2.2	Cement	9	Ton	80,000	753,984	450	1,675.52
2.3	Sand	39	M^3	4,700	184,569	450	410.15
3	Plaster Work				0	450	0.00
	Ceiling				0	450	0.00
3.1	Cement	5	Ton	80,000	418,880	450	930.84
3.2	Sand	19	M^3	4,700	87,890	450	195.31
	Walls				0	450	0.00
3.4	Cement	28	Ton	80,000	2,220,064	450	4,933.48
3.5	Sand	99	M^3	4,700	465,817	450	1,035.15
4	Painting Work				0	450	0.00
	Ceiling				0	450	0.00
4.1	Surface smoothing paste	75	Kg	210	15,708	450	34.91
4.2	Painting	123	Kg	650	80,223	450	178.27
	Walls				0	450	0.00
4.3	Surface smoothing paste	396	Kg	210	83,252	450	185.01
4.5	Painting	654	Kg	650	425,182	450	944.85
5	Tiles Works				0	450	0.00
	Floor				0	450	0.00
5.1	Tiles	374	M^2	7,000	2,618,000	450	5,817.78
5.2	Cement	4	Ton	80,000	299,200	450	664.89
5.3	Sand	37	M^3	4,700	175,780	450	390.62
	Walls				0	450	0.00
5.4	Tiles	254	M^2	5,000	1,271,600	450	2,825.78
5.3	Cement	3	Ton	80,000	203,456	450	452.12
5.4	Sand	25	M^3	4,700	119,530	450	265.62
6	Doors Works				0	450	0.00
6.1	Doors Interior	0		0	0	450	0.00
7	Windows Works				0	450	0.00
7.1	PVC / Aluminium windows	41	M^2	30,000	1,234,200	450	2,742.67
8	Electrical Works				0	450	0.00
8.1	Electrical Work for floor including cost of material & workmanship	340	L.S	8,100	2,754,000	450	6,120.00
9	Toilets & Kitchens Plumbing Works : no. of all for floor				0	450	0.00
9.1	Internal plumbing works	7	Unit	150,000	990,000	450	2,200.00
9.2	External Water supply & Sewage networks for floor including cost of material & workmanship	340	L.S	2,700	918,000	450	2,040.00
10	Staircase				0	450	0.00
9.3	No Steps Tiles	22	Step	0	0	450	0.00
9.4	Handrail	22			0	450	0.00
11	Gypsum Work & Decoration				0	450	0.00
11.1	Cornice lengt + 20% for other gypsum decoration	748	M^2		0	450	0.00
	Total				36,434,259		80,965.02

Table 5-13 Third Floor Workmanship Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	32	Unit	40,000	1,280,000	450	2,844.44
1.2	Slab Concrete including beams	340	M^2	12,000	4,080,000	450	9,066.67
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	714	M^2	2,000	1,428,000	450	3,173.33
3	Plaster Work						
3.1	Install plaster for Walls	1802	M^2	1,000	1,802,000	450	4,004.44
3.2	Install plaster for Ceiling	340	M^2	1,100	374,000	450	831.11
4	Painting Work						
4.1	Install Painting for Walls	1802	M^2	1,000	1,802,000	450	4,004.44
4.2	Install Painting for Ceiling	340	M^2	1,100	374,000	450	831.11
5	Tiles Works						
5.1	Install Tiles for Floor	340	M^2	2,000	680,000	450	1,511.11
5.2	Install Tiles for Walls	231	M^2	2,200	508,640	450	1,130.31
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
6.2	Handrail	22	M	1	22	450	0.05
7	Doors Works						
7.1	Install Interior Doors	0	Unit	15,000	0	450	0.00
8	Windows Works						
8.1	Install Windwos incl. in unit price	41	M^2	1	41	450	0.09
9	Electrical Works						
9.1	Installation cost incl. in material unit price	374	M^2	1	374	450	0.83
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	6	Unit	50,000	300,000	450	666.67
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	374	M^2		0	450	0.00
11	Gypsum Work & Decoration						
11.1	Cornice & other gypsum decoration	578	M	1	578	450	1.28
	Total				12,709,677.14		28,243.73

Table 5-14 Fourth Floor Materials Cost

Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
Fourth Floor						
Skeleton						
Columns Concrete	21	M^3	52,000	1,098,240.00	450	2,440.53
Columns Reinforcement Ø 16 mm	2,112	KG	400	844,800.00	450	1,877.33
Columns Links Ø 8 mm	598	KG	455	272,272.00	450	605.05
Columns Tie Wire	352	Bundel	17,000	5,984,000.00	450	13,297.78
Slab Concrete including beams	81	M^3	52,000	4,209,920.00	450	9,355.38
Reinforcement Ø 16 mm	7,392	KG	400	2,956,800.00	450	6,570.67
Reinforcement Ø 12 mm	4,928	KG	400	1,971,200.00	450	4,380.44
Beams Reinforcement Ø 16 mm	528	KG	400	211,200.00	450	469.33
Beams links Ø 8 mm	317	KG	455	144,144.00	450	320.32
Tie Wire	1	Bundel	17,000	18,133.33	450	40.30
Masonry Work	0			0.00	450	0.00
Concrete Masonry Unit	11,088	Unit	195	2,162,160.00	450	4,804.80
Cement	9	Ton	80,000	709,632.00	450	1,576.96
Sand	37	M^3	4,700	173,712.00	450	386.03
Plaster Work	0			0.00	450	0.00
Ceiling	0			0.00	450	0.00
Cement	5	Ton	80,000	394,240.00	450	876.09
Sand	18	M^3	4,700	82,720.00	450	183.82
Walls	0			0.00	450	0.00
Cement	26	Ton	80,000	2,089,472.00	450	4,643.27
Sand	93	M^3	4,700	438,416.00	450	974.26
Painting Work	0			0.00	450	0.00
Ceiling	0			0.00	450	0.00
Surface smoothing paste	70	KG	210	14,784.00	450	32.85
Painting	116	KG	650	75,504.00	450	167.79
Walls	0			0.00	450	0.00
Surface smoothing paste	373	KG	210	78,355.20	450	174.12
Painting	616	KG	650	400,171.20	450	889.27
Tiles Works	0			0.00	450	0.00
Floor	0			0.00	450	0.00
Tiles	352	M^2	7,000	2,464,000.00	450	5,475.56
Cement	4	Ton	80,000	281,600.00	450	625.78
Sand	35	M^3	4,700	165,440.00	450	367.64
Walls	0			0.00	450	0.00
Tiles	239	M^2	5,000	1,196,800.00	450	2,659.56
Cement	2	Ton	80,000	191,488.00	450	425.53
Sand	24	M^3	4,700	112,499.20	450	250.00
Doors Works	0			0.00	450	0.00
Doors Interior	0	Unit	0	0.00	450	0.00
Windows Works	0			0.00	450	0.00
PVC / Aluminium windows	39	M^2	30,000	1,161,600.00	450	2,581.33
Electrical Works	0			0.00	450	0.00
Electrical Work for floor including cost of material & workmanship	352	L.S	8,100	2,851,200.00	450	6,336.00
Toilets & Kitchens Plumbing Works : no. of all for floor	0			0.00	450	0.00
Internal plumbing works	28	Unit	150,000	4,125,000.00	450	9,166.67
External Water supply & Sewage networks for floor including cost of material & workmanship	352	L.S	2,700	950,400.00	450	2,112.00
Staircase	0			0.00	450	0.00
No Steps Tiles	22	Step	0	0.00	450	0.00
Handrail	22	M		0.00	450	0.00
Gypsum Work & Decoration	0			0.00	450	0.00
Cornice lengt + 20% for other gypsum decoration	704	M^2		0.00	450	0.00
Total				37,829,902.93		84,066.45

Table 5-15 Fourth Floor Workmanship Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	32	Unit	40,000	1,280,000	450	2,844.44
1.2	Slab Concrete including beams	320	M^2	12,000	3,840,000	450	8,533.33
1.3	Formwork & rebar staircase	0	Unit	80,000	0	450	0.00
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	672	M^2	2,000	1,344,000	450	2,986.67
3	Plaster Work						
3.1	Install plaster for Walls	1696	M^2	1,000	1,696,000	450	3,768.89
3.2	Install plaster for Ceiling	320	M^2	1,100	352,000	450	782.22
4	Painting Work						
4.1	Install Painting for Walls	1696	M^2	1,000	1,696,000	450	3,768.89
4.2	Install Painting for Ceiling	320	M^2	1,100	352,000	450	782.22
5	Tiles Works						
5.1	Install Tiles for Floor	320	M^2	2,000	640,000	450	1,422.22
5.2	Install Tiles for Walls	217.6	M^2	2,200	478,720	450	1,063.82
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
6.2	Handrail	22	M	1	22	450	0.05
7	Doors Works						
7.1	Install Interior Doors	0	Unit	15,000	0	450	0.00
8	Windows Works				0	450	0.00
8.1	Install Windwos incl. in unit price	39	M^2	1	39	450	0.09
9	Electrical Works						
9.1	Installation cost incl. in material unit price	352	M^2	0	0	450	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	5	Unit	50,000	250,000	450	555.56
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	352	M^2	0	0	450	0.00
11	Gypsum Work & Decoration						
11.1	Cornice & other gypsum decoration	544	M	1	544	450	1.21
	Total				11,929,346.72		26,509.66

Table 5-16 External Works - Cost of Materials

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wal**l (M.L Factors)						
	Foundation						
1.1	Concete Foundations	22	M^3	52,000	1,158,300.00	450	2,574.00
1.2	Reinforcement Ø 16 mm	1,485	Kg	400	594,000.00	450	1,320.00
	Columns						
1.3	Columns Concrete	5	M3	52,000	257,400.00	450	572.00
1.4	Columns Reinforcement Ø 16 mm	693	Kg	400	277,200.00	450	616.00
1.5	Columns Links Ø 8 mm	208	Kg	455	94,594.50	450	210.21
1.6	Tie Wire for the boundary wall	0	Bundel	17,000	5,610.00	450	12.47
	Masonry Work						
1.7	Concrete Masonry Unit	4,455	Unit	195	868,725.00	450	1,930.50
1.8	Cement	4	Ton	80,000	285,120.00	450	633.60
1.9	Sand	15	M^3	4,700	69,795.00	450	155.10
	Plaster Work						
1.10	Cement	4	Ton	80,000	332,640.00	450	739.20
1.11	Sand	24	M^3	4,700	111,672.00	450	248.16
	Painting Work						
1.12	Surface smoothing paste	119	Kg	210	24,948.00	450	55.44
1.13	Painting	196	Kg	650	127,413.00	450	283.14
2	Tiles Works for Landscape						
	Floor						
2.1	Tiles	99	M2	7,000	693,000.00	450	1,540.00
2.2	Cement	1	Ton	80,000	79,200.00	450	176.00
2.3	Sand	10	M^3	4,700	46,530.00	450	103.40
3	Doors Works						
3.1	Main Gates	0	Unit	320,000	0.00	450	0.00
	Total				5,026,147.50		11,169.22

Table 5-17 External Works - Materials Cost

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wall** (M.L Factors)						
	Earth Work						
1.1	Excavation	84	M^3	2,500	208,828	450	464.06
1.2	Backfill Local (per site)	1	L.S	90,000	90,000	450	200.00
	Concrete						
1.3	Cast Lean, R.C for Foundation & Column	34.38	Unit	200	6,876	450	15.28
1.4	Formwork & Rebar for Foundation & Column	34.38	Unit	35	1,203	450	2.67
	Masonry Work				0	450	0.00
1.5	Install Concrete Masonry Unit Wall	270	M^2	2,000	540,000	450	1,200.00
	Plaster Work						
1.6	Install Plaster for Walls	540	M^2	1,000	540,000	450	1,200.00
1.7	Install Plaster for Ceiling	540	M^2	1,100	594,000	450	1,320.00
	Painting Work						
1.8	Install Painting for Walls	540	M^2	1,000	540,000	450	1,200.00
1.9	Install Painting for Ceiling	540	M^2	1,100	594,000	450	1,320.00
2	Tiles Works for Yard						
	Install Tiles for Floor	150	M	2,000	300,000	450	666.67
3	Doors Works						
3.1	Install Exterior Gates	0	Unit	20,000	0	450	0.00
	Total				3,414,906.90		7,588.68

Table 5-18 Sub-Structure & GF Construction Cost

Item	SDG	USD
Engineering & Approval Fees	420,000.00	933.33
Materials Cost	61,601,816.53	136,892.93
Workmanship Cost	28,353,521.70	63,007.83
Sub -Total	90,375,338.23	200,834.08
Total Cost	90,576,172.32	200,834.08

Table 5-19 First Floor Construction Cost

#	Item	SDG	USD
1	Materials Cost	34,871,858.90	77,493.02
2	Workmanship Cost	13,567,376.00	30,149.72
	Sub -Total	48,439,234.90	107,642.74
	Total Cost	48,439,234.90	107,642.74

Table 5-20 Second Floor Construction Cost

#	Item	SDG	USD
1	Materials Cost	41,504,172.23	92,231.49
2	Workmanship Cost	14,129,215.98	31,398.26
	Sub -Total	55,633,388.21	123,629.75
	Total Cost	55,757,017.96	123,629.75

Table 5-21Third Floor Construction Cost

Item	SDG	USD
Materials Cost	36,434,259.37	80,965.02
Workmanship Cost	12,709,677.14	28,243.73
Sub -Total	49,143,936.51	109,208.75
Total Cost	49,253,145.25	109,208.75

Table 5-22 Fourth Floor Construction Cost

#	Item	SDG	USD
1	Materials Cost	37,829,902.93	84,066.45
2	Workmanship Cost	11,929,346.72	26,509.66
	Sub -Total	49,759,249.65	110,576.11
	Total Cost	49,869,825.76	110,576.11

Table 5-23 External Works - Construction Cost

#	Item	SDG	USD
1	Materials Cost	5,026,147.50	11,169.22
2	Workmanship Cost	3,414,906.90	7,588.68
	Sub -Total	8,441,054.40	18,757.90
	Total Cost	8,459,812.29	18,757.90

Table 5-24 Construction Cost & Current Value

#	Item	Area M2	Cost SDG	Cost USD
1.00	Ground Floor	350.00	90,576,172.32	200,834.08
2.00	First Floor	380.00	48,439,234.90	107,642.74
3.00	Second Floor	380.00	55,757,017.96	123,629.75
4.00	Third Floor	340.00	49,253,145.25	109,208.75
5.00	Fourth Floor	320.00	49,869,825.76	110,576.11
6.00	External Works		8,441,054.40	18,757.90
	Total Estimated Buildings Cost		293,895,396.20	670,649.34
	Profit %		10%	10%
	Profit Amount		29,389,539.62	67,064.93
	New Constructed Buildings Value		323,284,935.82	737,714.27
	Current Buildings Conditions %		90%	
	Current Constructed Buildings Value		290,956,442.24	663,942.84

Table 5-25: Land Valuation

Date	Plot #	Block #	Area M^2	Neighborhood	City	Owner	
11/03/22	0	0	500		0	0	
Characteristics	Normal	$ Ex. Rate	450	Currency	SDG		
Comparable #	**Subject Land**	**1**	**2**	**3**	**4**	**5**	**6**
Characteristics	Excellent	**Excellent**			**Normal**		
Area M^2	400	500	400	450	380	420	400
Sale Value	-	150,000,000	140,000,000	160,000,000	120,000,000	100,000,000	110,000,000
M2 Price	-	300,000	350,000	355,556	315,789	238,095	275,000
Today	11/03/2022	11/03/2022	11/03/2022	11/03/2022	11/03/2022	11/03/2022	11/03/2022
Sale Date	11/03/2022	16/03/2021	21/02/2021	05/06/2021	08/07/2021	12/12/2020	1/1/2021
Time Lag	0	11	12	9	8	14	5
$ Ex. Rate	450	410	400	420	450	380	390
$ Ex. Rate Diff.	0	40	50	30	0	70	60
$ Ex. Rate Diff. %	0.00%	9.76%	12.50%	7.14%	0.00%	18.42%	15.38%
M^2 Adjustments							
Sale Time Adjust		329,268	393,750	380,952	315,789	281,955	317,308
Average		358,310			307,710		
Subject Land Estimated Market Value							
Characteristics		**If Excellent**			**If Normal**		
M^2 Estimated Value		358,310			307,710		
Plot Estimated Value		143,323,897					
Plot Estimated Value Rounded		**143,000,000**					

Table 5-26: Real Estate Market Value

Item	SDG	USD
Buildings Value	290,956,442.24	663,942.84
Land Value	143,000,000.00	317,777.78
Real Estate	433,956,442.24	981,720.62

5.5 Real Estate No. 2

Table 5-27 shows information and results of test no. 2, complete calculation sheets were included in appendix B.

Table 5-27: Test No. 2 Results

Date	Plot #	Block #	City	Client	Owner

Plot Size	Length	Width	Area	Premeter M			Ex. Rate
	M	M	M^2	Regular Shape	Irregular Shape	Final	$ to SDG
	25	20	500	90	0	90	450

Building Data

Floor	M^2	T & K	Doors
Ground Floor	310	5	9
First Floor	330	6	10
Second Floor	0	0	0
Third Floor	0	0	0
Fourth Floor	0	0	0
Annex	0	0	0
General Works	0	0	0
Others	0	0	0
Total	640		

Item	QTY
Floors	2
Elevators	0
Main gates	0
Building Age/ Years	Condition %
Staircase Tiles	No Steps Tiles
Air Conditioning Type & QTY	
Split / Window	0
Water Cooling	0

Foundation Factor	11
No. of Foundations	28.182
No. of Foundations Say	29

% Profit	% Materials Waste
10%	10%
Buildings Cond. %	80%

Real Estate Estimated Market Value

Item	SDG	USD
Buildings	135,327,946	329,761
Land	126,000,000	280,000
Real Estate	261,327,946	609,761

5.6 Real Estate No. 3

Table 5-28 shows information and results of test no. 2, complete calculation sheets were included in appendix C.

Table 5-28: Test No. 3 Results

Date	Plot #	Block #	City	Client	Owner

Plot Size	Length	Width	Area	Premeter M			Ex. Rate
	M	M	M^2	Regular Shape	Irregular Shape	Final	$ to SDG
	25	20	500	90	0	90	450

Building Data

Floor	M2	T & K	Doors	Item	QTY
Ground Floor	300	5	9	Floors	3
First Floor	330	7	10	Elevators	0
Second Floor	315	6	11	Main gates	0
Third Floor	0	0	0	Building Age/ Years	Condition %
Fourth Floor	0	0	0	Staircase Tiles	nite Steps (going & rise)
Annex	0	0	0	Air Conditioning Type & QTY	
General Works	0	0	0	Spilt / Window	0
Others	0	0	0	Water Cooling	0
Total	945				

Foundation Factor	11
No. of Foundations	27.273
No. of Foundations Say	28

% Profit	% Materials Waste
10%	10%
Buildings Cond. %	85%

Real Estate Estimated Market Value

Item	SDG	USD
Buildings	**184,775,799**	**441,284**
Land	**121,000,000**	**268,889**
Real Estate	**305,775,799**	**710,173**

5.7 Real Estate No. 4

Table 5-29 shows information and results of test no. 2, complete calculation sheets were included in appendix D.

Table 5-29: Test No. 4 Results

Date	Plot #	Block #	City	Client	Owner

Plot Size	Length	Width	Area	Premeter M			Ex. Rate
	M	M	M^2	Regular Shape	Irregular Shape	Final	$ to SDG
	25	20	500	90	0	90	450

Building Data

Floor	M2	T & K	Doors	Item	QTY
Ground Floor	300	5	10	Floors	1
First Floor	0	0	0	Elevators	0
Second Floor	0	0	0	Main gates	0
Third Floor	0	0	0	Building Age/ Years	Condition %
Fourth Floor	0	0	0	Staircase Tiles	No Steps Tiles
Annex	0	0	0	Air Conditioning Type & QTY	
General Works	0	0	0	Spilt / Window	0
Others	0	0	0	Water Cooling	0
Total	300				

Foundation Factor	11
No. of Foundations	27.273
No. of Foundations Say	28

% Profit	% Materials Waste
10%	10%
Buildings Cond. %	95%

Real Estate Estimated Market Value

Item	SDG	USD
Buildings	**111,383,925**	**282,042**
Land	**137,000,000**	**304,444**
Real Estate	**248,383,925**	**586,487**

5.8 Real Estate No. 5

Table 5-30 shows information and results of test no. 2, complete calculation sheets were included in appendix E.

Table 5-30: Test No. 5 Results

Date	Plot #	Block #	City	Client	Owner

Plot Size	Length	Width	Area	Premeter M			Ex. Rate
	M	M	M^2	Regular Shape	Irregular Shape	Final	$ to SDG
	25	20	500	90	0	90	450

Building Data

Floor	M2	T & K	Doors	Item	QTY
Ground Floor	210	4	9	Floors	3
First Floor	210	3	8	Elevators	0
Second Floor	235	4	8	Main gates	0
Third Floor	0	0	0	Building Age/ Years	Condition %
Fourth Floor	0	0	0	Staircase Tiles	No Steps Tiles
Annex	0	0	0	Air Conditioning Type & QTY	
General Works	0	0	0	Spilt / Window	0
Others	0	0	0	Water Cooling	0
Total	655				

Foundation Factor	11
No. of Foundations	19.091
No. of Foundations Say	20

% Profit	% Materials Waste
10%	10%
Buildings Cond. %	70%

Real Estate Estimated Market Value

Item	SDG	USD
Buildings	**107,027,248**	**264,819**
Land	**105,000,000**	**233,333**
Real Estate	**212,027,248**	**498,153**

5.9 Model Results vs. Manual results

Having used the model to calculate the market value of the five real estates assigned for the model testing, those market values were compared with those that had previously been calculated using manual calculations.

