

**HOUSING MARKET DEMAND, HOUSING FINANCE, AND
HOUSING PREFERENCES FOR THE CITY OF KIGALI**

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CHAPTER 1

SUPPLY AND DEMAND STUDY

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ACRONYMS

DU	Dwelling Unit(s)
DHS	Demographic and Health Survey
EICV	Integrated Household Living Conditions Survey
HH	Household
Kw	Kilowatt
MINECOFIN	Ministry of Economy and Finance
M ²	Square meter
M ³	Cubic meter
Mw	Megawatt
NISR	National Institute of Statistics of Rwanda
RHA	Rwanda Housing Authority
RCF	Reinforced Concrete Frame
RDB	Rwanda Development Board
RSSB	Rwanda Social Security Board
WUP	World Urbanization Prospects

1. HOUSING DEMAND IN KIGALI

1.1. Purpose and Scope of the Analysis

This document presents an estimation of demand and supply of housing in the city of Kigali for period from 2012 to 2022, by income segment and by type of dwelling unit (DU). The period of analysis was set to include 2012 as base year, plus a 10-year forecast.

Overall housing demand is used as a base for estimating the portion that corresponds to *affordable housing*, which is the main focus of this study. A definition of affordable housing is provided in numeral 1.6.1.

This document also provides a general assessment of present conditions of the housing delivery system in Kigali.

1.2. Demand Drivers

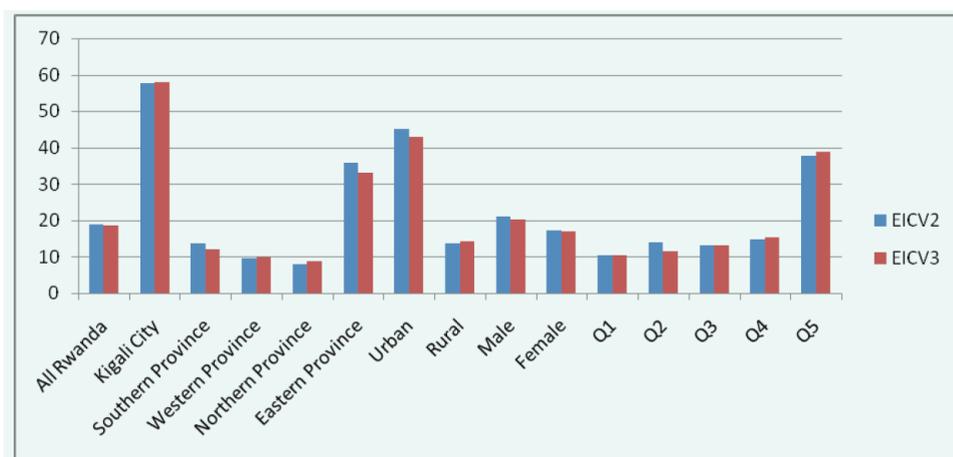
Housing demand in Kigali is driven by two main factors: first, by demographic change resulting from population growth (including natural growth and in-migration) and, second, by economic and policy factors, such as economic transition, geographic location of economic opportunity in rural and urban areas, changes in household income and government policy and regulations that manage growth.

In terms of demographic shifts, Kigali is expected to double its population by 2022 due in part to migration from the countryside but also due to the city's position as the pre-eminent urban centre of Rwanda, which will influence the volume of rural to urban migration to Kigali, compared to other urban locations in the country. . This projection is based on historical trends. For instance, according with EICV3¹, about 19% of the population has migrated within the country in the period from 2006 to 2011. Moreover, the survey indicates that 58% of migration has been towards Kigali, a trend similar to EICV2², when migration towards Kigali was 57.6%. The following table from EICV3 illustrates proportion of migration in Rwanda:

¹ Enquête Intégrale des Conditions de Vie (EICV), 3, 20010/2011

² Enquête Intégrale des Conditions de Vie (EICV), 2, 2005/2006

Exhibit 1: Migration between 2006 and 2011 in Rwanda



Source: EICV3 (vertical axis corresponds to % of migrating population)

Demographic shifts will also be influenced by economic factors that will operate as drivers in their own right. For example, increased FDI in Kigali and the housing construction industry itself will contribute to economic change as it creates a multiplier effect, hence increasing the attractiveness of the city as a centre of economic opportunity.

In addition to demographic and economic factors, housing demand in Kigali is bound to be affected by policy decisions; including land use plans, housing finance policy, and other urbanization policies. For example, the Kigali City Conceptual Master Plan and the Districts Detailed Physical Plans (in final preparation as this document is written), reflect the country's government policy of fostering urbanization, as a part of the strategy to achieve middle-income country status for Rwanda in 2020³. This policy seeks to increase urban population to 30% up from approximately 15%⁴ at present, as indicated by the EICV3 table shown below:

³ Rwanda VISION 2020.