Table 5 31 shows both values: those generated by the model values and those that were manually calculated. It also shows the differences between these values in terms of SDG and percentage.

Table 5-31: Model Results vs. Manual Results

#	Test #	Model Value SDG	Manual Value SDG	Difference	
				SDG	%
1	Test 1	433,956,442.24	461,295,698.10	-27,339,255.86	-5.93%
2	Test 2	261,327,945.64	242,512,333.55	18,815,612.09	7.76%
3	Test 3	305,775,799.42	303,329,593.03	2,446,206.40	0.81%
4	Test 4	248,383,925.11	270,986,862.30	-22,602,937.19	-8.34%
5	Test 5	212,027,247.81	219,236,174.23	-7,208,926.43	-3.29%

5.10 Analysis of Model Test Results

As shown in Table 5-31 above, the real estate market values generated by the model are relatively close to those that were manually calculated.

Table 5-31 also shows the differences between the two values in percentages. Some of the model-generated market values are less than those that were manually calculated (indicated by a negative sign), while others exceed the manually calculated values (indicated by a positive sign).

As shown in Table 7-1, the maximum percentage of the negative value is -8.34%, and for the positive value is 7.76 %

5.11 Model Precision

For practical use of the model, the model precision should be estimated. Calculating the arithmetic mean for the lowest and highest model-generated values sets up the range of the expected market value of the subject real estate.

To calculate the arithmetic mean:

$$\bar{A} = \sum A / n$$

Where:

$\bar{A}$ = Arithmetic mean, A = Model generated values, n = Number of generated values, $\sum A$ = Sum for generated values

Equation 5-1

Mean for percentage of values below the manual calculation =

$$((-5.93\%) + (-8.34\%) + (-3.29\%)) \div 3 = -5.85\%$$

Mean for percentage of values exceeding the manual calculation =

$$(7.76\% + 0.81\%) \div 2 = 4.28\%$$

Accordingly, the real estate market value generated by the model could be less than the manually calculated value by 5.85%, or could exceed the manually calculated value by 4.28. For approximation, let us round both values to 5%.

It should be borne in mind that the valuation process is a value opinion. Therefore, for practical use of the model, the upper value of market value is

expected to be + 5% and the lower value is -5%. Accordingly, we can conclude that:

Model Precision = ±5%

5.12 Conclusions about the Model

I. Mathematical models can be used in the valuation process.
II. Mathematical models can estimate assets' market values with acceptable accuracy.
III. Mathematical models save time compared to manual calculation.

CHAPTER VI

Conclusions and Recommendations

Finally, and after this research work, the researcher came up with some useful conclusions and recommendations for the valuation practice in unstable and inefficient market, such as Sudan at present.

6.1 Conclusions of the Local Practice Assessment

To sum up:

I. Most of the examined valuation reports did not comply with the framework of the IVS.
II. Compared to general standards, only half of the general standards of the IVS were satisfied.
III. In most cases, the expert selected and applied the valuation method in a reasonably acceptable way.
IV. In all examined valuation reports, experts did not state any information about environmental hazards and topographical conditions.

6.2 Conclusions of Public Trust Assessment

I. To some extent, the community trusts the professional practice in Sudan, but they believe that valuation experts

tend to underestimate assets' values and that brokers may provide accurate values.

6.3 Conclusions of Construction Cost Model

I. Considering all discussions about the current market instability in Sudan, valuation approaches and valuation uncertainty, it is recommended that valuation experts should use the model developed in the present study to estimate the market value of real estate in Sudan. With precision of ±5% , the model can be statistically classified as producing reliable market values.

6.4 Recommendations to Improve Local Practice and Public Trust

I. Local valuation experts should improve their skills in professional reporting.
II. Professional training programs should be adopted by the authorities to qualify asset valuation experts.
III. Universities should adopt academic degrees (i.e., Master of Science or diploma) in asset valuation to qualify future experts.
IV. Authorities should constitute a regulatory body to organize the asset valuation profession.
V. National valuation practice standards should be developed or any of the international standards should be adopted.

VI. A professional code of ethics should be developed to improve public trust in the valuation profession.

6.5 Recommendations Construction Cost Model

I. In sum, the most valuable feature of the model is its time-saving nature. Using the model to generate market values for real estate is significantly quicker than the classical manual method.
II. The model can be used to calculate quantities of construction materials and workmanship for the category of buildings that the model supports.
III. Also, contractors can depend on the model to estimate contract value, especially in lump sum contracts.
IV. Valuation service applicants can use the model values submitted by valuation firms.

6.6 Further Research

I. A study to develop a new model that covers other categories and types of buildings (i.e., commercial, schools, steel structures, administrational, ….).
II. A research to develop a model applicable for industrial assets valuation
III. A study on the relation between the three main valuation approaches in unstable markets.

IV. A research on using artificial intelligence in assets valuation.

V. A study to examine the effect of forced sale act on the collected value of the asset when sold.

References List

1. The Appraisal Foundation, (2018- 2019), Uniform Standards of Professional Appraisal Practice - USPAP
2. International Valuation Standards Council- IVSC, (2020) International Valuation Standards -IVS
3. Royal Institution of Chartered Surveyors -RICS, (2017), RICS Valuation – Global Standards -Red Book
4. Appraisal Institute, (2012) , Making Sense of The Nonsense Providing Credible Appraisals in A Declining Market
5. Appraisal Institute (2018) ,Principles of Mathematical Modelling, Ideas, Methods and Examples
6. Appraisal Institute, (2012) ,Appraisal Methods for Real Property
7. Appraisal Institute, (2013) ,Understanding the Appraisal
8. Branko Bozic1, Dragana Milicevic, Marko Pejic, Stevan Marosan ,(2013), The use of multiple linear regression in property valuation.
9. Hakan Yaman, Elçin Tas, (2013), A building cost estimation model based on functional elements.
10. Information Technology Services , (2017), Advanced Formulas and Functions in Microsoft Excel.
11. Joint Federal Government / Industry Cost Predictability Taskforce, (2012) Guide to Cost Predictability in Construction.
12. Richard E. Polton, (2009), An Appraisal Challenge

13. Emad Elbeltagi,(2014), Project Cash Flow.
14. Engineering and Regional Operations, (2015), Cost Estimating Manual for Projects.
15. Charles Yoe, (2000), Risk Analysis Framework for Cost Estimation.
16. Nor Azmi Ahmad, (n.d.), Exploring The Types Of Construction Cost Modelling for Projects in Malaysia projects.
17. Unified Facilities Criteria (UFC), (2011), Handbook: Construction Cost Estimating.
18. The Appraisal Institute of Canada, (2010), Market and Marketability Analysis.
19. Iain Hyslop, AACI, P. App, (2013), The request fora 'forced sale'valuation.
20. Peter C. Melvin, (2015), Active Markets.
21. Genworth (2015), Analyzing Appraisals: Focus on Sales Comparison.
22. Pro Teck, (n.d.), Appraisal Policies and Procedures Manual.
23. by Jerome Nagy, (2012), Appraisals in Declining and Recovering Markets.
24. Jasmina SetkoviT,1 Slobodan LakiT,1 Marijana Lazarevska,2 Miloš CarkoviT,3Saša VujoševiT,1 Jelena CvijoviT,4 and Mladen GogiT5, (2018), Assessment of the Real Estate Market Value in the European Market by Artificial Neural Networks Application.

25. Appraisal Institute, (2017), Guide Note 11, Comparable Selection in a Declining Market.
26. Janet Gough, (n,d), Risk and Uncertainty.
27. Justin Mchood, (2011), Declining Markets: What Is a Declining Market?
28. Appraisal Institute, (2011), Guide Note: Development of an Opinion of Market Value in the Aftermath of a Disaster.
29. Bernard Guerrien and Ozgur Gun, (2011), Efficient Market Hypothesis: What are we talking about?
30. Gerry Glavery, (n.d.), How a Declining Market Affects Appraisals.
31. David Enns, (n.d.), Property Market and Imperfect Information.
32. Shanaka Herath1, Gunther Maier2, (2015), Informational efficiency of the real estate market.
33. Appraisal Institute, (2009), Market Conditions Addendum to the Appraisal Report.
34. Greene, Robert M, (2012), Market conditions adjustments for residential development land in a declining market.
35. Aswath Damodaran, (n.d.), Market Efficiency: Definitions and Tests.
36. AIG United Guaranty, (2008), Declining Market, Eligibility, and Underwriting Guideline Changes.
37. Gunther Maier, Shanaka Herath (n.d.), Real Estate Market Efficiency.

38. John William Webster Lawson, (2008), Theory of Real Estate Valuation.
39. Carles Serrat, (2009), Mathematics & Statistics Applied to Civil Engineering & Building.
40. Carsten Hartmann, (2015), \Introduction to Mathematical Modeling.
41. Adebola G. Musa, Olawande Daramola, Alfred Owoloko, Oludayo Olugbara,(2013), A Neural-CBR System for Real Property Valuation.
42. lbert P.C. Chana, Rotimi Boluwatife Abidoyeb, (2019), Advanced Property Valuation Techniques and Valuation Accuracy: Deciphering the Artificial Neural Network Technique.
43. S. Lek, Y.S. Park, (2008), Learn more about Artificial Neural Network.
44. Angelos Mimis , Antonis Rovolis & Marianthi Stamou,(2012), Property valuation with artificial neural network :the case of Athens.
45. Prof. A.K. Soni, Abdulkadir Abubakar Sadiq, (2015), Real Estate Valuation Using Artificial Neural Network (Ann)
46. Rotimi Boluwatife Abidoye, and Albert P. C. Chan, (2018), Hedonic Valuation of Real Estate Properties in Nigeria
47. N. B. Chaphalkar, Mukesh Dhatunde (2015), Real property valuation using sales comparison method and multiple regression analysis.

48. Anita Kanojia, Dr. R. B. Magar, 3Umesh Jadhav, (2016), Valuation of Residential Properties by Hedonic Pricing Method (HPM).
49. Ewa Kucharska,(2013), Uncertainty Of Property Valuation as a Subject Of Academic Research.
50. American Society of Appraisers, (2014), a New Perspective for Understanding Real Estate Market in Romania.
51. Leonid Kogan and Tan Wang, (2003), A Simple Theory of Asset Pricing under Model Uncertainty.
52. Viral V. Acharyay and Lasse Heje Pedersenz, (2003), Asset Pricing with Liquidity Risk.
53. John Lifflander, (2008), Defensive Appraising in a Declining Market.
54. Monika Piazzesi, Stanford & NBER, Martin Schneiderm Stanford & NBER, (2012), Inflation and the Price of Real Assets.
55. Martin HOESLI, Elion JANI,(2005),Monte Carlo Simulations for Real Estate Valuation.
56. Ann F. Kaplan, William N. Goetzmann, (2011), Review of the Efficient Market Theory and Evidence.
57. Geert Bekaert, Eric Engstrom, and Yuhang Xing, (2005), Risk, Uncertainty and Asset Prices.
58. Jonathan Clarke, Tomas Jandik, Gershon Mandelker, (n.d.), The Efficient Markets Hypothesis.
59. Nick French, Laura Gabrielite uncertainty of valuation, (2004), The uncertainty of valuation.

60. The Journal Of Finance • VOL. LXVIII, NO. 5 (2013) Uncertainty, Time-Varying Fear, and Asset Prices.
61. Xiaohui Gaoa, Jinming Xueb,(2017), Measuring and Understanding Uncertainty of Uncertainty.
62. Steven Laposa, (n.d.), Valuation Methodologies in Distressed Real Estate Markets: History Lessons and Proposed Solutions.
63. Rui Albuquerque, Martin S. Eichenbaum,Sergio Rebelo,(2012), Valuation Risk And Asset Pricing.
64. Obayomi Abiola Benjamin, (n, d), Valuation Uncertainty- The Need for Standards in Valuation Practice.
65. Sabina Źróbek,Ewa Kucharska-Stasiak,(2014), Current Problems Of Valuation and Real Estate Management By Value.
66. Randall Bell, (n.d.), The Impact of Detrimental Conditions on Property Values.
67. Eugene Pasymowsk, (2007), How to Discredit Most Real Estate Appraisals in One Minute.
68. International Valuation Standards Council, (2010), Discussion Paper:Valuation Uncertainty.
69. Anglyn, Ted, (2005), Distressed property valuation issues.
70. Ronald M. Green, (n.d.), The Challenge of Real Estate Professionalism.
71. Robert Hand, (n.d.), Forecasting Real Estate Values: Appraisals are Old News, Regression is The New Black.
72. Kaushal Shah,(2007), Challenges in Real Estate Valuation.

73. Akram Elkhalifa[1] and Dr. Mohamed Yagoub Shaddad[2], (n.d.), Real Estate Appraisal in Sudan: Challenges and Potentials.
74. Bank of Greece,2nd conference on real estate market (n.d.), Property valuations during crisis: consequences and risks.
75. Kaberere Ndungu, Mwenda Makathimo and Mary Kaaria,,(n.d.), The Challenges in Globalization of Valuation Profession – Lessons from Nairobi, Kenya.
76. Michael J. Fishman, Jonathan A. Parker, (2010), Valuation, Adverse Selection, and Market Collapses.
77. Haywood County, 2011.
78. (Tamim,2009).
79. (Elkhalifa, Shaddad, 2009)

Appendices

Appendix A: Survey Sheet - Public Trust

Please (√) to select your answer:

When you ask the asset valuation service, you are representative of?

☐ A company ☐ A Commercial Bank ☐ An Individual

Part 2: Public Trust Assessment

As assets valuation customer and from your communications with valuation experts and valuation reports, please choose from the following statements what you believe is appropriate:

1. Asset valuation is an organized, methodological process and it has its rules and standards

☐ Agree	☐ Neutral	☐ To some extend	☐ Disagree

2. Asset valuation conducted by qualified experts

☐ Agree	☐ Neutral	☐ To some extend	☐ Disagree

3. It is not professional to pay the valuation service fee as a percentage of the asset estimated value

☐ Agree	☐ Neutral	☐ To some extend	☐ Disagree

4. Usually, the valuer underestimates the market value of the asset

☐ Agree	☐ Neutral	☐ To some extend	☐ Disagree

5. When asking the valuer for a determined value for the subject asset, he usually replies positively.

☐ Agree	☐ Neutral	☐ To some extend	☐ Disagree

6. A real estate broker can estimate real estate market value more precise than certified assets valuation firms.

☐ Agree	☐ Neutral	☐ To some extend	☐ Disagree

Appendix B: Model Test No. 2 – Spreadsheets

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1	Earth Work							
1	Excavation	310	1.05	M3	325	10%	32.47	357
2	Backfill Local Material	310	0.72	M3	224	10%	22.44	247
3	Backfill Selected Material	310	0.20	M3	62	10%	6.20	68
2	R.C. Sub-structure							
	Foundation							
1	Lean Concete	310	0.06	M3	19	10%	1.91	21
2	Concete Foundations	310	0.26	M3	81	10%	8.12	89
3	Reinforcement Ø 16 mm	310	15.00	Kg	4,650	10%	465.00	5,115
4	Tie Wire	310	0.00	Bundel	1	0%	0.00	1
	Short Columns							
1	Concete Short Columns	310	0.05	M3	16	10%	1.55	17
2	Reinforcement Ø 16 mm	310	9.00	Kg	2,790	10%	279.00	3,069
3	Links Ø 8 mm	310	1.70	Kg	527	10%	52.70	580
4	Tie Wire	310	0.00	Bundel	1	0%	0.00	1
	Suspended Slab							
1	Concete Suspended Slab	310	0.23	M3	71	10%	7.13	78
2	Reinforcement Ø 16 mm	310	21.00	Kg	6,510	10%	651.00	7,161
3	Reinforcement Ø 12 mm	310	14.00	Kg	4,340	10%	434.00	4,774
4	Beams Reinforcement Ø 16 mm	310	1.50	Kg	465	10%	46.50	512
5	Beams links Ø 8 mm	310	0.90	Kg	279	10%	27.90	307
6	Tie Wire	310	0.01	Bundel	2	0%	0.00	2
3	Ground Floor							
	Skeleton							
1	Columns Concrete	310	0.06	M3	19	10%	1.86	20
2	Columns Reinforcement Ø 16 mm	310	6.00	Kg	1,860	10%	186.00	2,046
3	Columns Links Ø 8 mm	310	1.70	Kg	527	10%	52.70	580
4	Columns Tie Wire	310	1.00	Bundel	310	10%	31.00	341
5	Slab Concrete including beams	310	0.23	M3	71	10%	7.13	78
6	Reinforcement Ø 16 mm	310	21.00	Kg	6,510	10%	651.00	7,161
7	Reinforcement Ø 12 mm	310	14.00	Kg	4,340	10%	434.00	4,774
8	Beams Reinforcement Ø 16 mm	310	1.50	Kg	465	10%	46.50	512
9	Beams links Ø 8 mm	310	0.90	Kg	279	10%	27.90	307
10	Tie Wire	310	0.01	Bundel	3	0%	0.00	3

4	Masonry Work							
1	Concrete Masonry Unit	310	37.50	Unit	11,625	10%	1,162.50	12,788
2	Cement	310	0.03	Ton	9	10%	0.93	10
3	Sand	310	0.13	M3	39	10%	3.88	43
5	Plaster Work							
	Ceiling							
1	Cement	310	0.01	Unit	4	10%	0.43	5
2	Sand	310	0.05	M3	16	10%	1.55	17
	Walls							
3	Cement	310	0.08	Ton	26	10%	2.60	29
4	Sand	310	0.30	M3	93	10%	9.30	102
6	Painting Work							
	Ceiling							
1	Surface smoothing paste	310	0.20	Kg	62	10%	6.20	68
2	Painting	310	0.33	Kg	102	10%	10.23	113
7	Walls							
1	Surface smoothing paste	310	1.20	Kg	372	10%	37.20	409
2	Painting	310	1.98	Kg	614	10%	61.38	675
8	Tiles Works							
	Floor							
1	Tiles	310	1.00	M2	310		0.00	310
2	Cement	310	0.01	Ton	3		0.00	3
3	Sand	310	0.10	M3	31		0.00	31
	Walls							
1	Tiles	310	0.74	M2	229	10%	22.94	252
2	Cement	310	0.01	Ton	2	10%	0.23	3
3	Sand	310	0.07	M3	23	10%	2.29	25
9	Doors Works							
1	Gates Exterior	310	0.00	Unit	0	10%	0.00	0
2	Doors Interior	310	9.00	Unit	0	10%	0.00	0
10	Windows Works							
1	PVC / Aluminium windows	310	0.10	M2	31	10%	3.10	34
11	Electrical Works							
	Electrical works by flat rate for m2	310	1.00	M2	310	10%	31.00	341
12	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	5	1.00	Unit	5	10%	0.50	6
2	External Water supply & Sewage networks for floor including cost of material & workmanship	310	1.00	M2	310	10%	31.00	341
13	Staircase							
1	Steps Tiles (going & rise) marble or geranite	20	1.00	Step	20	10%	2.00	22
2	Handrail	7	1.00	M	7	10%	0.70	8
14	Elevator							
1	Elevator including installation	0	1.00	Unit	0	10%	0.00	0
15	Gypsum Work & Decoration							
1	Cornich length + 20% for other gypsum decoration	310	2.00	M	620	10%	62.00	682
16	Air conditioniong Works							
1	Spilit / Window Type	0	1.00	Unit	0	10%	0.00	0
2	Water Cooler (Evaporators)	0	1.00	Unit	0	10%	0.00	0

	#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1		Skeleton							
	1	Columns Concrete	330	0.06	M3	20	10%	1.98	22
	2	Columns Reinforcement Ø 16 mm	330	6.00	Kg	1,980	10%	198.00	2,178
	3	Columns Links Ø 8 mm	330	1.70	Kg	561	10%	56.10	617
	4	Columns Tie Wire	330	0.00	Bundel	1	10%	0.11	1
	5	Slab Concrete including beams	330	0.23	M3	76	10%	7.59	83
	6	Reinforcement Ø 16 mm cover slab	330	21.00	Kg	6,930	10%	693.00	7,623
	7	Reinforcement Ø 12 mm cover slab	330	14.00	Kg	4,620	10%	462.00	5,082
	8	Beams Reinforcement Ø 16 mm cover slab	330	1.50	Kg	495	10%	49.50	545
	9	Beams links Ø 8 mm cover slab	330	0.90	Kg	297	10%	29.70	327
	10	Tie Wire	330	0.00	Bundel	1	0%	0.00	1
2		Masonry Work							
	1	Concrete Masonry Unit	330	31.50	Unit	10,395	10%	1,039.50	11,435
	2	Cement	330	0.03	Ton	8	10%	0.83	9
	3	Sand	330	0.11	M3	35	10%	3.47	38
3		Plaster Work							
		Ceiling							
	1	Cement	330	0.01	Unit	5	10%	0.46	5
	2	Sand	330	0.05	M3	17	10%	1.65	18
		Walls							
	1	Cement	330	0.07	Ton	24	10%	2.45	27
	2	Sand	330	0.27	M3	87	10%	8.75	96
4		Painting Work							
		Ceiling							
	1	Surface smoothing paste	330	0.20	Kg	66	10%	6.60	73
	2	Painting	330	0.33	Kg	109	10%	10.89	120
		Walls							
	1	Surface smoothing paste	330	1.06	Kg	350	10%	34.98	385
	2	Painting	330	1.75	Kg	577	10%	57.72	635
5		Tiles Works							
		Floor							
	1	Tiles	330	1.00	M2	330	10%	33.00	363
	2	Cement	330	0.01	Ton	3	10%	0.33	4
	3	Sand	330	0.10	M3	33	10%	3.30	36
		Walls							
	1	Tiles	330	0.68	M2	224	10%	22.44	247
	2	Cement	330	0.01	Ton	2	10%	0.22	2
	3	Sand	330	0.07	M3	22	10%	2.24	25
6		Doors Works							
		Doors Interior	10	1.00	Unit	10	10%	1.00	11
7		Windows Works							
	1	PVC / Aluminium windows	330	0.11	M2	36	10%	3.63	40
8		Electrical Works							
	1	Electrical works by flat rate for m2	330	1.00	M2	330	10%	33.00	363
9		Toilets & Kitchens Plumbing Works : no. of all for floor							
	1	Internal plumbing works	6	1.00	Unit	6	10%	0.60	7
	2	External Water supply & Sewage networks for floor including cost of material & workmanship	330	1.00	M2	330	10%	33.00	363
10		Staircase							
	1	Steps Tiles (going & rise)	20	1.00	Step	20	10%	2.00	22
	2	Handrail	20	1.00	M	20	10%	2.00	22
11		Gypsum Work & Decoration							
	1	Cornich lengt + 20% for other gypsum decoration	330	2.00	M	660	10%	66.00	726

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Earth Work						
1.1	Backfill Selected Material	68	M3	4,800	327,360.00	450	727.47
2	R.C. Sub-structure						
	Foundation						
2.1	Lean Concete	21	M3	43,000	901,108.00	450	2,002.46
2.2	Concete Foundations	89	M3	52,000	4,642,560.00	450	10,316.80
2.3	Reinforcement Ø 16 mm	5,115	Kg	400	2,046,000.00	450	4,546.67
2.4	Tie Wire	1	Bundel	17,000	17,566.67	450	39.04
3	Short Columns						
3.1	Concete Short Columns	17	M3	52,000	886,600.00	450	1,970.22
3.2	Reinforcement Ø 16 mm	3,069	Kg	400	1,227,600.00	450	2,728.00
3.3	Links Ø 8 mm	580	Kg	455	263,763.50	450	586.14
3.4	Tie Wire	1	Bundel	17,000	17,566.67	450	39.04
4	Suspended Slab						
4.1	Concete Suspended Slab	78	M3	52,000	4,078,360.00	450	9,063.02
4.2	Reinforcement Ø 16 mm	7,161	Kg	400	2,864,400.00	450	6,365.33
4.3	Reinforcement Ø 12 mm	4,774	Kg	400	1,909,600.00	450	4,243.56
4.4	Beams Reinforcement Ø 16 mm	512	Kg	400	204,600.00	450	454.67
4.5	Beams links Ø 8 mm	307	Kg	455	139,639.50	450	310.31
4.6	Tie Wire	2	Bundel	17,000	35,133.33	450	78.07
5	Ground Floor						
	Skeleton						
5.1	Columns Concrete	20	M3	52,000	1,063,920.00	450	2,364.27
5.2	Columns Reinforcement Ø 16 mm	2,046	Kg	400	818,400.00	450	1,818.67
5.3	Columns Links Ø 8 mm	580	Kg	455	263,763.50	450	586.14
5.4	Columns Tie Wire	341	Bundel		0.00	450	0.00
5.5	Slab Concrete including beams	78	M3	52,000	4,078,360.00	450	9,063.02
5.6	Reinforcement Ø 16 mm	7,161	Kg	400	2,864,400.00	450	6,365.33
5.7	Reinforcement Ø 12 mm	4,774	Kg	400	1,909,600.00	450	4,243.56
5.8	Beams Reinforcement Ø 16 mm	512	Kg	400	204,600.00	450	454.67
5.9	Beams links Ø 8 mm	307	Kg	455	139,639.50	450	310.31
5.10	Tie Wire	3		17,000	52,700.00	450	117.11

6	Masonry Work						
6.1	Concrete Masonry Unit	12,788		195	2,493,562.50	450	5,541.25
6.2	Cement	10		1	10.23	450	0.02
6.3	Sand	43		1	42.63	450	0.09
7	Plaster Work						
	Ceiling						
7.1	Cement	5		1	4.77	450	0.01
7.2	Sand	17		1	17.05	450	0.04
	Walls				0.00	450	0.00
7.3	Cement	29		1	28.64	450	0.06
7.4	Sand	102		1	102.30	450	0.23
8	Painting Work						
	Ceiling						
8.1	Surface smoothing paste	68		210	14,322.00	450	31.83
8.2	Painting	113		650	73,144.50	450	162.54
	Walls						
8.3	Surface smoothing paste	409		210	85,932.00	450	190.96
8.4	Painting	675		650	438,867.00	450	975.26
9	Tiles Works						
	Floor						
9.1	Tiles	310		7,000	2,170,000.00	450	4,822.22
9.2	Cement	3		1	3.10	450	0.01
	Sand	31		1	31.00	450	0.07
	Walls						
9.3	Tiles	252		5,000	1,261,700.00	450	2,803.78
9.4	Cement	3		1	2.52	450	0.01
	Sand	25		1	25.23	450	0.06
10	Doors Works						
10.1	Gates Exterior	0		320,000	0.00	450	0.00
10.2	Doors Interior	9		150,000	1,350,000.00	450	3,000.00
11	Windows Works				0.00	450	0.00
11.1	PVC / Aluminium windows	34			0.00	450	0.00
12	Electrical Works						
12.1	Electrical Work for floor including cost of material & workmanship	310		8,100	2,511,000.00	450	5,580.00
13	Toilets & Kitchens Plumbing Works : no. of all for floor						
13.1	Internal plumbing works	6			0.00	450	0.00
13.2	External Water supply & Sewage networks for floor including cost of material & workmanship	310		2,700	837,000.00	450	1,860.00
14	Staircase						
14.1	No Steps Tiles	22	Step	0	0.00	450	0.00
14.2	Handrail	8	M	1	7.70	450	0.02
15	Elevator						
15.1	Elevator including installation	0	Unit	1	0.00	450	0.00
16	Gypsum Work & Decoration				0.00	450	0.00
16.1	Cornich lengt + 20% for other gypsum decoration	682		1	682.00	450	1.52
17	Airconditioniong Works						
17.1	Spilt / Window	0	Unit		0.00	450	0.00
17.2	Water Cooling	0	Unit		0.00	450	0.00
	Total				42,193,725.85		93,763.84

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Columns Concrete	22	M3	52,000	1,132,560	450	2,516.80
1.2	Columns Reinforcement Ø 16 mm	2,178	kg	400	871,200	450	1,936.00
1.3	Columns Links Ø 8 mm	617	kg	455	280,781	450	623.96
1.4	Columns Tie Wire	1	kg	17,000	20,570	450	45.71
1.5	Slab Concrete including beams	83	kg	52,000	4,341,480	450	9,647.73
1.6	Reinforcement Ø 16 mm	7,623	kg	400	3,049,200	450	6,776.00
1.7	Reinforcement Ø 12 mm	5,082	kg	400	2,032,800	450	4,517.33
1.8	Beams Reinforcement Ø 16 mm	545	kg	400	217,800	450	484.00
1.9	Beams links Ø 8 mm	327	kg	455	148,649	450	330.33
1.10	Tie Wire	1	Bund	17,000	18,700	450	41.56
2	Masonry Work						
2.1	Concrete Masonry Unit	11,435	Unit	195	2,229,728	450	4,954.95
2.2	Cement	9	kg	1	9	450	0.02
2.3	Sand	38	M3	1	38	450	0.08
3	Plaster Work						
	Ceiling						
3.1	Cement	5	TON	1	5	450	0.01
3.2	Sand	18	M3	1	18	450	0.04
4	Walls						
4.1	Cement	27	TON	1	27	450	0.06
4.2	Sand	96	M3	1	96	450	0.21
5	Painting Work						
	Ceiling						
5.1	Surface smoothing paste	73	Kg	210	15,246	450	33.88
5.2	Painting	120	kg	650	77,864	450	173.03
	Walls				0	450	0.00
5.3	Surface smoothing paste	385		210	80,804	450	179.56
5.4	Painting	635		650	412,677	450	917.06
6	Tiles Works						
	Floor						
6.1	Tiles	363	M2	7,000	2,541,000	450	5,646.67
6.2	Cement	4	Ton	1	4	450	0.01
6.3	Sand	36	M3	1	36	450	0.08
	Walls						
6.4	Tiles	247	M2	5,000	1,234,200	450	2,742.67
6.5	Cement	2	Ton	1	2	450	0.01
6.6	Sand	25	M3	1	25	450	0.05

7	Doors Works				0	450	0.00
7.1	Doors Interior	10	Unit	150,000	1,500,000	450	3,333.33
8	Windows Works						
8.1	PVC / Aluminium windows	40	M2		0	450	0.00
9	Electrical Works						
9.1	Electrical Work for floor including cost of material & workmanship	330	L.S	8,100	2,673,000	450	5,940.00
10	Toilets & Kitchens Plumbing Works : no. of all for floor						
10.1	Internal plumbing works	7	Unit		0	450	0.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship	330	L.S	2,700	891,000	450	1,980.00
11	Staircase						
11.1	No Steps Tiles	22	Set	0	0	450	0.00
11.2	Handrail	22	M		0	450	0.00
12	Gypsum Work & Decoration						
12.1	Cornich lengt + 20% for other gypsum decoration	726	M		0	450	0.00
	Total				23,769,517		52,821.15

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wal**l (M.L Factors)						
	Foundation						
1.1	Concete Foundations	22	M3	52,000	1,158,300.00	450	2,574.00
1.2	Reinforcement Ø 16 mm	1,485	Kg	400	594,000.00	450	1,320.00
	Columns	0			0.00	450	0.00
1.3	Columns Concrete	5	M3	52,000	257,400.00	450	572.00
1.4	Columns Reinforcement Ø 16 mm	693	Kg	400	277,200.00	450	616.00
1.5	Columns Links Ø 8 mm	208	Kg	455	94,594.50	450	210.21
1.6	Tie Wire for the boundary wall	0	Bundel	17,000	5,610.00	450	12.47
	Masonry Work	0		0	0.00	450	0.00
1.7	Concrete Masonry Unit	4,455	Unit	195	868,725.00	450	1,930.50
1.8	Cement	4	Ton	80,000	285,120.00	450	633.60
1.9	Sand	15	M3	4,700	69,795.00	450	155.10
	Plaster Work	0		1	0.00	450	0.00
1.10	Cement	4	Ton	80,000	332,640.00	450	739.20
1.11	Sand	24	M3	4,700	111,672.00	450	248.16
	Painting Work	0			0.00	450	0.00
1.12	Surface smoothing paste	119	Kg	210	24,948.00	450	55.44
1.13	Painting	196	Kg	650	127,413.00	450	283.14
2	Tiles Works for land escape	0			0.00	450	0.00
	Floor	0		1	0.00	450	0.00
2.1	Tiles	99	M2	7,000	693,000.00	450	1,540.00
2.2	Cement	1	Ton	80,000	79,200.00	450	176.00
2.3	Sand	10	M3	4,700	46,530.00	450	103.40
3	Doors Works	0		650	0.00	450	0.00
3.1	Main Gates	0	Unit	320,000	0.00	450	0.00
	Total				5,026,147.50		11,169.22

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Engineering & Approval						
1.1	Design Cost	1	L.S	300,000	300,000	450	666.67
1.2	Governmental Fees	1	L.S	120,000	120,000	450	266.67
2	Site Preparation				0	450	0.00
2.1	Site Cleaning	1	L.S	150,000	150,000	450	333.33
2.2	Survey Work	1	L.S	200,000	200,000	450	444.44
3	Earth Work					450	0.00
3.1	Excavation	357	M3	2,500	892,800	450	1,984.00
3.2	Backfill Local (per site)	247	L.S	90,000	22,219,560	450	49,376.80
3.3	Backfill Selected	68	M3	90,000	6,138,000	450	13,640.00
4	Concrete Sub-structure				0	450	0.00
4.1	Foundation				0	450	0.00
4.2	Cast Lean, R.C for foundation & Short Column	127	M3	200	25,457	450	56.57
4.3	Formwork & rebar for foundation & Short Column	127	M3	45,000	5,727,870	450	12,728.60
5	Suspended Slab				0	450	0.00
5.1	Formwork & rebar for Slab	310	M2	35,000	10,850,000	450	24,111.11
6	Ground Floor				0	450	0.00
	Skeleton				0	450	0.00
6.1	Formwork & rebar for floor	20	M3	40,000	818,400	450	1,818.67
6.2	Slab Concrete including beams	310	M2	35,000	10,850,000	450	24,111.11
6.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
7	Masonry Work				0	450	0.00
7.1	Install Concrete Masonry Unit wall	775	M2	2,000	1,550,000	450	3,444.44
8	Plaster Work				0	450	0.00
8.1	Install plaster for Walls	1860	M2	1,000	1,860,000	450	4,133.33
8.2	Install plaster for Ceiling	330	M2	1,100	363,000	450	806.67
9	Painting Work				0	450	0.00
9.1	Install Painting for Walls	1860	M2	1,000	1,860,000	450	4,133.33
9.2	Install Painting for Ceiling	330	M2	1,100	363,000	450	806.67
10	Tiles Works				0	450	0.00
10.1	Install Tiles for Floor	310	M	2,000	620,000	450	1,377.78
10.2	Install Tiles for Walls	229.4	M	2,200	504,680	450	1,121.51
11	Staircase Works						
11.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
11.2	Handrail	8	M	1	8	450	0.02
12	Doors Works				0	450	0.00
12.1	Install Exteriors Gates	0	Unit	20,000	0	450	0.00
12.2	Install Interior Doors	9	Unit	15,000	135,000	450	300.00
13	Windows Works				0	450	0.00
13.1	Installation cost incl. in material unit price	34	M2	0	0	450	0.00
14	Electrical Works				0	450	0.00
14.1	Installation cost incl. in material unit price	341	M2	0	0	450	0.00
15	Toilets & Kitchens Plumbing Works				0	450	0.00
15.1	Internal plumbing works (per unit)	5	Unit	50,000	250,000	450	555.56
15.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	341	M2	0	0	450	0.00
16	Sewage Well				0	450	0.00
16.1	Sewage Well works	1	Unit	0	0	450	0.00
17	Gypsum Work & Decoration				0	450	0.00
17.1	Cornich & other gypsum decoration - material cost included	620	M	3,000	1,860,000	450	4,133.33
18	Elevator Work				0	450	0.00
18.1	Installation cost incl. in material unit price	0	Unit	0	0	450	0.00
	Total				67,737,796.90		150,528.44

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	22	Unit	40,000	871,200	450	1,936.00
1.2	Slab Concrete including beams	330	M2	35,000	11,550,000	450	25,666.67
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	693	M2	2,000	1,386,000	450	3,080.00
3	Plaster Work						
3.1	Install plaster for Walls	1749	M2	1,000	1,749,000	450	3,886.67
3.2	Install plaster for Ceiling	330	M2	1,100	363,000	450	806.67
4	Painting Work						
4.1	Install Painting for Walls	1749	M2	1,000	1,749,000	450	3,886.67
4.2	Install Painting for Ceiling	330	M2	1,100	363,000	450	806.67
5	Tiles Works						
5.1	Install Tiles for Floor	330	M2	2,000	660,000	450	1,466.67
5.2	Install Tiles for Walls	224.4	M2	2,200	493,680	450	1,097.07
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
6.2	Handrail	22	M	1	22	450	0.05
7	Doors Works						
7.1	Install Interior Doors	10	Unit	15,000	150,000	450	333.33
8	Windows Works						
8.1	Installation cost incl. in material unit price	40	M2	0	0	450	0.00
9	Electrical Works						
9.1	Installation cost incl. in material unit price	363	M2	0	0	450	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	6	Unit	1	6	450	0.01
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	363	M2	0	0	450	0.00
11	Gypsum Work & Decoration						
11.1	Cornich & other gypsum decoration	561	M	1	561	450	1.25
	Total				19,415,491.00		43,145.54

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wal**l (M.L Factors)						
	Earth Work						
1.1	Excavation	84	M3	2,500	208,828	450	464.06
1.2	Backfill Local (per site)	54	L.S	90,000	4,869,315	450	10,820.70
	Concrete						
1.3	Cast Lean, R.C for foundation & Column	34.38	Unit	200	6,876	450	15.28
1.4	Formwork & rebar for foundation & Column	34.38	Unit	45,000	1,546,999	450	3,437.78
	Masonry Work				0	450	0.00
1.5	Install Concrete Masonry Unit wall	270	M2	2,000	540,000	450	1,200.00
	Plaster Work						
1.6	Install plaster for Walls	540	M2	1,000	540,000	450	1,200.00
1.7	Install plaster for Ceiling	540	M2	1,100	594,000	450	1,320.00
	Painting Work						
1.8	Install Painting for Walls	540	M2	1,000	540,000	450	1,200.00
1.9	Install Painting for Ceiling	540	M2	1,100	594,000	450	1,320.00
2	Tiles Works for Yard						
	Install Tiles for Floor	190	M	2,000	380,000	450	844.44
3	Doors Works						
3.1	Install Exteriors Gates	0	Unit	20,000	0	450	0.00
	Total				9,820,017.43		21,822.26

Item	SDG	USD
Engineering & Approval Fees	420,000.00	933.33
Materials Cost	42,193,725.85	93,763.84
Workmanship Cost	67,737,796.90	150,528.44
Sub -Total	110,351,522.75	245,225.61
Total Cost	110,596,748.35	245,225.61

Item	SDG	USD
Materials Cost	23,769,517.06	52,821.15
Workmanship Cost	19,415,491.00	43,145.54
Sub -Total	43,185,008.06	95,966.68
Total Cost	43,185,008.06	95,966.68

Item	SDG	USD
Materials Cost	5,026,147.50	11,169.22
Workmanship Cost	9,820,017.43	21,822.26
Sub -Total	14,846,164.93	32,991.48
Total Cost	14,879,156.40	32,991.48

#	Item	Area M	Cost SDG	Cost USD
1	Ground Floor	310	110,596,748.35	245,770.55
2	First Floor	330	43,185,008.06	95,966.68
3	Second Floor	0	0.00	0.00
4	Third Floor	0	0.00	0.00
5	Fourth Floor	0	0.00	0.00
6	External Works			32,991.48
	Total Estimated Buildings Cost		153,781,756.41	374,728.71
	Profit %		10%	10%
	Profit Amount		15378175.64	37472.87141
	New Constructed Buildings Value		**169,159,932.05**	**412,201.59**
	Current Buildings Conditiuons %		**80%**	
	Current Constructed Buildings Value		**135,327,945.64**	**329,761.27**

Date	Plot #	Block #	Area M2	Neighborhood	City	Owner	
27/11/22	0	0	500		0	0	
Characteristics	Normal	$ Ex. Rate	450	Currency	SDG		

Comparable #	Subject Land	1	2	3	4	5	6
Characteristics	Excellent	**Excellent**			**Normal**		
Area M2	400	500	400	430	400	420	430
Sell Value	-	130,000,000	120,000,000	140,000,000	100,000,000	90,000,000	90,000,000
M2 Price	-	260,000	300,000	325,581	250,000	214,286	209,302
Today	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022
Sell Date	27/11/2022	16/03/2021	21/02/2021	05/06/2021	08/07/2021	12/12/2020	1/1/2021
Time Lag	0	20	21	17	16	23	5
$ Ex. Rate	450	410	400	420	450	380	390
$ Ex. Rate Diff.	0	40	50	30	0	70	60
$ Ex. Rate Diff. %	0.00%	9.76%	12.50%	7.14%	0.00%	18.42%	15.38%
M2 Adjustments							
Sell Time Adjust		285,366	337,500	348,837	250,000	253,759	241,503
Average		314,267			248,816		
Subject Land Estimated Market Value							
Characteristics		**If Excellent**			**If Normal**		
M2 Estimated Value		314,267			248,816		
Plot Estimated Value		125,706,892					
Plot Estimated Value Rounded		**126,000,000**					

Item	SDG	USD
Buildings Value	135,327,945.64	329,761.27
Land Value	126,000,000	280,000.00
Real Estate	261,327,946	609,761.27

Appendix C: Model Test No. 3 – Spreadsheets

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1	Earth Work							
1	Excavation	300	1.05	M3	314	10%	31.42	346
2	Backfill Local Material	300	0.72	M3	217	10%	21.72	239
3	Backfill Selected Material	300	0.20	M3	60	10%	6.00	66
2	R.C. Sub-structure							
	Foundation							
1	Lean Concete	300	0.06	M3	18	10%	1.84	20
2	Concete Foundations	300	0.26	M3	79	10%	7.85	86
3	Reinforcement Ø 16 mm	300	15.00	Kg	4,500	10%	450.00	4,950
4	Tie Wire	300	0.00	Bundel	1	0%	0.00	1
	Short Columns							
1	Concete Short Columns	300	0.05	M3	15	10%	1.50	17
2	Reinforcement Ø 16 mm	300	9.00	Kg	2,700	10%	270.00	2,970
3	Links Ø 8 mm	300	1.70	Kg	510	10%	51.00	561
4	Tie Wire	300	0.00	Bundel	1	0%	0.00	1
	Suspended Slab							
1	Concete Suspended Slab	300	0.23	M3	69	10%	6.90	76
2	Reinforcement Ø 16 mm	300	21.00	Kg	6,300	10%	630.00	6,930
3	Reinforcement Ø 12 mm	300	14.00	Kg	4,200	10%	420.00	4,620
4	Beams Reinforcement Ø 16 mm	300	1.50	Kg	450	10%	45.00	495
5	Beams links Ø 8 mm	300	0.90	Kg	270	10%	27.00	297
6	Tie Wire	300	0.01	Bundel	2	0%	0.00	2
3	Ground Floor							
	Skeleton							
1	Columns Concrete	300	0.06	M3	18	10%	1.80	20
2	Columns Reinforcement Ø 16 mm	300	6.00	Kg	1,800	10%	180.00	1,980
3	Columns Links Ø 8 mm	300	1.70	Kg	510	10%	51.00	561
4	Columns Tie Wire	300	1.00	Bundel	300	10%	30.00	330
5	Slab Concrete including beams	300	0.23	M3	69	10%	6.90	76
6	Reinforcement Ø 16 mm	300	21.00	Kg	6,300	10%	630.00	6,930
7	Reinforcement Ø 12 mm	300	14.00	Kg	4,200	10%	420.00	4,620
8	Beams Reinforcement Ø 16 mm	300	1.50	Kg	450	10%	45.00	495
9	Beams links Ø 8 mm	300	0.90	Kg	270	10%	27.00	297
10	Tie Wire	300	0.01	Bundel	3	0%	0.00	3
4	Masonry Work							