⁴ WUP2011 = 19%; EICV3 Table 1.1.8 = 14,7%

Exhibit 2: Urban and Rural Population in Rwanda (2006 – 2011)

	EICV3			EICV2		
	Area of residence		Total population (in 000s)	Area of residence		Total population (in 000s)
	Urban	Rural		Urban	Rural	
All Rwanda	14.8	85.2	10,762	16.6	83.4	9,491
Province						
Kigali City	83.8	16.2	1,059	84.6	15.4	913
Southern Province	12.6	87.4	2,527	14.3	85.7	2,420
Western Province	6.7	93.3	2,586	7.4	92.6	2,287
Northern Province	6.1	93.9	1,981	9.8	90.2	1,751
Eastern Province	3.6	96.4	2,609	5.2	94.8	2,120

Source: EICV3

It is important to note that the natural growth of Kigali is subject to national and municipal policies that shape demographic, migration and settlement processes. For example, national urbanization plans and policies can divert growth to second and third tier cities. Or municipal policy can prioritize public expenditures towards different housing agendas, such as public/social housing, public/private partnerships, or private sector options. In the end, public policy will play a crucial role in managing demographic trends and economic aspirations; and it should be carefully used as a tool to manage settlement and housing goals in conjunction with private sector processes.

1.3. Sources of Information and Methodology

Housing demand has been estimated through the analysis and interpretation of available statistical data from two main sources:

National Institute of Statistics of Rwanda (NISR)

Third Integrated Household Living Conditions Survey (EICV3), the Demographic and Health Survey (DHS 2010), the National Population Projection 2007-2022, The Evolution of Poverty in Rwanda 2000 to 2011, the Third General Census of Population and Housing, the Civil Servants Census 2010, and the Establishment Census 2011.

Rwanda Social Security Board

Data base: Workers monthly salary range of declared employees from July 2011 to March 2012 in Kigali City

In addition to statistical data review, several interviews were held with officers from NISR, RSSB, RHA, MINECOFIN and from RDB, in order to exchange

views about assumptions and indicators that were used for estimating housing demand in Kigali.

Other documental sources consulted are:

- **Rwanda Land Use Master Plan**
Chapter 2, Demography.
- **Kigali City Planning Documents**
 - Kigali City Conceptual Master Plan (chapter 2 and chapter 4)
 - District Plans for Kinyinya, Kimihurura and Masaka
 - Detailed Physical Plans for Kicukiro and Gasabo (Concept and Vision).
- **World Bank's Housing Market Qualitative Assessment**
A detailed qualitative assessment of housing conditions in Rwanda, with particular focus in Kigali, was completed by the World Bank in March 2012.
- **UN Department of Population**
UN Population Department Statistics, notably the *World Urbanization Prospects 2011 Review* (WUP2011).

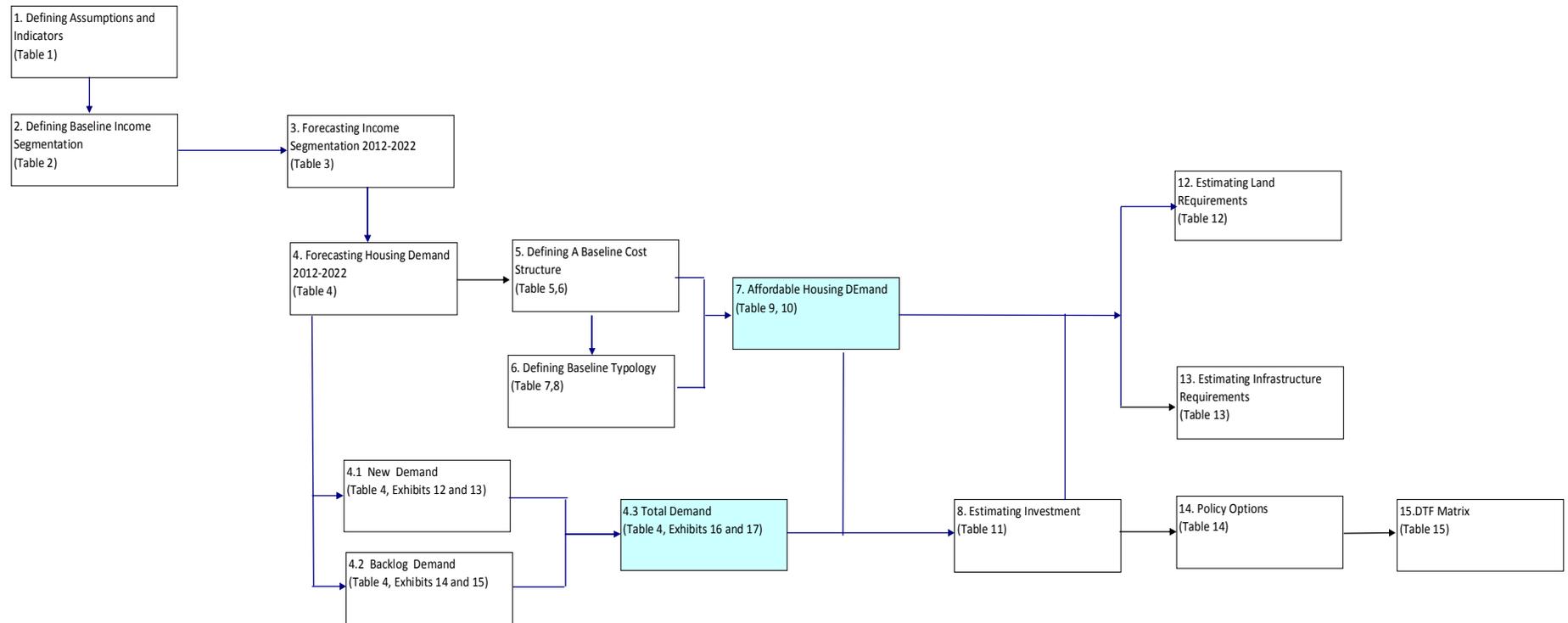
Methodology:

The methodology used to determine housing demand in the City of Kigali begins by establishing assumptions about baseline conditions, such as city's population in 2011, household size and current income segmentation structure. Thereafter, assumptions are set forth to determine indicators used to forecast housing demand in 2012-2022. Indicators include the rate of population growth in Kigali, the change in household size and the rate of income growth. These assumptions and indicators are explained in greater detail in numeral 1.3. The graphic in the following page illustrates the methodological process.

Limitations:

Results presented in this document are the product of assumptions and estimations based on existing statistical data and on field observations. They present a conservative scenario which might evolve as conditions in Rwanda, and especially in Kigali, will change and improve over the next years. More exact results will be possible with the help of a quantitative housing survey, which the team preparing this study strongly recommends for validating or correcting results herein presented. Also, as this study is written, the NISR is finalizing review of EICV3 data, which should be available by October 2012. That information will be crucial for comparing results of this study and must be used as new input for the mathematical model used to estimate housing demand.

Exhibit 3: Methodological Process Applied to Determine Housing Demand in Kigali



Note: Tables indicated in each step correspond to the mathematical model presented in separate excel file.

1.4. Assumptions and Indicators

1.4.1. Population

Population in Kigali in 2011 was 1,059,000 according with EICV3. To establish what the population will be in the period 2012-2022, three scenarios were considered. (Please see assumptions in exhibit 12).

Scenario 1: Population will continue to grow at inter-census rate in the next years, which is deduced by comparing population in Kigali in EICV2 (2005/6) to EICV3 (2010/11). Rate of growth in his case is 5.74% per year (please see exhibit 13).

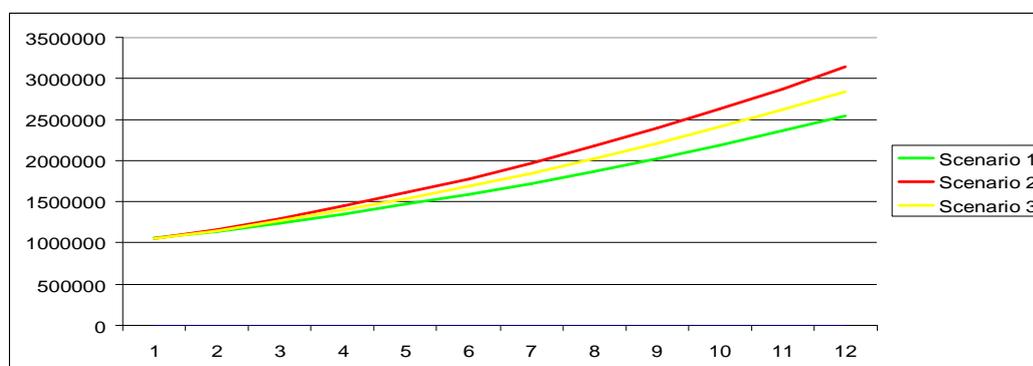
Scenario 2: Population in Kigali will grow at a rate equal to that estimated by NISR in its *Population Projections 2007-2022*. In this case, rate of growth is 5.79% per year (Please see exhibit 14).