4	Masonry Work							
1	Concrete Masonry Unit	300	37.50	Unit	11,250	10%	1,125.00	12,375
2	Cement	300	0.03	Ton	9	10%	0.90	10
3	Sand	300	0.13	M3	38	10%	3.75	41
5	Plaster Work							
	Ceiling							
1	Cement	300	0.01	Unit	4	10%	0.42	5
2	Sand	300	0.05	M3	15	10%	1.50	17
	Walls							
3	Cement	300	0.08	Ton	25	10%	2.52	28
4	Sand	300	0.30	M3	90	10%	9.00	99
6	Painting Work							
	Ceiling							
1	Surface smoothing paste	300	0.20	Kg	60	10%	6.00	66
2	Painting	300	0.33	Kg	99	10%	9.90	109
7	Walls							
1	Surface smoothing paste	300	1.20	Kg	360	10%	36.00	396
2	Painting	300	1.98	Kg	594	10%	59.40	653
8	Tiles Works							
	Floor							
1	Tiles	300	1.00	M2	300		0.00	300
2	Cement	300	0.01	Ton	3		0.00	3
3	Sand	300	0.10	M3	30		0.00	30
	Walls							
1	Tiles	300	0.74	M2	222	10%	22.20	244
2	Cement	300	0.01	Ton	2	10%	0.22	2
3	Sand	300	0.07	M3	22	10%	2.22	24
9	Doors Works							
1	Gates Exterior	300	0.00	Unit	0	10%	0.00	0
2	Doors Interior	300	9.00	Unit	0	10%	0.00	0
10	Windows Works							
1	PVC / Aluminium windows	300	0.10	M2	30	10%	3.00	33
11	Electrical Works							
	Electrical works by flat rate for m2	300	1.00	M2	300	10%	30.00	330
12	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	5	1.00	Unit	5	10%	0.50	6
2	External Water supply & Sewage networks for floor including cost of material & workmanship	300	1.00	M2	300	10%	30.00	330
13	Staircase							
1	Steps Tiles (going & rise) marble or geranite	20	1.00	Step	20	10%	2.00	22
2	Handrail	7	1.00	M	7	10%	0.70	8
14	Elevator							
1	Elevator including installation	0	1.00	Unit	0	10%	0.00	0
15	Gypsum Work & Decoration							
1	Cornich length + 20% for other gypsum decoration	300	2.00	M	600	10%	60.00	660
16	Air conditioniong Works							
1	Spilit / Window Type	0	1.00	Unit	0	10%	0.00	0
2	Water Cooler (Evaporators)	0	1.00	Unit	0	10%	0.00	0

	#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1		Skeleton							
	1	Columns Concrete	330	0.06	M3	20	10%	1.98	22
	2	Columns Reinforcement Ø 16 mm	330	6.00	Kg	1,980	10%	198.00	2,178
	3	Columns Links Ø 8 mm	330	1.70	Kg	561	10%	56.10	617
	4	Columns Tie Wire	330	0.00	Bundel	1	10%	0.11	1
	5	Slab Concrete including beams	330	0.23	M3	76	10%	7.59	83
	6	Reinforcement Ø 16 mm cover slab	330	21.00	Kg	6,930	10%	693.00	7,623
	7	Reinforcement Ø 12 mm cover slab	330	14.00	Kg	4,620	10%	462.00	5,082
	8	Beams Reinforcement Ø 16 mm cover slab	330	1.50	Kg	495	10%	49.50	545
	9	Beams links Ø 8 mm cover slab	330	0.90	Kg	297	10%	29.70	327
	10	Tie Wire	330	0.00	Bundel	1	0%	0.00	1
2		Masonry Work							
	1	Concrete Masonry Unit	330	31.50	Unit	10,395	10%	1,039.50	11,435
	2	Cement	330	0.03	Ton	8	10%	0.83	9
	3	Sand	330	0.11	M3	35	10%	3.47	38
3		Plaster Work							
		Ceiling							
	1	Cement	330	0.01	Unit	5	10%	0.46	5
	2	Sand	330	0.05	M3	17	10%	1.65	18
		Walls							
	1	Cement	330	0.07	Ton	24	10%	2.45	27
	2	Sand	330	0.27	M3	87	10%	8.75	96
4		Painting Work							
		Ceiling							
	1	Surface smoothing paste	330	0.20	Kg	66	10%	6.60	73
	2	Painting	330	0.33	Kg	109	10%	10.89	120
		Walls							
	1	Surface smoothing paste	330	1.06	Kg	350	10%	34.98	385
	2	Painting	330	1.75	Kg	577	10%	57.72	635
5		Tiles Works							
		Floor							
	1	Tiles	330	1.00	M2	330	10%	33.00	363
	2	Cement	330	0.01	Ton	3	10%	0.33	4
	3	Sand	330	0.10	M3	33	10%	3.30	36
		Walls							
	1	Tiles	330	0.68	M2	224	10%	22.44	247
	2	Cement	330	0.01	Ton	2	10%	0.22	2
	3	Sand	330	0.07	M3	22	10%	2.24	25
6		Doors Works							
		Doors Interior	10	1.00	Unit	10	10%	1.00	11
7		Windows Works							
	1	PVC / Aluminium windows	330	0.11	M2	36	10%	3.63	40
8		Electrical Works							
	1	Electrical works by flat rate for m2	330	1.00	M2	330	10%	33.00	363
9		Toilets & Kitchens Plumbing Works : no. of all for floor							
	1	Internal plumbing works	7	1.00	Unit	7	10%	0.70	8
	2	External Water supply & Sewage networks for floor including cost of material & workmanship	330	1.00	M2	330	10%	33.00	363
10		Staircase							
	1	Steps Tiles (going & rise)	20	1.00	Step	20	10%	2.00	22
	2	Handrail	20	1.00	M	20	10%	2.00	22
11		Gypsum Work & Decoration							
	1	Cornich lengt + 20% for other gypsum decoration	330	2.00	M	660	10%	66.00	726

	#	Item	Floor Area M^2 / QTY	Factor for M^2 (F)	Unit	Item QTY	Add Waste %	Waste QTY	Total QTY
1		Skeleton							
	1	Columns Concrete	315	0.06	M3	19	10%	1.89	21
	2	Columns Reinforcement Ø 16 mm	315	6	Kg	1,890	10%	189.00	2,079
	3	Columns Links Ø 8 mm	315	1.7	Kg	536	10%	53.55	589
	4	Columns Tie Wire	315	1	Bundel	315	10%	31.50	347
	5	Slab Concrete including beams	315	0.23	M3	72	10%	7.25	80
	6	Reinforcement Ø 16 mm cover slab	315	21	Kg	6,615	10%	661.50	7,277
	7	Reinforcement Ø 12 mm cover slab	315	14	Kg	4,410	10%	441.00	4,851
	8	Beams Reinforcement Ø 16 mm cover slab	315	1.5	Kg	473	10%	47.25	520
	9	Beams links Ø 8 mm cover slab	315	0.9	Kg	284	10%	28.35	312
	10	Tie Wire	315	0.003	Bundel	1	0%	0.00	1
2		Masonry Work							
	1	Concrete Masonry Unit	315	31.5	Unit	9,923	10%	992.25	10,915
	2	Cement	315	0.025	Ton	8	10%	0.79	9
	3	Sand	315	0.105	M3	33	10%	3.31	36
3		Plaster Work							
		Ceiling							
	1	Cement	315	0.014	Unit	4	10%	0.44	5
	2	Sand	315	0.05	M3	16	10%	1.58	17
		Walls							
	1	Cement	315	0.074	Ton	23	10%	2.34	26
	2	Sand	315	0.265	M3	83	10%	8.35	92
4		Painting Work							
		Ceiling							
	1	Surface smoothing paste	315	0.2	Kg	63	10%	6.30	69
	2	Painting	315	0.33	Kg	104	10%	10.40	114
		Walls							
	1	Surface smoothing paste	315	1.06	Kg	334	10%	33.39	367
	2	Painting	315	1.749	Kg	551	10%	55.09	606
5		Tiles Works							
		Floor							
	1	Tiles	315	1	M2	315	10%	31.50	347
	2	Cement	315	0.01	Ton	3	10%	0.32	3
	3	Sand	315	0.1	M3	32	10%	3.15	35
		Walls							
	1	Tiles	315	0.68	M2	214	10%	21.42	236
	2	Cement	315	0.007	Ton	2	10%	0.21	2
	3	Sand	315	0.068	M3	21	10%	2.14	24
6		Doors Works							
	1	Doors Interior	11	1	Unit	11	10%	1.10	12
7		Windows Works							
	1	PVC / Aluminium windows	315	0.11	M2	35	10%	3.47	38
8		Electrical Works							
	1	Electrical works by flat rate for m2	315	1	M2	315	10%	31.50	347
9		Toilets & Kitchens Plumbing Works : no. of all for floor							
	1	Internal plumbing works	6	1	Unit	6	10%	0.60	7
	2	External Water supply & Sewage networks for floor including cost of material & workmanship	315	1	Unit	315		0.00	315
10		Staircase							
	1	Steps Tiles (going & rise)	20	1	Step	20	10%	2.00	22
	2	Handrail	20	1	M	20	10%	2.00	22
11		Gypsum Work & Decoration							
	1	Cornich lengt + 20% for other gypsum decoration	315	2	M	630	10%	63.00	693

#	Item	Floor Area M^2 or B. Wall length M or QTY	Factor for M^2 or M.L **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
	Boundary Wall (M.L Factors)							
	Foundation							
1	Excavation	90	0.8	M3	75.9	10%	7.59	83.53
2	Backfill	90	0.5	M3	49.2	10%	4.92	54.10
3	Lean Concete for Foundations	90	0.1	M3	6.5	10%	0.65	7.15
4	Concete Foundations	90	0.2	M3	20.3	10%	2.03	22.28
5	Reinforcement Ø 16 mm	90	15.0	Kg	1,350.0	10%	135.00	1,485.00
6	Tie Wiers	90	0.0	Bundel	0.3	0%	0.00	0.30
	Columns							
1	Columns Concrete	90	0.1	M3	4.5	10%	0.45	4.95
2	Columns Reinforcement Ø 16 mm	90	7.0	Kg	630.0	10%	63.00	693.00
3	Columns Links Ø 8 mm	90	2.1	Kg	189.0	10%	18.90	207.90
4	Tie Wire for the boundary wall	90	0.0	Bundel	0.3	10%	0.03	0.33
	Masonry Work							
1	Concrete Masonry Unit	90	45.0	Unit	4,050.0	10%	405.00	4,455.00
2	Cement	90	0.0	Ton	3.2	10%	0.32	3.56
3	Sand	90	0.2	M3	13.5	10%	1.35	14.85
	Plaster Work					10%		
1	Cement	90	0.0	Ton	3.8	10%	0.38	4.16
2	Sand	90	0.2	M3	21.6	10%	2.16	23.76
	Painting Work							
1	Surface smoothing paste	90	1.2	Kg	108.0	10%	10.80	118.80
2	Painting	90	2.0	Kg	178.2	10%	17.82	196.02
	Tiles Works							
	Floor							
1	Tiles	90	1.0	M2	90.0	10%	9.00	99.00
2	Cement	90	0.0	Ton	0.9	10%	0.09	0.99
3	Sand	90	0.1	M3	9.0	10%	0.90	9.90
	Doors Works							
1	Main Gates	0	0.0	Unit	0.0	10%	0.00	0.00

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Earth Work						
1.1	Backfill Selected Material	66	M3	4,800	316,800.00	450	704.00
2	R.C. Sub-structure						
	Foundation						
2.1	Lean Concete	20	M3	43,000	872,040.00	450	1,937.87
2.2	Concete Foundations	86	M3	52,000	4,492,800.00	450	9,984.00
2.3	Reinforcement Ø 16 mm	4,950	Kg	400	1,980,000.00	450	4,400.00
2.4	Tie Wire	1	Bundel	17,000	17,000.00	450	37.78
3	Short Columns						
3.1	Concete Short Columns	17	M3	52,000	858,000.00	450	1,906.67
3.2	Reinforcement Ø 16 mm	2,970	Kg	400	1,188,000.00	450	2,640.00
3.3	Links Ø 8 mm	561	Kg	455	255,255.00	450	567.23
3.4	Tie Wire	1	Bundel	17,000	17,000.00	450	37.78
4	Suspended Slab						
4.1	Concete Suspended Slab	76	M3	52,000	3,946,800.00	450	8,770.67
4.2	Reinforcement Ø 16 mm	6,930	Kg	400	2,772,000.00	450	6,160.00
4.3	Reinforcement Ø 12 mm	4,620	Kg	400	1,848,000.00	450	4,106.67
4.4	Beams Reinforcement Ø 16 mm	495	Kg	400	198,000.00	450	440.00
4.5	Beams links Ø 8 mm	297	Kg	455	135,135.00	450	300.30
4.6	Tie Wire	2	Bundel	17,000	34,000.00	450	75.56
5	Ground Floor						
	Skeleton						
5.1	Columns Concrete	20	M3	52,000	1,029,600.00	450	2,288.00
5.2	Columns Reinforcement Ø 16 mm	1,980	Kg	400	792,000.00	450	1,760.00
5.3	Columns Links Ø 8 mm	561	Kg	455	255,255.00	450	567.23
5.4	Columns Tie Wire	330	Bundel		0.00	450	0.00
5.5	Slab Concrete including beams	76	M3	52,000	3,946,800.00	450	8,770.67
5.6	Reinforcement Ø 16 mm	6,930	Kg	400	2,772,000.00	450	6,160.00
5.7	Reinforcement Ø 12 mm	4,620	Kg	400	1,848,000.00	450	4,106.67
5.8	Beams Reinforcement Ø 16 mm	495	Kg	400	198,000.00	450	440.00
5.9	Beams links Ø 8 mm	297	Kg	455	135,135.00	450	300.30
5.10	Tie Wire	3		17,000	51,000.00	450	113.33

6	Masonry Work						
6.1	Concrete Masonry Unit	12,375		195	2,413,125.00	450	5,362.50
6.2	Cement	10		1	9.90	450	0.02
6.3	Sand	41		1	41.25	450	0.09
7	Plaster Work						
	Ceiling						
7.1	Cement	5		1	4.62	450	0.01
7.2	Sand	17		1	16.50	450	0.04
	Walls				0.00	450	0.00
7.3	Cement	28		1	27.72	450	0.06
7.4	Sand	99		1	99.00	450	0.22
8	Painting Work						
	Ceiling						
8.1	Surface smoothing paste	66		210	13,860.00	450	30.80
8.2	Painting	109		650	70,785.00	450	157.30
	Walls						
8.3	Surface smoothing paste	396		210	83,160.00	450	184.80
8.4	Painting	653		650	424,710.00	450	943.80
9	Tiles Works						
	Floor						
9.1	Tiles	300		7,000	2,100,000.00	450	4,666.67
9.2	Cement	3		1	3.00	450	0.01
	Sand	30		1	30.00	450	0.07
	Walls						
9.3	Tiles	244		5,000	1,221,000.00	450	2,713.33
9.4	Cement	2		1	2.44	450	0.01
	Sand	24		1	24.42	450	0.05
10	Doors Works						
10.1	Gates Exterior	0		320,000	0.00	450	0.00
10.2	Doors Interior	9		150,000	1,350,000.00	450	3,000.00
11	Windows Works				0.00	450	0.00
11.1	PVC / Aluminium windows	33			0.00	450	0.00
12	Electrical Works						
12.1	Electrical Work for floor including cost of material & workmanship	300		8,100	2,430,000.00	450	5,400.00
13	Toilets & Kitchens Plumbing Works : no. of all for floor						
13.1	Internal plumbing works	6			0.00	450	0.00
13.2	External Water supply & Sewage networks for floor including cost of material & workmanship	300		2,700	810,000.00	450	1,800.00
14	Staircase						
14.1	Geranite Steps (going & rise)	22	Step	100	2,200.00	450	4.89
14.2	Handrail	8	M	1	7.70	450	0.02
15	Elevator						
15.1	Elevator including installation	0	Unit	1	0.00	450	0.00
16	Gypsum Work & Decoration				0.00	450	0.00
16.1	Cornich lengt + 20% for other gypsum decoration	660		1	660.00	450	1.47
17	Airconditioniong Works						
17.1	Spilt / Window	0	Unit		0.00	450	0.00
17.2	Water Cooling	0	Unit		0.00	450	0.00
	Total				**40,878,386.55**		90,840.86

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Columns Concrete	22	M3	52,000	1,132,560	450	2,516.80
1.2	Columns Reinforcement Ø 16 mm	2,178	kg	400	871,200	450	1,936.00
1.3	Columns Links Ø 8 mm	617	kg	455	280,781	450	623.96
1.4	Columns Tie Wire	1	kg	17,000	20,570	450	45.71
1.5	Slab Concrete including beams	83	kg	52,000	4,341,480	450	9,647.73
1.6	Reinforcement Ø 16 mm	7,623	kg	400	3,049,200	450	6,776.00
1.7	Reinforcement Ø 12 mm	5,082	kg	400	2,032,800	450	4,517.33
1.8	Beams Reinforcement Ø 16 mm	545	kg	400	217,800	450	484.00
1.9	Beams links Ø 8 mm	327	kg	455	148,649	450	330.33
1.10	Tie Wire	1	Bund	17,000	18,700	450	41.56
2	Masonry Work						
2.1	Concrete Masonry Unit	11,435	Unit	195	2,229,728	450	4,954.95
2.2	Cement	9	kg	1	9	450	0.02
2.3	Sand	38	M3	1	38	450	0.08
3	Plaster Work						
	Ceiling						
3.1	Cement	5	TON	1	5	450	0.01
3.2	Sand	18	M3	1	18	450	0.04
4	Walls						
4.1	Cement	27	TON	1	27	450	0.06
4.2	Sand	96	M3	1	96	450	0.21
5	Painting Work						
	Ceiling						
5.1	Surface smoothing paste	73	Kg	210	15,246	450	33.88
5.2	Painting	120	kg	650	77,864	450	173.03
	Walls				0	450	0.00
5.3	Surface smoothing paste	385		210	80,804	450	179.56
5.4	Painting	635		650	412,677	450	917.06
6	Tiles Works						
	Floor						
6.1	Tiles	363	M2	7,000	2,541,000	450	5,646.67
6.2	Cement	4	Ton	1	4	450	0.01
6.3	Sand	36	M3	1	36	450	0.08
	Walls						
6.4	Tiles	247	M2	5,000	1,234,200	450	2,742.67
6.5	Cement	2	Ton	1	2	450	0.01
6.6	Sand	25	M3	1	25	450	0.05
7	Doors Works				0	450	0.00
7.1	Doors Interior	10	Unit	150,000	1,500,000	450	3,333.33
8	Windows Works						
8.1	PVC / Aluminium windows	40	M2		0	450	0.00
9	Electrical Works						
9.1	Electrical Work for floor including cost of material & workmanship	330	L.S	8,100	2,673,000	450	5,940.00
10	Toilets & Kitchens Plumbing Works : no. of all for floor						
10.1	Internal plumbing works	8	Unit		0	450	0.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship	330	L.S	2,700	891,000	450	1,980.00
11	Staircase						
11.1	Geranite Steps (going & rise)	22	Set	100	2,200	450	4.89
11.2	Handrail	22	M		0	450	0.00
12	Gypsum Work & Decoration						
12.1	Cornich lengt + 20% for other gypsum decoration	726	M		0	450	0.00
	Total				23,771,717		52,826.04

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Columns Concrete	21	M3	52,000	1,081,080.00	450	2,402.40
1.2	Columns Reinforcement Ø 16 mm	2,079	KG	400	831,600.00	450	1,848.00
1.3	Columns Links Ø 8 mm	589	KG	455	268,017.75	450	595.60
1.4	Columns Tie Wire	347	Bund	17,000	5,890,500.00	450	13,090.00
1.5	Slab Concrete including beams	80	M3	52,000	4,144,140.00	450	9,209.20
1.6	Reinforcement Ø 16 mm	7,277	KG	400	2,910,600.00	450	6,468.00
1.7	Reinforcement Ø 12 mm	4,851	KG	400	1,940,400.00	450	4,312.00
1.8	Beams Reinforcement Ø 16 mm	520	KG	400	207,900.00	450	462.00
1.9	Beams links Ø 8 mm	312	KG	455	141,891.75	450	315.32
1.10	Tie Wire	1	Bund	17,000	17,850.00	450	39.67
2	Masonry Work				0.00	450	0.00
2.1	Concrete Masonry Unit	10,915	Unit	195	2,128,376.25	450	4,729.73
2.2	Cement	9	Ton	1	8.73	450	0.02
2.3	Sand	36	M3	1	36.38	450	0.08
3	Plaster Work				0.00	450	0.00
	Ceiling				0.00	450	0.00
3.1	Cement	5	Ton	1	4.85	450	0.01
3.2	Sand	17	M3	1	17.33	450	0.04
4	Walls				0.00	450	0.00
4.1	Cement	26	Ton	1	25.71	450	0.06
4.2	Sand	92	M3	1	91.82	450	0.20
5	Painting Work				0.00	450	0.00
	Ceiling				0.00	450	0.00
5.1	Surface smoothing paste	69	KG	210	14,553.00	450	32.34
5.2	Painting	114	KG	650	74,324.25	450	165.17
	Walls				0.00	450	0.00
5.3	Surface smoothing paste	367	KG	210	77,130.90	450	171.40
5.4	Painting	606	KG	650	393,918.53	450	875.37
6	Tiles Works				0.00	450	0.00
	Floor				0.00	450	0.00
6.1	Tiles	347	M2	7,000	2,425,500.00	450	5,390.00
6.2	Cement	3	Ton	1	3.47	450	0.01
6.3	Sand	35	M3	1	34.65	450	0.08
	Walls				0.00	450	0.00
6.4	Tiles	236	M2	5,000	1,178,100.00	450	2,618.00
6.5	Cement	2	Ton	1	2.36	450	0.01
6.6	Sand	24	M3	1	23.56	450	0.05
7	Doors Works				0.00	450	0.00
7.1	Doors Interior	6	Unit	150,000	900,000.00	450	2,000.00
8	Windows Works				0.00	450	0.00
8.1	PVC / Aluminium windows	38	M2		0.00	450	0.00
9	Electrical Works				0.00	450	0.00
9.1	Electrical Work for floor including cost of material & workmanship	315	L.S	8,100	2,551,500.00	450	5,670.00
10	Toilets & Kitchens Plumbing Works : no. of all for floor				0.00	450	0.00
10.1	Internal plumbing works	7	Unit		0.00	450	0.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship	315	L.S	2,700	850,500.00	450	1,890.00
11	Staircase				0.00	450	0.00
11.1	Geranite Steps (going & rise)	22	Step	100	2,200.00	450	4.89
11.2	Handrail	22	Step		0.00	450	0.00
12	Gypsum Work & Decoration				0.00	450	0.00
	Cornich lengt + 20% for other gypsum decoration	693	M2		0.00	450	0.00
	Total				28,030,331.28		62,289.63

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wal**l (M.L Factors)						
	Foundation						
1.1	Concete Foundations	22	M3	52,000	1,158,300.00	450	2,574.00
1.2	Reinforcement Ø 16 mm	1,485	Kg	400	594,000.00	450	1,320.00
	Columns	0			0.00	450	0.00
1.3	Columns Concrete	5	M3	52,000	257,400.00	450	572.00
1.4	Columns Reinforcement Ø 16 mm	693	Kg	400	277,200.00	450	616.00
1.5	Columns Links Ø 8 mm	208	Kg	455	94,594.50	450	210.21
1.6	Tie Wire for the boundary wall	0	Bundel	17,000	5,610.00	450	12.47
	Masonry Work	0		0	0.00	450	0.00
1.7	Concrete Masonry Unit	4,455	Unit	195	868,725.00	450	1,930.50
1.8	Cement	4	Ton	80,000	285,120.00	450	633.60
1.9	Sand	15	M3	4,700	69,795.00	450	155.10
	Plaster Work	0		1	0.00	450	0.00
1.10	Cement	4	Ton	80,000	332,640.00	450	739.20
1.11	Sand	24	M3	4,700	111,672.00	450	248.16
	Painting Work	0			0.00	450	0.00
1.12	Surface smoothing paste	119	Kg	210	24,948.00	450	55.44
1.13	Painting	196	Kg	650	127,413.00	450	283.14
2	Tiles Works for land escape	0			0.00	450	0.00
	Floor	0		1	0.00	450	0.00
2.1	Tiles	99	M2	7,000	693,000.00	450	1,540.00
2.2	Cement	1	Ton	80,000	79,200.00	450	176.00
2.3	Sand	10	M3	4,700	46,530.00	450	103.40
3	Doors Works	0		650	0.00	450	0.00
3.1	Main Gates	0	Unit	320,000	0.00	450	0.00
	Total				5,026,147.50		11,169.22

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Engineering & Approval						
1.1	Design Cost	1	L.S	300,000	300,000	450	666.67
1.2	Governmental Fees	1	L.S	120,000	120,000	450	266.67
2	Site Preparation				0	450	0.00
2.1	Site Cleaning	1	L.S	150,000	150,000	450	333.33
2.2	Survey Work	1	L.S	200,000	200,000	450	444.44
3	Earth Work					450	0.00
3.1	Excavation	346	M3	2,500	864,000	450	1,920.00
3.2	Backfill Local (per site)	239	L.S	90,000	21,502,800	450	47,784.00
3.3	Backfill Selected	66	M3	90,000	5,940,000	450	13,200.00
4	Concrete Sub-structure				0	450	0.00
4.1	Foundation				0	450	0.00
4.2	Cast Lean, R.C for foundation & Short Column	123	M3	200	24,636	450	54.75
4.3	Formwork & rebar for foundation & Short Column	123	M3	45,000	5,543,100	450	12,318.00
5	Suspended Slab				0	450	0.00
5.1	Formwork & rebar for Slab	300	M2	35,000	10,500,000	450	23,333.33
6	Ground Floor				0	450	0.00
	Skeleton				0	450	0.00
6.1	Formwork & rebar for floor	20	M3	40,000	792,000	450	1,760.00
6.2	Slab Concrete including beams	300	M2	35,000	10,500,000	450	23,333.33
6.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
7	Masonry Work				0	450	0.00
7.1	Install Concrete Masonry Unit wall	750	M2	2,000	1,500,000	450	3,333.33
8	Plaster Work				0	450	0.00
8.1	Install plaster for Walls	1800	M2	1,000	1,800,000	450	4,000.00
8.2	Install plaster for Ceiling	330	M2	1,100	363,000	450	806.67
9	Painting Work				0	450	0.00
9.1	Install Painting for Walls	1800	M2	1,000	1,800,000	450	4,000.00
9.2	Install Painting for Ceiling	330	M2	1,100	363,000	450	806.67
10	Tiles Works				0	450	0.00
10.1	Install Tiles for Floor	300	M	2,000	600,000	450	1,333.33
10.2	Install Tiles for Walls	222	M	2,200	488,400	450	1,085.33
11	Staircase Works						
11.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
11.2	Handrail	8	M	1	8	450	0.02
12	Doors Works				0	450	0.00
12.1	Install Exteriors Gates	0	Unit	20,000	0	450	0.00
12.2	Install Interior Doors	9	Unit	15,000	135,000	450	300.00
13	Windows Works				0	450	0.00
13.1	Installation cost incl. in material unit price	33	M2	0	0	450	0.00
14	Electrical Works				0	450	0.00
14.1	Installation cost incl. in material unit price	330	M2	0	0	450	0.00
15	Toilets & Kitchens Plumbing Works				0	450	0.00
15.1	Internal plumbing works (per unit)	5	Unit	50,000	250,000	450	555.56
15.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	330	M2	0	0	450	0.00
16	Sewage Well				0	450	0.00
16.1	Sewage Well works	1	Unit	0	0	450	0.00
17	Gypsum Work & Decoration				0	450	0.00
17.1	Cornich & other gypsum decoration - material cost included	600	M	3,000	1,800,000	450	4,000.00
18	Elevator Work				0	450	0.00
18.1	Installation cost incl. in material unit price	0	Unit	0	0	450	0.00
	Total				**65,615,965.70**		**145,813.26**

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	22	Unit	40,000	871,200	450	1,936.00
1.2	Slab Concrete including beams	330	M2	35,000	11,550,000	450	25,666.67
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	693	M2	2,000	1,386,000	450	3,080.00
3	Plaster Work						
3.1	Install plaster for Walls	1749	M2	1,000	1,749,000	450	3,886.67
3.2	Install plaster for Ceiling	330	M2	1,100	363,000	450	806.67
4	Painting Work						
4.1	Install Painting for Walls	1749	M2	1,000	1,749,000	450	3,886.67
4.2	Install Painting for Ceiling	330	M2	1,100	363,000	450	806.67
5	Tiles Works						
5.1	Install Tiles for Floor	330	M2	2,000	660,000	450	1,466.67
5.2	Install Tiles for Walls	224.4	M2	2,200	493,680	450	1,097.07
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
6.2	Handrail	22	M	1	22	450	0.05
7	Doors Works						
7.1	Install Interior Doors	10	Unit	15,000	150,000	450	333.33
8	Windows Works						
8.1	Installation cost incl. in material unit price	40	M2	0	0	450	0.00
9	Electrical Works						
9.1	Installation cost incl. in material unit price	363	M2	0	0	450	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	7	Unit	1	7	450	0.02
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	363	M2	0	0	450	0.00
11	Gypsum Work & Decoration						
11.1	Cornich & other gypsum decoration	561	M	1	561	450	1.25
	Total				19,415,492.00		43,145.54

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	28	Unit	40,000	1,120,000	450	2,488.89
1.2	Slab Concrete including beams	315	M2	35,000	11,025,000	450	24,500.00
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	662	M2	2,000	1,323,000	450	2,940.00
3	Plaster Work						
3.1	Install plaster for Walls	1670	M2	1,000	1,669,500	450	3,710.00
3.2	Install plaster for Ceiling	315	M2	1,100	346,500	450	770.00
4	Painting Work						
4.1	Install Painting for Walls	1670	M2	1,000	1,669,500	450	3,710.00
4.2	Install Painting for Ceiling	315	M2	1,100	346,500	450	770.00
5	Tiles Works						
5.1	Install Tiles for Floor	315	M2	2,000	630,000	450	1,400.00
5.2	Install Tiles for Walls	214	M2	2,200	471,240	450	1,047.20
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
6.2	Handrail	22	M	1	22	450	0.05
7	Doors Works						
7.1	Install Interior Doors	11	Unit	15,000	165,000	450	366.67
8	Windows Works						
8.1	Installation cost incl. in material unit price	38	M2	1	38	450	0.08
9	Electrical Works						
9.1	Installation cost incl. in material unit price	347	M2	0	0	450	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	6	Unit	50,000	300,000	450	666.67
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	315	M2	0	0	450	0.00
11	Gypsum Work & Decoration						
11.1	Cornich & other gypsum decoration	536	M	1	536	450	1.19
	Total				**19,146,857.62**		42,548.57

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wal**l (M.L Factors)						
	Earth Work						
1.1	Excavation	84	M3	2,500	208,828	450	464.06
1.2	Backfill Local (per site)	54	L.S	90,000	4,869,315	450	10,820.70
	Concrete						
1.3	Cast Lean, R.C for foundation & Column	34.38	Unit	200	6,876	450	15.28
1.4	Formwork & rebar for foundation & Column	34.38	Unit	45,000	1,546,999	450	3,437.78
	Masonry Work				0	450	0.00
1.5	Install Concrete Masonry Unit wall	270	M2	2,000	540,000	450	1,200.00
	Plaster Work						
1.6	Install plaster for Walls	540	M2	1,000	540,000	450	1,200.00
1.7	Install plaster for Ceiling	540	M2	1,100	594,000	450	1,320.00
	Painting Work						
1.8	Install Painting for Walls	540	M2	1,000	540,000	450	1,200.00
1.9	Install Painting for Ceiling	540	M2	1,100	594,000	450	1,320.00
2	Tiles Works for Yard						
	Install Tiles for Floor	200	M	2,000	400,000	450	888.89
3	Doors Works						
3.1	Install Exteriors Gates	0	Unit	20,000	0	450	0.00
	Total				9,840,017.43		21,866.71

Item	SDG	USD
Engineering & Approval Fees	420,000.00	933.33
Materials Cost	40,878,386.55	90,840.86
Workmanship Cost	65,615,965.70	145,813.26
Sub -Total	106,914,352.25	237,587.45
Total Cost	107,151,939.70	237,587.45

Item	SDG	USD
Materials Cost	23,771,717.06	52,826.04
Workmanship Cost	19,415,492.00	43,145.54
Sub -Total	43,187,209.06	95,971.58
Total Cost	43,187,209.06	95,971.58

Item	SDG	USD
Materials Cost	28,030,331.28	62,289.63
Workmanship Cost	19,146,857.62	42,548.57
Sub -Total	47,177,188.90	104,838.20
Total Cost	47,282,027.09	104,838.20

Item	SDG	USD
Materials Cost	5,026,147.50	11,169.22
Workmanship Cost	9,840,017.43	21,866.71
Sub -Total	14,866,164.93	33,035.92
Total Cost	14,899,200.85	33,035.92

Item	Area M	Cost SDG	Cost USD
Ground Floor	300	107,151,939.70	238,115.42
First Floor	330	43,187,209.06	95,971.58
Second Floor	315	47,282,027.09	104,838.20
Third Floor	0	0.00	0.00
Fourth Floor	0	0.00	0.00
External Works			33,035.92
Total Estimated Buildings Cost		197,621,175.85	471,961.12
Profit %		10%	10%
Profit Amount		19762117.59	47196.11168
New Constructed Buildings Value		**217,383,293.44**	**519,157.23**
Current Buildings Conditiuons %		**85%**	
Current Constructed Buildings Value		**184,775,799.42**	**441,283.64**

Date	Plot #	Block #	Area M2	Neighborhood	City	Owner	
27/11/22	0	0	500		0	0	
Characteristics	Normal	$ Ex. Rate	450	Currency	SDG		

Comparable #	Subject Land	1	2	3	4	5	6
Characteristics	Excellent	**Excellent**			**Normal**		
Area M2	400	500	395	480	409	350	420
Sell Value	-	120,000,000	130,000,000	140,000,000	90,000,000	90,000,000	90,000,000
M2 Price	-	240,000	329,114	291,667	220,049	257,143	214,286
Today	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022
Sell Date	27/11/2022	16/03/2021	21/02/2021	05/06/2021	08/07/2021	12/12/2020	1/1/2021
Time Lag	0	20	21	17	16	23	5
$ Ex. Rate	450	410	400	420	450	380	390
$ Ex. Rate Diff.	0	40	50	30	0	70	60
$ Ex. Rate Diff. %	0.00%	9.76%	12.50%	7.14%	0.00%	18.42%	15.38%
M2 Adjustments							
Sell Time Adjust		263,415	370,253	312,500	220,049	304,511	247,253
Average		302,396			247,965		
Subject Land Estimated Market Value							
Characteristics		**If Excellent**			**If Normal**		
M2 Estimated Value		302,396			247,965		
Plot Estimated Value		120,958,243					
Plot Estimated Value Rounded		**121,000,000**					

Item	SDG	USD
Buildings Value	184,775,799.42	441,283.64
Land Value	121,000,000	268,888.89
Real Estate	305,775,799	710,172.53

Appendix D: Model Test No. 4 – Spreadsheets

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1	Earth Work							
1	Excavation	300	1.05	M3	314	10%	31.42	346
2	Backfill Local Material	300	0.72	M3	217	10%	21.72	239
3	Backfill Selected Material	300	0.20	M3	60	10%	6.00	66
2	R.C. Sub-structure							
	Foundation							
1	Lean Concete	300	0.06	M3	18	10%	1.84	20
2	Concete Foundations	300	0.26	M3	79	10%	7.85	86
3	Reinforcement Ø 16 mm	300	15.00	Kg	4,500	10%	450.00	4,950
4	Tie Wire	300	0.00	Bundel	1	0%	0.00	1
	Short Columns							
1	Concete Short Columns	300	0.05	M3	15	10%	1.50	17
2	Reinforcement Ø 16 mm	300	9.00	Kg	2,700	10%	270.00	2,970
3	Links Ø 8 mm	300	1.70	Kg	510	10%	51.00	561
4	Tie Wire	300	0.00	Bundel	1	0%	0.00	1
	Suspended Slab							
1	Concete Suspended Slab	300	0.23	M3	69	10%	6.90	76
2	Reinforcement Ø 16 mm	300	21.00	Kg	6,300	10%	630.00	6,930
3	Reinforcement Ø 12 mm	300	14.00	Kg	4,200	10%	420.00	4,620
4	Beams Reinforcement Ø 16 mm	300	1.50	Kg	450	10%	45.00	495
5	Beams links Ø 8 mm	300	0.90	Kg	270	10%	27.00	297
6	Tie Wire	300	0.01	Bundel	2	0%	0.00	2
3	Ground Floor							
	Skeleton							
1	Columns Concrete	300	0.06	M3	18	10%	1.80	20
2	Columns Reinforcement Ø 16 mm	300	6.00	Kg	1,800	10%	180.00	1,980
3	Columns Links Ø 8 mm	300	1.70	Kg	510	10%	51.00	561
4	Columns Tie Wire	300	1.00	Bundel	300	10%	30.00	330
5	Slab Concrete including beams	300	0.23	M3	69	10%	6.90	76
6	Reinforcement Ø 16 mm	300	21.00	Kg	6,300	10%	630.00	6,930
7	Reinforcement Ø 12 mm	300	14.00	Kg	4,200	10%	420.00	4,620
8	Beams Reinforcement Ø 16 mm	300	1.50	Kg	450	10%	45.00	495
9	Beams links Ø 8 mm	300	0.90	Kg	270	10%	27.00	297
10	Tie Wire	300	0.01	Bundel	3	0%	0.00	3

4	Masonry Work							
1	Concrete Masonry Unit	300	37.50	Unit	11,250	10%	1,125.00	12,375
2	Cement	300	0.03	Ton	9	10%	0.90	10
3	Sand	300	0.13	M3	38	10%	3.75	41
5	Plaster Work							
	Ceiling							
1	Cement	300	0.01	Unit	4	10%	0.42	5
2	Sand	300	0.05	M3	15	10%	1.50	17
	Walls							
3	Cement	300	0.08	Ton	25	10%	2.52	28
4	Sand	300	0.30	M3	90	10%	9.00	99
6	Painting Work							
	Ceiling							
1	Surface smoothing paste	300	0.20	Kg	60	10%	6.00	66
2	Painting	300	0.33	Kg	99	10%	9.90	109
7	Walls							
1	Surface smoothing paste	300	1.20	Kg	360	10%	36.00	396
2	Painting	300	1.98	Kg	594	10%	59.40	653
8	Tiles Works							
	Floor							
1	Tiles	300	1.00	M2	300		0.00	300
2	Cement	300	0.01	Ton	3		0.00	3
3	Sand	300	0.10	M3	30		0.00	30
	Walls							
1	Tiles	300	0.74	M2	222	10%	22.20	244
2	Cement	300	0.01	Ton	2	10%	0.22	2
3	Sand	300	0.07	M3	22	10%	2.22	24
9	Doors Works							
1	Gates Exterior	300	0.00	Unit	0	10%	0.00	0
2	Doors Interior	300	10.00	Unit	0	10%	0.00	0
10	Windows Works							
1	PVC / Aluminium windows	300	0.10	M2	30	10%	3.00	33
11	Electrical Works							
	Electrical works by flat rate for m2	300	1.00	M2	300	10%	30.00	330
12	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	5	1.00	Unit	5	10%	0.50	6
2	External Water supply & Sewage networks for floor including cost of material & workmanship	300	1.00	M2	300	10%	30.00	330
13	Staircase							
1	Steps Tiles (going & rise) marble or geranite	20	1.00	Step	20	10%	2.00	22
2	Handrail	7	1.00	M	7	10%	0.70	8
14	Elevator							
1	Elevator including installation	0	1.00	Unit	0	10%	0.00	0
15	Gypsum Work & Decoration							
1	Cornich length + 20% for other gypsum decoration	300	2.00	M	600	10%	60.00	660
16	Air conditioniong Works							
1	Spilit / Window Type	0	1.00	Unit	0	10%	0.00	0
2	Water Cooler (Evaporators)	0	1.00	Unit	0	10%	0.00	0

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
	Skeleton							
1	Columns Concrete	0	0.06	M3	0	10%	0.00	0
2	Columns Reinforcement Ø 16 mm	0	6.00	Kg	0	10%	0.00	0
3	Columns Links Ø 8 mm	0	1.70	Kg	0	10%	0.00	0
4	Columns Tie Wire	0	0.00	Bundel	0	10%	0.00	0
5	Slab Concrete including beams	0	0.23	M3	0	10%	0.00	0
6	Reinforcement Ø 16 mm cover slab	0	21.00	Kg	0	10%	0.00	0
7	Reinforcement Ø 12 mm cover slab	0	14.00	Kg	0	10%	0.00	0
8	Beams Reinforcement Ø 16 mm cover slab	0	1.50	Kg	0	10%	0.00	0
9	Beams links Ø 8 mm cover slab	0	0.90	Kg	0	10%	0.00	0
10	Tie Wire	0	0.00	Bundel	0	0%	0.00	0
	Masonry Work							
1	Concrete Masonry Unit	0	31.50	Unit	0	10%	0.00	0
2	Cement	0	0.03	Ton	0	10%	0.00	0
3	Sand	0	0.11	M3	0	10%	0.00	0
	Plaster Work							
	Ceiling							
1	Cement	0	0.01	Unit	0	10%	0.00	0
2	Sand	0	0.05	M3	0	10%	0.00	0
	Walls							
1	Cement	0	0.07	Ton	0	10%	0.00	0
2	Sand	0	0.27	M3	0	10%	0.00	0
	Painting Work							
	Ceiling							
1	Surface smoothing paste	0	0.20	Kg	0	10%	0.00	0
2	Painting	0	0.33	Kg	0	10%	0.00	0
	Walls							
1	Surface smoothing paste	0	1.06	Kg	0	10%	0.00	0
2	Painting	0	1.75	Kg	0	10%	0.00	0

	Tiles Works							
	Floor							
1	Tiles	0	1.00	M2	0	10%	0.00	0
2	Cement	0	0.01	Ton	0	10%	0.00	0
3	Sand	0	0.10	M3	0	10%	0.00	0
	Walls							
1	Tiles	0	0.68	M2	0	10%	0.00	0
2	Cement	0	0.01	Ton	0	10%	0.00	0
3	Sand	0	0.07	M3	0	10%	0.00	0
	Doors Works							
	Doors Interior	0	1.00	Unit	0	10%	0.00	0
	Windows Works							
1	PVC / Aluminium windows	0	0.11	M2	0	10%	0.00	0
	Electrical Works							
1	Electrical works by flat rate for m2	0	1.00	M2	0	10%	0.00	0
	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	0	1.00	Unit	0	10%	0.00	0
2	External Water supply & Sewage networks for floor including cost of material & workmanship	0	1.00	M2	0	10%	0.00	0
	Staircase							
1	Steps Tiles (going & rise)	0	1.00	Step	0	10%	0.00	0
2	Handrail	0	1.00	M	0	10%	0.00	0
	Gypsum Work & Decoration							
1	Cornich lengt + 20% for other gypsum decoration	0	2.00	M	0	10%	0.00	0

#	Item	Floor Area M^2 or B. Wall length M or QTY	Factor for M^2 or M.L **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
	Boundary Wall (M.L Factors)							
	Foundation							
1	Excavation	90	0.8	M3	75.9	10%	7.59	83.53
2	Backfill	90	0.5	M3	49.2	10%	4.92	54.10
3	Lean Concete for Foundations	90	0.1	M3	6.5	10%	0.65	7.15
4	Concete Foundations	90	0.2	M3	20.3	10%	2.03	22.28
5	Reinforcement Ø 16 mm	90	15.0	Kg	1,350.0	10%	135.00	1,485.00
6	Tie Wiers	90	0.0	Bundel	0.3	0%	0.00	0.30
	Columns							
1	Columns Concrete	90	0.1	M3	4.5	10%	0.45	4.95
2	Columns Reinforcement Ø 16 mm	90	7.0	Kg	630.0	10%	63.00	693.00
3	Columns Links Ø 8 mm	90	2.1	Kg	189.0	10%	18.90	207.90
4	Tie Wire for the boundary wall	90	0.0	Bundel	0.3	10%	0.03	0.33
	Masonry Work							
1	Concrete Masonry Unit	90	45.0	Unit	4,050.0	10%	405.00	4,455.00
2	Cement	90	0.0	Ton	3.2	10%	0.32	3.56
3	Sand	90	0.2	M3	13.5	10%	1.35	14.85
	Plaster Work					10%		
1	Cement	90	0.0	Ton	3.8	10%	0.38	4.16
2	Sand	90	0.2	M3	21.6	10%	2.16	23.76
	Painting Work							
1	Surface smoothing paste	90	1.2	Kg	108.0	10%	10.80	118.80
2	Painting	90	2.0	Kg	178.2	10%	17.82	196.02
	Tiles Works							
	Floor							
1	Tiles	90	1.0	M2	90.0	10%	9.00	99.00
2	Cement	90	0.0	Ton	0.9	10%	0.09	0.99
3	Sand	90	0.1	M3	9.0	10%	0.90	9.90
	Doors Works							
1	Main Gates	0	0.0	Unit	0.0	10%	0.00	0.00

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Earth Work						
1.1	Backfill Selected Material	66	M3	4,800	316,800.00	450	704.00
2	R.C. Sub-structure						
	Foundation						
2.1	Lean Concete	20	M3	43,000	872,040.00	450	1,937.87
2.2	Concete Foundations	86	M3	52,000	4,492,800.00	450	9,984.00
2.3	Reinforcement Ø 16 mm	4,950	Kg	400	1,980,000.00	450	4,400.00
2.4	Tie Wire	1	Bundel	17,000	17,000.00	450	37.78
3	Short Columns						
3.1	Concete Short Columns	17	M3	52,000	858,000.00	450	1,906.67
3.2	Reinforcement Ø 16 mm	2,970	Kg	400	1,188,000.00	450	2,640.00
3.3	Links Ø 8 mm	561	Kg	455	255,255.00	450	567.23
3.4	Tie Wire	1	Bundel	17,000	17,000.00	450	37.78
4	Suspended Slab						
4.1	Concete Suspended Slab	76	M3	52,000	3,946,800.00	450	8,770.67
4.2	Reinforcement Ø 16 mm	6,930	Kg	400	2,772,000.00	450	6,160.00
4.3	Reinforcement Ø 12 mm	4,620	Kg	400	1,848,000.00	450	4,106.67
4.4	Beams Reinforcement Ø 16 mm	495	Kg	400	198,000.00	450	440.00
4.5	Beams links Ø 8 mm	297	Kg	455	135,135.00	450	300.30
4.6	Tie Wire	2	Bundel	17,000	34,000.00	450	75.56
5	Ground Floor						
	Skeleton						
5.1	Columns Concrete	20	M3	52,000	1,029,600.00	450	2,288.00
5.2	Columns Reinforcement Ø 16 mm	1,980	Kg	400	792,000.00	450	1,760.00
5.3	Columns Links Ø 8 mm	561	Kg	455	255,255.00	450	567.23
5.4	Columns Tie Wire	330	Bundel		0.00	450	0.00
5.5	Slab Concrete including beams	76	M3	52,000	3,946,800.00	450	8,770.67
5.6	Reinforcement Ø 16 mm	6,930	Kg	400	2,772,000.00	450	6,160.00
5.7	Reinforcement Ø 12 mm	4,620	Kg	400	1,848,000.00	450	4,106.67
5.8	Beams Reinforcement Ø 16 mm	495	Kg	400	198,000.00	450	440.00
5.9	Beams links Ø 8 mm	297	Kg	455	135,135.00	450	300.30
5.10	Tie Wire	3		17,000	51,000.00	450	113.33

6	Masonry Work						
6.1	Concrete Masonry Unit	12,375		195	2,413,125.00	450	5,362.50
6.2	Cement	10		1	9.90	450	0.02
6.3	Sand	41		1	41.25	450	0.09
7	Plaster Work						
	Ceiling						
7.1	Cement	5		1	4.62	450	0.01
7.2	Sand	17		1	16.50	450	0.04
	Walls				0.00	450	0.00
7.3	Cement	28		1	27.72	450	0.06
7.4	Sand	99		1	99.00	450	0.22
8	Painting Work						
	Ceiling						
8.1	Surface smoothing paste	66		210	13,860.00	450	30.80
8.2	Painting	109		650	70,785.00	450	157.30
	Walls						
8.3	Surface smoothing paste	396		210	83,160.00	450	184.80
8.4	Painting	653		650	424,710.00	450	943.80
9	Tiles Works						
	Floor						
9.1	Tiles	300		7,000	2,100,000.00	450	4,666.67
9.2	Cement	3		1	3.00	450	0.01
	Sand	30		1	30.00	450	0.07
	Walls						
9.3	Tiles	244		5,000	1,221,000.00	450	2,713.33
9.4	Cement	2		1	2.44	450	0.01
	Sand	24		1	24.42	450	0.05
10	Doors Works						
10.1	Gates Exterior	0		320,000	0.00	450	0.00
10.2	Doors Interior	10		150,000	1,500,000.00	450	3,333.33
11	Windows Works				0.00	450	0.00
11.1	PVC / Aluminium windows	33			0.00	450	0.00
12	Electrical Works						
12.1	Electrical Work for floor including cost of material & workmanship	300		8,100	2,430,000.00	450	5,400.00
13	Toilets & Kitchens Plumbing Works : no. of all for floor						
13.1	Internal plumbing works	6			0.00	450	0.00
13.2	External Water supply & Sewage networks for floor including cost of material & workmanship	300		2,700	810,000.00	450	1,800.00
14	Staircase						
14.1	No Steps Tiles	22	Step	0	0.00	450	0.00
14.2	Handrail	8	M	1	7.70	450	0.02
15	Elevator						
15.1	Elevator including installation	0	Unit	1	0.00	450	0.00
16	Gypsum Work & Decoration				0.00	450	0.00
16.1	Cornich lengt + 20% for other gypsum decoration	660		1	660.00	450	1.47
17	Airconditioniong Works						
17.1	Spilt / Window	0	Unit		0.00	450	0.00
17.2	Water Cooling	0	Unit		0.00	450	0.00
	Total				**41,026,186.55**		91,169.30

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wall** (M.L Factors)						
	Foundation						
1.1	Concete Foundations	22	M3	52,000	1,158,300.00	450	2,574.00
1.2	Reinforcement Ø 16 mm	1,485	Kg	400	594,000.00	450	1,320.00
	Columns	0			0.00	450	0.00
1.3	Columns Concrete	5	M3	52,000	257,400.00	450	572.00
1.4	Columns Reinforcement Ø 16 mm	693	Kg	400	277,200.00	450	616.00
1.5	Columns Links Ø 8 mm	208	Kg	455	94,594.50	450	210.21
1.6	Tie Wire for the boundary wall	0	Bundel	17,000	5,610.00	450	12.47
	Masonry Work	0		0	0.00	450	0.00
1.7	Concrete Masonry Unit	4,455	Unit	195	868,725.00	450	1,930.50
1.8	Cement	4	Ton	80,000	285,120.00	450	633.60
1.9	Sand	15	M3	4,700	69,795.00	450	155.10
	Plaster Work	0		1	0.00	450	0.00
1.10	Cement	4	Ton	80,000	332,640.00	450	739.20
1.11	Sand	24	M3	4,700	111,672.00	450	248.16
	Painting Work	0			0.00	450	0.00
1.12	Surface smoothing paste	119	Kg	210	24,948.00	450	55.44
1.13	Painting	196	Kg	650	127,413.00	450	283.14
2	Tiles Works for land escape	0			0.00	450	0.00
	Floor	0		1	0.00	450	0.00
2.1	Tiles	99	M2	7,000	693,000.00	450	1,540.00
2.2	Cement	1	Ton	80,000	79,200.00	450	176.00
2.3	Sand	10	M3	4,700	46,530.00	450	103.40
3	Doors Works	0		650	0.00	450	0.00
3.1	Main Gates	0	Unit	320,000	0.00	450	0.00
	Total				5,026,147.50		11,169.22

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Engineering & Approval						
1.1	Design Cost	1	L.S	300,000	300,000	450	666.67
1.2	Governmental Fees	1	L.S	120,000	120,000	450	266.67
2	Site Preparation				0	450	0.00
2.1	Site Cleaning	1	L.S	150,000	150,000	450	333.33
2.2	Survey Work	1	L.S	200,000	200,000	450	444.44
3	Earth Work					450	0.00
3.1	Excavation	346	M3	2,500	864,000	450	1,920.00
3.2	Backfill Local (per site)	239	L.S	90,000	21,502,800	450	47,784.00
3.3	Backfill Selected	66	M3	90,000	5,940,000	450	13,200.00
4	Concrete Sub-structure				0	450	0.00
4.1	Foundation				0	450	0.00
4.2	Cast Lean, R.C for foundation & Short Column	123	M3	200	24,636	450	54.75
4.3	Formwork & rebar for foundation & Short Column	123	M3	45,000	5,543,100	450	12,318.00
5	Suspended Slab				0	450	0.00
5.1	Formwork & rebar for Slab	300	M2	35,000	10,500,000	450	23,333.33
6	Ground Floor				0	450	0.00
	Skeleton				0	450	0.00
6.1	Formwork & rebar for floor	20	M3	40,000	792,000	450	1,760.00
6.2	Slab Concrete including beams	300	M2	35,000	10,500,000	450	23,333.33
6.3	Formwork & rebar staircase	1	Unit	80,000	80,000	450	177.78
7	Masonry Work				0	450	0.00
7.1	Install Concrete Masonry Unit wall	750	M2	2,000	1,500,000	450	3,333.33
8	Plaster Work				0	450	0.00
8.1	Install plaster for Walls	1800	M2	1,000	1,800,000	450	4,000.00
8.2	Install plaster for Ceiling	0	M2	1,100	0	450	0.00
9	Painting Work				0	450	0.00
9.1	Install Painting for Walls	1800	M2	1,000	1,800,000	450	4,000.00
9.2	Install Painting for Ceiling	0	M2	1,100	0	450	0.00
10	Tiles Works				0	450	0.00
10.1	Install Tiles for Floor	300	M	2,000	600,000	450	1,333.33
10.2	Install Tiles for Walls	222	M	2,200	488,400	450	1,085.33
11	Staircase Works						
11.1	Steps Tiles (going & rise)	22	Step	1	22	450	0.05
11.2	Handrail	8	M	1	8	450	0.02
12	Doors Works				0	450	0.00
12.1	Install Exteriors Gates	0	Unit	20,000	0	450	0.00
12.2	Install Interior Doors	10	Unit	15,000	150,000	450	333.33
13	Windows Works				0	450	0.00
13.1	Installation cost incl. in material unit price	33	M2	0	0	450	0.00
14	Electrical Works				0	450	0.00
14.1	Installation cost incl. in material unit price	330	M2	0	0	450	0.00
15	Toilets & Kitchens Plumbing Works				0	450	0.00
15.1	Internal plumbing works (per unit)	5	Unit	50,000	250,000	450	555.56
15.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	330	M2	0	0	450	0.00
16	Sewage Well				0	450	0.00
16.1	Sewage Well works	1	Unit	0	0	450	0.00
17	Gypsum Work & Decoration				0	450	0.00
17.1	Cornich & other gypsum decoration - material cost included	600	M	3,000	1,800,000	450	4,000.00
18	Elevator Work				0	450	0.00
18.1	Installation cost incl. in material unit price	0	Unit	0	0	450	0.00
	Total				**64,904,965.70**		**144,233.26**

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wall** (M.L Factors)						
	Earth Work						
1.1	Excavation	84	M3	2,500	208,828	450	464.06
1.2	Backfill Local (per site)	54	L.S	90,000	4,869,315	450	10,820.70
	Concrete						
1.3	Cast Lean, R.C for foundation & Column	34.38	Unit	200	6,876	450	15.28
1.4	Formwork & rebar for foundation & Column	34.38	Unit	45,000	1,546,999	450	3,437.78
	Masonry Work				0	450	0.00
1.5	Install Concrete Masonry Unit wall	270	M2	2,000	540,000	450	1,200.00
	Plaster Work						
1.6	Install plaster for Walls	540	M2	1,000	540,000	450	1,200.00
1.7	Install plaster for Ceiling	540	M2	1,100	594,000	450	1,320.00
	Painting Work						
1.8	Install Painting for Walls	540	M2	1,000	540,000	450	1,200.00
1.9	Install Painting for Ceiling	540	M2	1,100	594,000	450	1,320.00
2	Tiles Works for Yard						
	Install Tiles for Floor	200	M	2,000	400,000	450	888.89
3	Doors Works						
3.1	Install Exteriors Gates	0	Unit	20,000	0	450	0.00
	Total				9,840,017.43		21,866.71

Item	SDG	USD
Engineering & Approval Fees	420,000.00	933.33
Materials Cost	41,026,186.55	91,169.30
Workmanship Cost	64,904,965.70	144,233.26
Sub -Total	106,351,152.25	236,335.89
Total Cost	106,587,488.15	236,335.89

Item	SDG	USD
Materials Cost	5,026,147.50	11,169.22
Workmanship Cost	9,840,017.43	21,866.71
Sub -Total	14,866,164.93	33,035.92
Total Cost	14,899,200.85	33,035.92

#	Item	Area M	Cost SDG	Cost USD
1	Ground Floor	300	106,587,488.15	236,861.08
2	First Floor	0	0.00	0.00
3	Second Floor	0	0.00	0.00
4	Third Floor	0	0.00	0.00
5	Fourth Floor	0	0.00	0.00
6	External Works			33,035.92
	Total Estimated Buildings Cost		106,587,488.15	269,897.01
	Profit %		10%	10%
	Profit Amount		10658748.81	26989.70068
	New Constructed Buildings Value		**117,246,236.96**	**296,886.71**
	Current Buildings Conditiuons %		**95%**	
	Current Constructed Buildings Value		**111,383,925.11**	**282,042.37**

Date	Plot #	Block #	Area M2	Neighborhood	City	Owner	
27/11/22	0	0	500		0	0	
Characteristics	Normal	$ Ex. Rate	450	Currency	SDG		

Comparable #	Subject Land	1	2	3	4	5	6
Characteristics	Excellent	**Excellent**			**Normal**		
Area M2	400	500	400	450	380	420	400
Sell Value	-	150,000,000	150,000,000	120,000,000	100,000,000	90,000,000	100,000,000
M2 Price	-	300,000	375,000	266,667	263,158	214,286	250,000
Today	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022
Sell Date	27/11/2022	16/03/2021	21/02/2021	05/06/2021	08/07/2021	12/12/2020	1/1/2021
Time Lag	0	20	21	17	16	23	5
$ Ex. Rate	450	410	400	420	450	380	390
$ Ex. Rate Diff.	0	40	50	30	0	70	60
$ Ex. Rate Diff. %	0.00%	9.76%	12.50%	7.14%	0.00%	18.42%	15.38%
M2 Adjustments							
Sell Time Adjust		329,268	421,875	285,714	263,158	253,759	288,462
Average		341,531			267,134		
Subject Land Estimated Market Value							
Characteristics		**If Excellent**			**If Normal**		
M2 Estimated Value		341,531			267,134		
Plot Estimated Value		136,612,587					
Plot Estimated Value Rounded		**137,000,000**					

Item	SDG	USD
Buildings Value	111,383,925.11	282,042.37
Land Value	137,000,000	304,444.44
Real Estate	248,383,925	586,486.82

Appendix E: Model Test No. 5 – Spreadsheets

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
1	Earth Work							
1	Excavation	280	1.05	M3	293	10%	29.32	323
2	Backfill Local Material	280	0.72	M3	203	10%	20.27	223
3	Backfill Selected Material	280	0.20	M3	56	10%	5.60	62
2	R.C. Sub-structure							
	Foundation							
1	Lean Concete	280	0.06	M3	17	10%	1.72	19
2	Concete Foundations	280	0.26	M3	73	10%	7.33	81
3	Reinforcement Ø 16 mm	280	15.00	Kg	4,200	10%	420.00	4,620
4	Tie Wire	280	0.00	Bundel	1	0%	0.00	1
	Short Columns							
1	Concete Short Columns	280	0.05	M3	14	10%	1.40	15
2	Reinforcement Ø 16 mm	280	9.00	Kg	2,520	10%	252.00	2,772
3	Links Ø 8 mm	280	1.70	Kg	476	10%	47.60	524
4	Tie Wire	280	0.00	Bundel	1	0%	0.00	1
	Suspended Slab							
1	Concete Suspended Slab	280	0.23	M3	64	10%	6.44	71
2	Reinforcement Ø 16 mm	280	21.00	Kg	5,880	10%	588.00	6,468
3	Reinforcement Ø 12 mm	280	14.00	Kg	3,920	10%	392.00	4,312
4	Beams Reinforcement Ø 16 mm	280	1.50	Kg	420	10%	42.00	462
5	Beams links Ø 8 mm	280	0.90	Kg	252	10%	25.20	277
6	Tie Wire	280	0.01	Bundel	2	0%	0.00	2
3	Ground Floor							
	Skeleton							
1	Columns Concrete	280	0.06	M3	17	10%	1.68	18
2	Columns Reinforcement Ø 16 mm	280	6.00	Kg	1,680	10%	168.00	1,848
3	Columns Links Ø 8 mm	280	1.70	Kg	476	10%	47.60	524
4	Columns Tie Wire	280	1.00	Bundel	280	10%	28.00	308
5	Slab Concrete including beams	280	0.23	M3	64	10%	6.44	71
6	Reinforcement Ø 16 mm	280	21.00	Kg	5,880	10%	588.00	6,468
7	Reinforcement Ø 12 mm	280	14.00	Kg	3,920	10%	392.00	4,312
8	Beams Reinforcement Ø 16 mm	280	1.50	Kg	420	10%	42.00	462
9	Beams links Ø 8 mm	280	0.90	Kg	252	10%	25.20	277
10	Tie Wire	280	0.01	Bundel	3	0%	0.00	3
4	Masonry Work							
1	Concrete Masonry Unit	280	37.50	Unit	10,500	10%	**1,050.00**	11,550
2	Cement	280	0.03	Ton	8	10%	0.84	9
3	Sand	280	0.13	M3	35	10%	3.50	39
5	Plaster Work							
	Ceiling							
1	Cement	280	0.01	Unit	4	10%	0.39	4
2	Sand	280	0.05	M3	14	10%	1.40	15
	Walls							
3	Cement	280	0.08	Ton	24	10%	2.35	26
4	Sand	280	0.30	M3	84	10%	8.40	92

6	Painting Work							
	Ceiling							
1	Surface smoothing paste	280	0.20	Kg	56	10%	5.60	62
2	Painting	280	0.33	Kg	92	10%	9.24	102
7	Walls							
1	Surface smoothing paste	280	1.20	Kg	336	10%	33.60	370
2	Painting	280	1.98	Kg	554	10%	55.44	610
8	Tiles Works							
	Floor							
1	Tiles	280	1.00	M2	280		0.00	280
2	Cement	280	0.01	Ton	3		0.00	3
3	Sand	280	0.10	M3	28		0.00	28
	Walls							
1	Tiles	280	0.74	M2	207	10%	20.72	228
2	Cement	280	0.01	Ton	2	10%	0.21	2
3	Sand	280	0.07	M3	21	10%	2.07	23
9	Doors Works							
1	Gates Exterior	280	0.00	Unit	0	10%	0.00	0
2	Doors Interior	280	9.00	Unit	0	10%	0.00	0
10	Windows Works							
1	PVC / Aluminium windows	280	0.10	M2	28	10%	2.80	31
11	Electrical Works							
	Electrical works by flat rate for m2	280	1.00	M2	280	10%	28.00	308
12	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	4	1.00	Unit	4	10%	0.40	4
2	External Water supply & Sewage networks for floor including cost of material & workmanship	280	1.00	M2	280	10%	28.00	308
13	Staircase							
1	Steps Tiles (going & rise) marble or geranite	20	1.00	Step	20	10%	2.00	22
2	Handrail	7	1.00	M	7	10%	0.70	8
14	Elevator							
1	Elevator including installation	0	1.00	Unit	0	10%	0.00	0
15	Gypsum Work & Decoration							
1	Cornich length + 20% for other gypsum decoration	280	2.00	M	560	10%	56.00	616
16	Air conditioniong Works							
1	Spilit / Window Type	0	1.00	Unit	0	10%	0.00	0
2	Water Cooler (Evaporators)	0	1.00	Unit	0	10%	0.00	0

#	Item	Floor Area M^2 / QTY	Factor for M^2 **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
	Skeleton							
1	Columns Concrete	265	0.06	M3	16	10%	1.59	17
2	Columns Reinforcement Ø 16 mm	265	6.00	Kg	1,590	10%	159.00	1,749
3	Columns Links Ø 8 mm	265	1.70	Kg	451	10%	45.05	496
4	Columns Tie Wire	265	0.00	Bundel	1	10%	0.09	1
5	Slab Concrete including beams	265	0.23	M3	61	10%	6.10	67
6	Reinforcement Ø 16 mm cover slab	265	21.00	Kg	5,565	10%	556.50	6,122
7	Reinforcement Ø 12 mm cover slab	265	14.00	Kg	3,710	10%	371.00	4,081
8	Beams Reinforcement Ø 16 mm cover slab	265	1.50	Kg	398	10%	39.75	437
9	Beams links Ø 8 mm cover slab	265	0.90	Kg	239	10%	23.85	262
10	Tie Wire	265	0.00	Bundel	1	0%	0.00	1
	Masonry Work							
1	Concrete Masonry Unit	265	31.50	Unit	8,348	10%	834.75	9,182
2	Cement	265	0.03	Ton	7	10%	0.67	7
3	Sand	265	0.11	M3	28	10%	2.78	31
	Plaster Work							
	Ceiling							
1	Cement	265	0.01	Unit	4	10%	0.37	4
2	Sand	265	0.05	M3	13	10%	1.33	15
	Walls							
1	Cement	265	0.07	Ton	20	10%	1.97	22
2	Sand	265	0.27	M3	70	10%	7.02	77
	Painting Work							
	Ceiling							
1	Surface smoothing paste	265	0.20	Kg	53	10%	5.30	58
2	Painting	265	0.33	Kg	87	10%	8.75	96
	Walls							
1	Surface smoothing paste	265	1.06	Kg	281	10%	28.09	309
2	Painting	265	1.75	Kg	463	10%	46.35	510
	Tiles Works							
	Floor							
1	Tiles	265	1.00	M2	265	10%	26.50	292
2	Cement	265	0.01	Ton	3	10%	0.27	3
3	Sand	265	0.10	M3	27	10%	2.65	29
	Walls							
1	Tiles	265	0.68	M2	180	10%	18.02	198
2	Cement	265	0.01	Ton	2	10%	0.18	2
3	Sand	265	0.07	M3	18	10%	1.80	20
	Doors Works							
	Doors Interior	8	1.00	Unit	8	10%	0.80	9
	Windows Works							
1	PVC / Aluminium windows	265	0.11	M2	29	10%	2.92	32
	Electrical Works							
1	Electrical works by flat rate for m2	265	1.00	M2	265	10%	26.50	292
	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	3	1.00	Unit	3	10%	0.30	3
2	External Water supply & Sewage networks for floor including cost of material & workmanship	265	1.00	M2	265	10%	26.50	292
	Staircase							
1	Steps Tiles (going & rise)	20	1.00	Step	20	10%	2.00	22
2	Handrail	20	1.00	M	20	10%	2.00	22
	Gypsum Work & Decoration							
1	Cornich lengt + 20% for other gypsum decoration	265	2.00	M	530	10%	53.00	583

#	Item	Floor Area M^2 / QTY	Factor for M^2 (F)	Unit	Item QTY	Add Waste %	Waste QTY	Total QTY
	Skeleton							
1	Columns Concrete	265	0.06	M3	16	10%	1.59	17
2	Columns Reinforcement Ø 16 mm	265	6	Kg	1,590	10%	159.00	1,749
3	Columns Links Ø 8 mm	265	1.7	Kg	451	10%	45.05	496
4	Columns Tie Wire	265	1	Bundel	265	10%	26.50	292
5	Slab Concrete including beams	265	0.23	M3	61	10%	6.10	67
6	Reinforcement Ø 16 mm cover slab	265	21	Kg	5,565	10%	556.50	6,122
7	Reinforcement Ø 12 mm cover slab	265	14	Kg	3,710	10%	371.00	4,081
8	Beams Reinforcement Ø 16 mm cover slab	265	1.5	Kg	398	10%	39.75	437
9	Beams links Ø 8 mm cover slab	265	0.9	Kg	239	10%	23.85	262
10	Tie Wire	265	0.003	Bundel	1	0%	0.00	1
	Masonry Work							
1	Concrete Masonry Unit	265	31.5	Unit	8,348	10%	834.75	9,182
2	Cement	265	0.025	Ton	7	10%	0.67	7
3	Sand	265	0.105	M3	28	10%	2.78	31
	Plaster Work							
	Ceiling							
1	Cement	265	0.014	Unit	4	10%	0.37	4
2	Sand	265	0.05	M3	13	10%	1.33	15
	Walls							
1	Cement	265	0.074	Ton	20	10%	1.97	22
2	Sand	265	0.265	M3	70	10%	7.02	77
	Painting Work							
	Ceiling							
1	Surface smoothing paste	265	0.2	Kg	53	10%	5.30	58
2	Painting	265	0.33	Kg	87	10%	8.75	96
	Walls							
1	Surface smoothing paste	265	1.06	Kg	281	10%	28.09	309
2	Painting	265	1.749	Kg	463	10%	46.35	510
	Tiles Works							
	Floor							
1	Tiles	265	1	M2	265	10%	26.50	292
2	Cement	265	0.01	Ton	3	10%	0.27	3
3	Sand	265	0.1	M3	27	10%	2.65	29
	Walls							
1	Tiles	265	0.68	M2	180	10%	18.02	198
2	Cement	265	0.007	Ton	2	10%	0.18	2
3	Sand	265	0.068	M3	18	10%	1.80	20
	Doors Works							
1	Doors Interior	8	1	Unit	8	10%	0.80	9
	Windows Works							
1	PVC / Aluminium windows	265	0.11	M2	29	10%	2.92	32
	Electrical Works							
1	Electrical works by flat rate for m2	265	1	M2	265	10%	26.50	292
	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	4	1	Unit	4	10%	0.40	4
2	External Water supply & Sewage networks for floor including cost of material & workmanship	265	1	Unit	265		0.00	265
	Staircase							
1	Steps Tiles (going & rise)	20	1	Step	20	10%	2.00	22
2	Handrail	20	1	M	20	10%	2.00	22
	Gypsum Work & Decoration							
1	Cornich lengt + 20% for other gypsum decoration	265	2	M	530	10%	53.00	583

#	Item	Floor Area M^2 / QTY	Factor for M^2 (F)	Unit	Item QTY	Add Waste %	Waste QTY	Total QTY
	Skeleton							
1	Columns Concrete	210	0.1	M3	13	10%	1.26	14
2	Columns Reinforcement Ø 16 mm	210	6.0	Kg	1,260	10%	126.00	1,386
3	Columns Links Ø 8 mm	210	1.7	Kg	357	10%	35.70	393
4	Columns Tie Wire	210	1.0	Bundel	210	10%	21.00	231
5	Slab Concrete including beams	210	0.2	M3	48	10%	4.83	53
6	Reinforcement Ø 16 mm cover slab	210	21.0	Kg	4,410	10%	441.00	4,851
7	Reinforcement Ø 12 mm cover slab	210	14.0	Kg	2,940	10%	294.00	3,234
8	Beams Reinforcement Ø 16 mm cover slab	210	1.5	Kg	315	10%	31.50	347
9	Beams links Ø 8 mm cover slab	210	0.9	Kg	189	10%	18.90	208
10	Tie Wire	210	0.0	Bundel	1	0%	0.00	1
	Masonry Work							
1	Concrete Masonry Unit	210	31.5	Unit	6,615	10%	661.50	7,277
2	Cement	210	0.0	Ton	5	10%	0.53	6
3	Sand	210	0.1	M3	22	10%	2.21	24
	Plaster Work							
	Ceiling							
1	Cement	210	0.0	Unit	3	10%	0.29	3
2	Sand	210	0.1	M3	11	10%	1.05	12
	Walls							
1	Cement	210	0.1	Ton	16	10%	1.56	17
2	Sand	210	0.3	M3	56	10%	5.57	61
	Painting Work							
	Ceiling							
1	Surface smoothing paste	210	0.2	Kg	42	10%	4.20	46
2	Painting	210	0.3	Kg	69	10%	6.93	76
	Walls							
1	Surface smoothing paste	210	1.1	Kg	223	10%	22.26	245
2	Painting	210	1.7	Kg	367	10%	36.73	404
	Tiles Works							
	Floor							
1	Tiles	210	1.0	M2	210	10%	21.00	231
2	Cement	210	0.0	Ton	2	10%	0.21	2
3	Sand	210	0.1	M3	21	10%	2.10	23
	Walls							
1	Tiles	210	0.7	M2	143	10%	14.28	157
2	Cement	210	0.0	Ton	1	10%	0.14	2
3	Sand	210	0.1	M3	14	10%	1.43	16
	Doors Works							
1	Doors Interior	0	1.0	Unit	0	10%	0.00	0
	Windows Works							
1	PVC / Aluminium windows	210	0.1	M2	23	10%	2.31	25
	Electrical Works							
1	Electrical works by flat rate for m2	210	1.0	M2	210	10%	21.00	231
	Toilets & Kitchens Plumbing Works : no. of all for floor							
1	Internal plumbing works	0	1.0	Unit	0	10%	0.00	0
2	External Water supply & Sewage networks for floor including cost of material & workmanship	210	1.0	M2	210	10%	21.00	231
	Staircase							
1	Steps Tiles (going & rise)	20	1.0	Step	20	10%	2.00	22
2	Handrail	20	1.0	M	20	10%	2.00	22
	Gypsum Work & Decoration							
1	Cornich lengt + 20% for other gypsum decoration	210	2.0	M	420	10%	42.00	462

#	Item	Floor Area M^2 or B. Wall length M or QTY	Factor for M^2 or M.L **(F)**	Unit	Item **QTY**	Add Waste %	Waste **QTY**	Total **QTY**
	Boundary Wall (M.L Factors)							
	Foundation							
1	Excavation	90	0.8	M3	75.9	10%	7.59	83.53
2	Backfill	90	0.5	M3	49.2	10%	4.92	54.10
3	Lean Concete for Foundations	90	0.1	M3	6.5	10%	0.65	7.15
4	Concete Foundations	90	0.2	M3	20.3	10%	2.03	22.28
5	Reinforcement Ø 16 mm	90	15.0	Kg	1,350.0	10%	135.00	1,485.00
6	Tie Wiers	90	0.0	Bundel	0.3	0%	0.00	0.30
	Columns							
1	Columns Concrete	90	0.1	M3	4.5	10%	0.45	4.95
2	Columns Reinforcement Ø 16 mm	90	7.0	Kg	630.0	10%	63.00	693.00
3	Columns Links Ø 8 mm	90	2.1	Kg	189.0	10%	18.90	207.90
4	Tie Wire for the boundary wall	90	0.0	Bundel	0.3	10%	0.03	0.33
	Masonry Work							
1	Concrete Masonry Unit	90	45.0	Unit	4,050.0	10%	405.00	4,455.00
2	Cement	90	0.0	Ton	3.2	10%	0.32	3.56
3	Sand	90	0.2	M3	13.5	10%	1.35	14.85
	Plaster Work					10%		
1	Cement	90	0.0	Ton	3.8	10%	0.38	4.16
2	Sand	90	0.2	M3	21.6	10%	2.16	23.76
	Painting Work							
1	Surface smoothing paste	90	1.2	Kg	108.0	10%	10.80	118.80
2	Painting	90	2.0	Kg	178.2	10%	17.82	196.02
	Tiles Works							
	Floor							
1	Tiles	90	1.0	M2	90.0	10%	9.00	99.00
2	Cement	90	0.0	Ton	0.9	10%	0.09	0.99
3	Sand	90	0.1	M3	9.0	10%	0.90	9.90
	Doors Works							
1	Main Gates	0	0.0	Unit	0.0	10%	0.00	0.00

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Earth Work						
1.1	Backfill Selected Material	62	M3	4,800	295,680.00	570	518.74
2	R.C. Sub-structure						
	Foundation						
2.1	Lean Concete	19	M3	43,000	813,904.00	570	1,427.90
2.2	Concete Foundations	81	M3	52,000	4,193,280.00	570	7,356.63
2.3	Reinforcement Ø 16 mm	4,620	Kg	400	1,848,000.00	570	3,242.11
2.4	Tie Wire	1	Bundel	17,000	15,866.67	570	27.84
3	Short Columns						
3.1	Concete Short Columns	15	M3	52,000	800,800.00	570	1,404.91
3.2	Reinforcement Ø 16 mm	2,772	Kg	400	1,108,800.00	570	1,945.26
3.3	Links Ø 8 mm	524	Kg	455	238,238.00	570	417.96
3.4	Tie Wire	1	Bundel	17,000	15,866.67	570	27.84
4	Suspended Slab						
4.1	Concete Suspended Slab	71	M3	52,000	3,683,680.00	570	6,462.60
4.2	Reinforcement Ø 16 mm	6,468	Kg	400	2,587,200.00	570	4,538.95
4.3	Reinforcement Ø 12 mm	4,312	Kg	400	1,724,800.00	570	3,025.96
4.4	Beams Reinforcement Ø 16 mm	462	Kg	400	184,800.00	570	324.21
4.5	Beams links Ø 8 mm	277	Kg	455	126,126.00	570	221.27
4.6	Tie Wire	2	Bundel	17,000	31,733.33	570	55.67
5	Ground Floor						
	Skeleton						
5.1	Columns Concrete	18	M3	52,000	960,960.00	570	1,685.89
5.2	Columns Reinforcement Ø 16 mm	1,848	Kg	400	739,200.00	570	1,296.84
5.3	Columns Links Ø 8 mm	524	Kg	455	238,238.00	570	417.96
5.4	Columns Tie Wire	308	Bundel		0.00	570	0.00
5.5	Slab Concrete including beams	71	M3	52,000	3,683,680.00	570	6,462.60
5.6	Reinforcement Ø 16 mm	6,468	Kg	400	2,587,200.00	570	4,538.95
5.7	Reinforcement Ø 12 mm	4,312	Kg	400	1,724,800.00	570	3,025.96
5.8	Beams Reinforcement Ø 16 mm	462	Kg	400	184,800.00	570	324.21
5.9	Beams links Ø 8 mm	277	Kg	455	126,126.00	570	221.27
5.10	Tie Wire	3		17,000	47,600.00	570	83.51
6	Masonry Work						
6.1	Concrete Masonry Unit	11,550		195	2,252,250.00	570	3,951.32
6.2	Cement	9		1	9.24	570	0.02
6.3	Sand	39		1	38.50	570	0.07

7	Plaster Work						
	Ceiling						
7.1	Cement	4		1	4.31	570	0.01
7.2	Sand	15		1	15.40	570	0.03
	Walls				0.00	570	0.00
7.3	Cement	26		1	25.87	570	0.05
7.4	Sand	92		1	92.40	570	0.16
8	Painting Work						
	Ceiling						
8.1	Surface smoothing paste	62		210	12,936.00	570	22.69
8.2	Painting	102		650	66,066.00	570	115.91
	Walls						
8.3	Surface smoothing paste	370		210	77,616.00	570	136.17
8.4	Painting	610		650	396,396.00	570	695.43
9	Tiles Works						
	Floor						
9.1	Tiles	280		7,000	1,960,000.00	570	3,438.60
9.2	Cement	3		1	2.80	570	0.00
	Sand	28		1	28.00	570	0.05
	Walls						
9.3	Tiles	228		5,000	1,139,600.00	570	1,999.30
9.4	Cement	2		1	2.28	570	0.00
	Sand	23		1	22.79	570	0.04
10	Doors Works						
10.1	Gates Exterior	0		320,000	0.00	570	0.00
10.2	Doors Interior	9		150,000	1,350,000.00	570	2,368.42
11	Windows Works				0.00	570	0.00
11.1	PVC / Aluminium windows	31			0.00	570	0.00
12	Electrical Works						
12.1	Electrical Work for floor including cost of material & workmanship	280		10,260	2,872,800.00	570	5,040.00
13	Toilets & Kitchens Plumbing Works : no. of all for floor						
13.1	Internal plumbing works	4			0.00	570	0.00
13.2	External Water supply & Sewage networks for floor including cost of material & workmanship	280		3,420	957,600.00	570	1,680.00
14	Staircase						
14.1	No Steps Tiles	22	Step	0	0.00	570	0.00
14.2	Handrail	8	M	1	7.70	570	0.01
15	Elevator						
15.1	Elevator including installation	0	Unit	1	0.00	570	0.00
16	Gypsum Work & Decoration				0.00	570	0.00
16.1	Cornich lengt + 20% for other gypsum decoration	616		1	616.00	570	1.08
17	Airconditioniong Works						
17.1	Spilt / Window	0	Unit		0.00	570	0.00
17.2	Water Cooling	0	Unit		0.00	570	0.00
	Total				**39,047,507.96**		68,504.40

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Columns Concrete	17	M3	52,000	909,480	570	1,595.58
1.2	Columns Reinforcement Ø 16 mm	1,749	kg	400	699,600	570	1,227.37
1.3	Columns Links Ø 8 mm	496	kg	455	225,475	570	395.57
1.4	Columns Tie Wire	1	kg	17,000	16,518	570	28.98
1.5	Slab Concrete including beams	67	kg	52,000	3,486,340	570	6,116.39
1.6	Reinforcement Ø 16 mm	6,122	kg	400	2,448,600	570	4,295.79
1.7	Reinforcement Ø 12 mm	4,081	kg	400	1,632,400	570	2,863.86
1.8	Beams Reinforcement Ø 16 mm	437	kg	400	174,900	570	306.84
1.9	Beams links Ø 8 mm	262	kg	455	119,369	570	209.42
1.10	Tie Wire	1	Bund	17,000	15,017	570	26.35
2	Masonry Work						
2.1	Concrete Masonry Unit	9,182	Unit	195	1,790,539	570	3,141.30
2.2	Cement	7	kg	1	7	570	0.01
2.3	Sand	31	M3	1	31	570	0.05
3	Plaster Work						
	Ceiling						
3.1	Cement	4	TON	1	4	570	0.01
3.2	Sand	15	M3	1	15	570	0.03
4	Walls						
4.1	Cement	22	TON	1	22	570	0.04
4.2	Sand	77	M3	1	77	570	0.14
5	Painting Work						
	Ceiling						
5.1	Surface smoothing paste	58	Kg	210	12,243	570	21.48
5.2	Painting	96	kg	650	62,527	570	109.70
	Walls				0	570	0.00
5.3	Surface smoothing paste	309		210	64,888	570	113.84
5.4	Painting	510		650	331,392	570	581.39
6	Tiles Works						
	Floor						
6.1	Tiles	292	M2	7,000	2,040,500	570	3,579.82
6.2	Cement	3	Ton	1	3	570	0.01
6.3	Sand	29	M3	1	29	570	0.05
	Walls						
6.4	Tiles	198	M2	5,000	991,100	570	1,738.77
6.5	Cement	2	Ton	1	2	570	0.00
6.6	Sand	20	M3	1	20	570	0.03
7	Doors Works				0	570	0.00
7.1	Doors Interior	8	Unit	150,000	1,200,000	570	2,105.26
8	Windows Works						
8.1	PVC / Aluminium windows	32	M2		0	570	0.00
9	Electrical Works						
9.1	Electrical Work for floor including cost of material & workmanship	265	L.S	10,260	2,718,900	570	4,770.00
10	Toilets & Kitchens Plumbing Works : no. of all for floor						
10.1	Internal plumbing works	3	Unit		0	570	0.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship	265	L.S	3,420	906,300	570	1,590.00
11	Staircase						
11.1	No Steps Tiles	22	Set	0	0	570	0.00
11.2	Handrail	22	M		0	570	0.00
12	Gypsum Work & Decoration						
12.1	Cornich lengt + 20% for other gypsum decoration	583	M		0	570	0.00
	Total				19,846,297		34,818.06

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Columns Concrete	17	M3	52,000	909,480.00	570	1,595.58
1.2	Columns Reinforcement Ø 16 mm	1,749	KG	400	699,600.00	570	1,227.37
1.3	Columns Links Ø 8 mm	496	KG	455	225,475.25	570	395.57
1.4	Columns Tie Wire	292	Bund	17,000	4,955,500.00	570	8,693.86
1.5	Slab Concrete including beams	67	M3	52,000	3,486,340.00	570	6,116.39
1.6	Reinforcement Ø 16 mm	6,122	KG	400	2,448,600.00	570	4,295.79
1.7	Reinforcement Ø 12 mm	4,081	KG	400	1,632,400.00	570	2,863.86
1.8	Beams Reinforcement Ø 16 mm	437	KG	400	174,900.00	570	306.84
1.9	Beams links Ø 8 mm	262	KG	455	119,369.25	570	209.42
1.10	Tie Wire	1	Bund	17,000	15,016.67	570	26.35
2	Masonry Work				0.00	570	0.00
2.1	Concrete Masonry Unit	9,182	Unit	195	1,790,538.75	570	3,141.30
2.2	Cement	7	Ton	1	7.35	570	0.01
2.3	Sand	31	M3	1	30.61	570	0.05
3	Plaster Work				0.00	570	0.00
	Ceiling				0.00	570	0.00
3.1	Cement	4	Ton	1	4.08	570	0.01
3.2	Sand	15	M3	1	14.58	570	0.03
4	Walls				0.00	570	0.00
4.1	Cement	22	Ton	1	21.63	570	0.04
4.2	Sand	77	M3	1	77.25	570	0.14
5	Painting Work				0.00	570	0.00
	Ceiling				0.00	570	0.00
5.1	Surface smoothing paste	58	KG	210	12,243.00	570	21.48
5.2	Painting	96	KG	650	62,526.75	570	109.70
	Walls				0.00	570	0.00
5.3	Surface smoothing paste	309	KG	210	64,887.90	570	113.84
5.4	Painting	510	KG	650	331,391.78	570	581.39
6	Tiles Works				0.00	570	0.00
	Floor				0.00	570	0.00
6.1	Tiles	292	M2	7,000	2,040,500.00	570	3,579.82
6.2	Cement	3	Ton	1	2.92	570	0.01
6.3	Sand	29	M3	1	29.15	570	0.05
	Walls				0.00	570	0.00
6.4	Tiles	198	M2	5,000	991,100.00	570	1,738.77
6.5	Cement	2	Ton	1	1.98	570	0.00
6.6	Sand	20	M3	1	19.82	570	0.03
7	Doors Works				0.00	570	0.00
7.1	Doors Interior	4	Unit	150,000	600,000.00	570	1,052.63
8	Windows Works				0.00	570	0.00
8.1	PVC / Aluminium windows	32	M2		0.00	570	0.00
9	Electrical Works				0.00	570	0.00
9.1	Electrical Work for floor including cost of material & workmanship	265	L.S	10,260	2,718,900.00	570	4,770.00
10	Toilets & Kitchens Plumbing Works : no. of all for floor				0.00	570	0.00
10.1	Internal plumbing works	4	Unit		0.00	570	0.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship	265	L.S	3,420	906,300.00	570	1,590.00
11	Staircase				0.00	570	0.00
11.1	No Steps Tiles	22	Step	0	0.00	570	0.00
11.2	Handrail	22	Step		0.00	570	0.00
12	Gypsum Work & Decoration				0.00	570	0.00
	Cornich lengt + 20% for other gypsum decoration	583	M2		0.00	570	0.00
	Total				24,185,278.70		42,430.31

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Third Floor						
	Skeleton						
1.1	Columns Concrete	14	M3	52,000	720,720	570	1,264.42
1.2	Columns Reinforcement Ø 16 mm	1,386	Kg	400	554,400	570	972.63
1.3	Columns Links Ø 8 mm	393	Kg	455	178,679	570	313.47
1.4	Columns Tie Wire	231	Bund	17,000	3,927,000	570	6,889.47
1.5	Slab Concrete including beams	53	M3	52,000	2,762,760	570	4,846.95
1.6	Reinforcement Ø 16 mm	4,851	Kg	400	1,940,400	570	3,404.21
1.7	Reinforcement Ø 12 mm	3,234	Kg	400	1,293,600	570	2,269.47
1.8	Beams Reinforcement Ø 16 mm	347	Kg	400	138,600	570	243.16
1.9	Beams links Ø 8 mm	208	Kg	455	94,595	570	165.96
1.10	Tie Wire	1	Bund	17,000	11,900	570	20.88
2	Masonry Work				0	570	0.00
2.1	Concrete Masonry Unit	7,277	Unit	195	1,418,918	570	2,489.33
2.2	Cement	6	Ton	1	6	570	0.01
2.3	Sand	24	M3	1	24	570	0.04
3	Plaster Work				0	570	0.00
	Ceiling				0	570	0.00
3.1	Cement	3	Ton	1	3	570	0.01
3.2	Sand	12	M3	1	12	570	0.02
	Walls				0	570	0.00
3.4	Cement	17	Ton	1	17	570	0.03
3.5	Sand	61	M3	1	61	570	0.11
4	Painting Work				0	570	0.00
	Ceiling				0	570	0.00
4.1	Surface smoothing paste	46	Kg	210	9,702	570	17.02
4.2	Painting	76	Kg	650	49,550	570	86.93
	Walls				0	570	0.00
4.3	Surface smoothing paste	245	Kg	210	51,421	570	90.21
4.5	Painting	404	Kg	650	262,612	570	460.72
5	Tiles Works				0	570	0.00
	Floor				0	570	0.00
5.1	Tiles	231	M2	7,000	1,617,000	570	2,836.84
5.2	Cement	2	Ton	1	2	570	0.00
5.3	Sand	23	M3	1	23	570	0.04
	Walls				0	570	0.00
5.4	Tiles	157	M2	5,000	785,400	570	1,377.89
5.3	Cement	2	Ton	1	2	570	0.00
5.4	Sand	16	M3	1	16	570	0.03
6	Doors Works				0	570	0.00
6.1	Doors Interior	0		0	0	570	0.00
7	Windows Works				0	570	0.00
7.1	PVC / Aluminium windows	25	M2		0	570	0.00
8	Electrical Works				0	570	0.00
8.1	Electrical Work for floor including cost of material & workmanship	210	L.S	10,260	2,154,600	570	3,780.00
9	Toilets & Kitchens Plumbing Works : no. of all for floor				0	570	0.00
9.1	Internal plumbing works	0	Unit		0	570	0.00
9.2	External Water supply & Sewage networks for floor including cost of material & workmanship	210	L.S	3,420	718,200	570	1,260.00
10	Staircase				0	570	0.00
9.3	No Steps Tiles	22	Step	0	0	570	0.00
9.4	Handrail	22			0	570	0.00
11	Gypsum Work & Decoration				0	570	0.00
11.1	Cornich lengt + 20% for other gypsum decoration	462	M2		0	570	0.00
	Total				18,690,221		32,789.86

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wall** (M.L Factors)						
	Foundation						
1.1	Concete Foundations	22	M3	52,000	1,158,300.00	570	2,032.11
1.2	Reinforcement Ø 16 mm	1,485	Kg	400	594,000.00	570	1,042.11
	Columns	0			0.00	570	0.00
1.3	Columns Concrete	5	M3	52,000	257,400.00	570	451.58
1.4	Columns Reinforcement Ø 16 mm	693	Kg	400	277,200.00	570	486.32
1.5	Columns Links Ø 8 mm	208	Kg	455	94,594.50	570	165.96
1.6	Tie Wire for the boundary wall	0	Bundel	17,000	5,610.00	570	9.84
	Masonry Work	0		0	0.00	570	0.00
1.7	Concrete Masonry Unit	4,455	Unit	195	868,725.00	570	1,524.08
1.8	Cement	4	Ton	80,000	285,120.00	570	500.21
1.9	Sand	15	M3	4,700	69,795.00	570	122.45
	Plaster Work	0		1	0.00	570	0.00
1.10	Cement	4	Ton	80,000	332,640.00	570	583.58
1.11	Sand	24	M3	4,700	111,672.00	570	195.92
	Painting Work	0			0.00	570	0.00
1.12	Surface smoothing paste	119	Kg	210	24,948.00	570	43.77
1.13	Painting	196	Kg	650	127,413.00	570	223.53
2	Tiles Works for land escape	0			0.00	570	0.00
	Floor	0		1	0.00	570	0.00
2.1	Tiles	99	M2	7,000	693,000.00	570	1,215.79
2.2	Cement	1	Ton	80,000	79,200.00	570	138.95
2.3	Sand	10	M3	4,700	46,530.00	570	81.63
3	Doors Works	0		650	0.00	570	0.00
3.1	Main Gates	0	Unit	320,000	0.00	570	0.00
	Total				5,026,147.50		8,817.80

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Engineering & Approval						
1.1	Design Cost	1	L.S	300,000	300,000	570	526.32
1.2	Governmental Fees	1	L.S	120,000	120,000	570	210.53
2	Site Preparation				0	570	0.00
2.1	Site Cleaning	1	L.S	150,000	150,000	570	263.16
2.2	Survey Work	1	L.S	200,000	200,000	570	350.88
3	Earth Work					570	0.00
3.1	Excavation	323	M3	2,500	806,400	570	1,414.74
3.2	Backfill Local (per site)	223	L.S	90,000	20,069,280	570	35,209.26
3.3	Backfill Selected	62	M3	90,000	5,544,000	570	9,726.32
4	Concrete Sub-structure				0	570	0.00
4.1	Foundation				0	570	0.00
4.2	Cast Lean, R.C for foundation & Short Column	115	M3	200	22,994	570	40.34
4.3	Formwork & rebar for foundation & Short Column	115	M3	45,000	5,173,560	570	9,076.42
5	Suspended Slab				0	570	0.00
5.1	Formwork & rebar for Slab	280	M2	35,000	9,800,000	570	17,192.98
6	Ground Floor				0	570	0.00
	Skeleton				0	570	0.00
6.1	Formwork & rebar for floor Column	18	M3	40,000	739,200	570	1,296.84
6.2	Slab Concrete including beams	280	M2	35,000	9,800,000	570	17,192.98
6.3	Formwork & rebar staircase	1	Unit	80,000	80,000	570	140.35
7	Masonry Work				0	570	0.00
7.1	Install Concrete Masonry Unit wall	700	M2	2,000	1,400,000	570	2,456.14
8	Plaster Work				0	570	0.00
8.1	Install plaster for Walls	1680	M2	1,000	1,680,000	570	2,947.37
8.2	Install plaster for Ceiling	265	M2	1,100	291,500	570	511.40
9	Painting Work				0	570	0.00
9.1	Install Painting for Walls	1680	M2	1,000	1,680,000	570	2,947.37
9.2	Install Painting for Ceiling	265	M2	1,100	291,500	570	511.40
10	Tiles Works				0	570	0.00
10.1	Install Tiles for Floor	280	M	2,000	560,000	570	982.46
10.2	Install Tiles for Walls	207.2	M	2,200	455,840	570	799.72
11	Staircase Works						
11.1	Steps Tiles (going & rise)	22	Step	1	22	570	0.04
11.2	Handrail	8	M	1	8	570	0.01
12	Doors Works				0	570	0.00
12.1	Install Exteriors Gates	0	Unit	20,000	0	570	0.00
12.2	Install Interior Doors	9	Unit	15,000	135,000	570	236.84
13	Windows Works				0	570	0.00
13.1	Installation cost incl. in material unit price	31	M2	0	0	570	0.00
14	Electrical Works				0	570	0.00
14.1	Installation cost incl. in material unit price	308	M2	0	0	570	0.00
15	Toilets & Kitchens Plumbing Works				0	570	0.00
15.1	Internal plumbing works (per unit)	4	Unit	50,000	200,000	570	350.88
15.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	308	M2	0	0	570	0.00
16	Sewage Well				0	570	0.00
16.1	Sewage Well works	1	Unit	0	0	570	0.00
17	Gypsum Work & Decoration				0	570	0.00
17.1	Cornich & other gypsum decoration - material cost included	560	M	3,000	1,680,000	570	2,947.37
18	Elevator Work				0	570	0.00
18.1	Installation cost incl. in material unit price	0	Unit	0	0	570	0.00
	Total				61,179,303.30		107,332.11

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	First Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	26.00	Unit	40,000	1,040,000	570	1,824.56
1.2	Slab Concrete including beams	265	M2	35,000	9,275,000	570	16,271.93
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	570	140.35
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	556.5	M2	2,000	1,113,000	570	1,952.63
3	Plaster Work						
3.1	Install plaster for Walls	1405	M2	1,000	1,404,500	570	2,464.04
3.2	Install plaster for Ceiling	265	M2	1,100	291,500	570	511.40
4	Painting Work						
4.1	Install Painting for Walls	1405	M2	1,000	1,404,500	570	2,464.04
4.2	Install Painting for Ceiling	265	M2	1,100	291,500	570	511.40
5	Tiles Works						
5.1	Install Tiles for Floor	265	M2	2,000	530,000	570	929.82
5.2	Install Tiles for Walls	180.2	M2	2,200	396,440	570	695.51
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	570	0.04
6.2	Handrail	22	M	1	22	570	0.04
7	Doors Works						
7.1	Install Interior Doors	8	Unit	15,000	120,000	570	210.53
8	Windows Works						
8.1	Installation cost incl. in material unit price	32	M2	0	0	570	0.00
9	Electrical Works						
9.1	Installation cost incl. in material unit price	292	M2	0	0	570	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	3	Unit	1	3	570	0.01
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	292	M2	0	0	570	0.00
11	Gypsum Work & Decoration						
11.1	Cornich & other gypsum decoration	450.5	M	1	451	570	0.79
	Total				15,946,937.50		27,977.08

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	26	Unit	40,000	1,040,000	570	1,824.56
1.2	Slab Concrete including beams	265	M2	35,000	9,275,000	570	16,271.93
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	570	140.35
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	557	M2	2,000	1,113,000	570	1,952.63
3	Plaster Work						
3.1	Install plaster for Walls	1405	M2	1,000	1,404,500	570	2,464.04
3.2	Install plaster for Ceiling	265	M2	1,100	291,500	570	511.40
4	Painting Work						
4.1	Install Painting for Walls	1405	M2	1,000	1,404,500	570	2,464.04
4.2	Install Painting for Ceiling	265	M2	1,100	291,500	570	511.40
5	Tiles Works						
5.1	Install Tiles for Floor	265	M2	2,000	530,000	570	929.82
5.2	Install Tiles for Walls	180	M2	2,200	396,440	570	695.51
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	570	0.04
6.2	Handrail	22	M	1	22	570	0.04
7	Doors Works						
7.1	Install Interior Doors	8	Unit	15,000	120,000	570	210.53
8	Windows Works						
8.1	Installation cost incl. in material unit price	32	M2	1	32	570	0.06
9	Electrical Works						
9.1	Installation cost incl. in material unit price	292	M2	0	0	570	0.00
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	4	Unit	50,000	200,000	570	350.88
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	265	M2	0	0	570	0.00
11	Gypsum Work & Decoration						
11.1	Cornich & other gypsum decoration	451	M	1	451	570	0.79
	Total				16,146,966.57		28,328.01

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	Second Floor						
	Skeleton						
1.1	Formwork & rebar for floor Column	52	Unit	40,000	2,080,000	570	3,649.12
1.2	Slab Concrete including beams	210	M2	35,000	7,350,000	570	12,894.74
1.3	Formwork & rebar staircase	1	Unit	80,000	80,000	570	140.35
2	Masonry Work						
2.1	Install Concrete Masonry Unit wall	441	M2	2,000	882,000	570	1,547.37
3	Plaster Work						
3.1	Install plaster for Walls	1113	M2	1,000	1,113,000	570	1,952.63
3.2	Install plaster for Ceiling	210	M2	1,100	231,000	570	405.26
4	Painting Work						
4.1	Install Painting for Walls	1113	M2	1,000	1,113,000	570	1,952.63
4.2	Install Painting for Ceiling	210	M2	1,100	231,000	570	405.26
5	Tiles Works						
5.1	Install Tiles for Floor	210	M2	2,000	420,000	570	736.84
5.2	Install Tiles for Walls	143	M2	2,200	314,160	570	551.16
6	Staircase Works						
6.1	Steps Tiles (going & rise)	22	Step	1	22	570	0.04
6.2	Handrail	22	M	1	22	570	0.04
7	Doors Works						
7.1	Install Interior Doors	0	Unit	15,000	0	570	0.00
8	Windows Works						
8.1	Install Windwos incl. in unit price	25	M2	1	25	570	0.04
9	Electrical Works						
9.1	Installation cost incl. in material unit price	231	M2	1	231	570	0.41
10	Toilets & Kitchens Plumbing Works						
10.1	Internal plumbing works (per unit)	0	Unit	50,000	0	570	0.00
10.2	External Water supply & Sewage networks for floor including cost of material & workmanship included in the unit price of the item in the material cost sheet	231	M2		0	570	0.00
11	Gypsum Work & Decoration						
11.1	Cornich & other gypsum decoration	357	M	1	357	570	0.63
	Total				**13,814,817.41**		24,236.52

#	Item	QTY	Unit	Unit Cost SDG	Amount Cost SDG	Ex. Rate USD/SDG	Amount Cost USD
1	**Boundary Wall** (M.L Factors)						
	Earth Work						
1.1	Excavation	84	M3	2,500	208,828	570	366.37
1.2	Backfill Local (per site)	54	L.S	90,000	4,869,315	570	8,542.66
	Concrete						
1.3	Cast Lean, R.C for foundation & Column	34.38	Unit	200	6,876	570	12.06
1.4	Formwork & rebar for foundation & Column	34.38	Unit	45,000	1,546,999	570	2,714.03
	Masonry Work				0	570	0.00
1.5	Install Concrete Masonry Unit wall	270	M2	2,000	540,000	570	947.37
	Plaster Work						
1.6	Install plaster for Walls	540	M2	1,000	540,000	570	947.37
1.7	Install plaster for Ceiling	540	M2	1,100	594,000	570	1,042.11
	Painting Work						
1.8	Install Painting for Walls	540	M2	1,000	540,000	570	947.37
1.9	Install Painting for Ceiling	540	M2	1,100	594,000	570	1,042.11
2	Tiles Works for Yard						
	Install Tiles for Floor	220	M	2,000	440,000	570	771.93
3	Doors Works						
3.1	Install Exteriors Gates	0	Unit	20,000	0	570	0.00
	Total				9,880,017.43		17,333.36

Item	SDG	USD
Engineering & Approval Fees	420,000.00	736.84
Materials Cost	39,047,507.96	68,504.40
Workmanship Cost	61,179,303.30	107,332.11
Sub -Total	100,646,811.26	176,573.35
Total Cost	100,823,384.61	176,573.35

Item	SDG	USD
Materials Cost	19,846,297.03	34,818.06
Workmanship Cost	15,946,937.50	27,977.08
Sub -Total	35,793,234.53	62,795.15
Total Cost	35,793,234.53	62,795.15

	Item	SDG	USD
1	Materials Cost	24,185,278.70	42,430.31
2	Workmanship Cost	16,146,966.57	28,328.01
	Sub -Total	40,332,245.26	70,758.33
	Total Cost	40,403,003.59	70,758.33

#	Item	SDG	USD
1	Materials Cost	18,690,220.85	32,789.86
2	Workmanship Cost	13,814,817.41	24,236.52
	Sub -Total	32,505,038.26	57,026.38
	Total Cost	32,562,064.65	57,026.38

#	Item	SDG	USD
1	Materials Cost	5,026,147.50	8,817.80
2	Workmanship Cost	9,880,017.43	17,333.36
	Sub -Total	14,906,164.93	26,151.17
	Total Cost	14,932,316.09	26,151.17

	Item	Area M	Cost SDG	Cost USD
1	Ground Floor	280	100,823,384.61	176,883.13
2	First Floor	265	35,793,234.53	62,795.15
3	Second Floor	265	40,403,003.59	70,758.33
4	Third Floor	210	32,562,064.65	57,026.38
5	Fourth Floor	0	0.00	0.00
6	External Works			26,151.17
	Total Estimated Buildings Cost		209,581,687.38	393,614.15
	Profit %		10%	10%
	Profit Amount		20958168.74	39361.41537
	New Constructed Buildings Value		**230,539,856.12**	**432,975.57**
	Current Buildings Conditiuons %		**70%**	
	Current Constructed Buildings Value		**161,377,899.28**	**303,082.90**

Date	Plot #	Block #	Area M2	Neighborhood	City	Owner	
27/11/22	0	0	500		0	0	
Characteristics	Normal	$ Ex. Rate	570	Currency	SDG		

Comparable #	Subject Land	1	2	3	4	5	6
Characteristics	Excellent	**Excellent**			**Normal**		
Area M2	400	520	425	470	410	425	410
Sell Value	-	110,000,000	110,000,000	130,000,000	80,000,000	70,000,000	80,000,000
M2 Price	-	211,538	258,824	276,596	195,122	164,706	195,122
Today	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022	27/11/2022
Sell Date	27/11/2022	16/03/2021	21/02/2021	05/06/2021	08/07/2021	12/12/2020	1/1/2021
Time Lag	0	20	21	17	16	23	5
$ Ex. Rate	570	410	400	420	450	380	390
$ Ex. Rate Diff.	0	160	170	150	120	190	180
$ Ex. Rate Diff. %	0.00%	39.02%	42.50%	35.71%	26.67%	50.00%	46.15%
M2 Adjustments							
Sell Time Adjust		294,090	368,824	375,380	247,154	247,059	285,178
Average		333,096			256,637		
Subject Land Estimated Market Value							
Characteristics		**If Excellent**			**If Normal**		
M2 Estimated Value		333,096			256,637		
Plot Estimated Value		133,238,358					
Plot Estimated Value Rounded		**133,000,000**					

Item	SDG	USD
Buildings Value	161,377,899.28	303,082.90
Land Value	133,000,000	233,333.33
Real Estate	294,377,899	536,416.23