Scenario 3: An average is estimated between scenario 1 and scenario 2. The rate yielded by this exercise is 5.77% per year (Please see exhibit 15)

Population growth scenarios from the Land Use Master Plan were reviewed for reference.

For the purpose of this calculation, the rate of growth of scenario 1 was adopted, since it is the one yielded by surveys undertaken in the last 10 years. According with Scenario 1, population in Kigali, in 2022, will reach 1,957,312 inhabitants. To verify this number, the projection was extended until the year 2040, horizon year for the ongoing studies for the Detailed Physical Plans of Kicukiro and Gasabo. The projection indicates that population in Kigali in 2040 will reach 5,347,178 inhabitants, which is in line with the projections of the Detailed Physical Plans (please see exhibit 13). This scenario may be affected by policy decisions about settlements and economic development of secondary and tertiary cities.

Exhibit 4: Kigali: Population Growth Scenarios



1.4.2. Baseline Income Segmentation

Income segmentation consists in estimating an income structure for Kigali, divided by income segments, and then determining the number of HH per income segment. Baseline income segmentation was estimated for Kigali in 2012 based on the statistical data base from RSSB (please see assumption in exhibit 16). It is assumed that said data base is a representative sample of the city's income structure (please see exhibit 17 and 18), because it represents about 75% of the city's overall population.

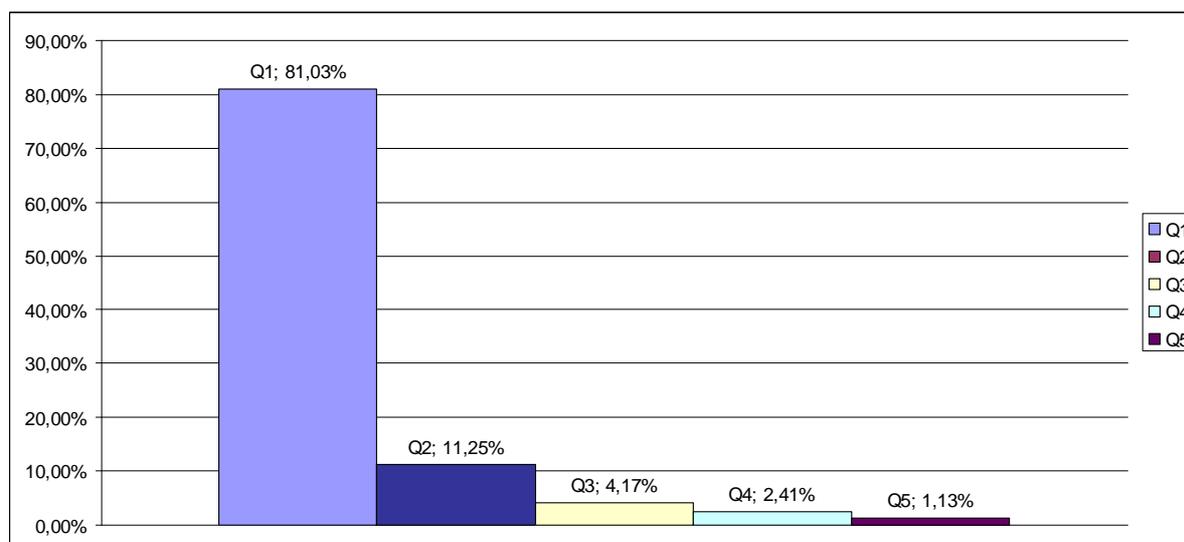
For the purpose of this calculation, it has been assumed that each person registered with RSSB represents one HH. According with estimation commissioned by this study to IPAR, there are more than one income earners in Q1 and Q2. That factor has been reflected in the income segmentation shown below:

Exhibit 5a: Kigali Baseline Income Segmentation (2012)

Quintile	Segment	Monthly Salary Range in Rwf		Annual Salary Range in Rwf		Estimated % of HH	Cumulative	Total % per Quintile
		From	To	From	To			
Q1	1	<	100.000	<	1.200.000	54,92%	54,92%	81,03%
	2	100.001	200.000	1.200.001	2.400.000	18,28%	73,20%	
	3	200.001	300.000	2.400.001	3.600.000	7,83%	81,03%	
Q2	4	300.001	400.000	3.600.001	4.800.000	5,47%	86,50%	11,25%
	5	400.001	500.000	4.800.001	6.000.000	3,46%	89,97%	
	6	500.001	600.000	6.000.001	7.200.000	2,32%	92,28%	
Q3	7	600.001	700.000	7.200.001	8.400.000	1,88%	94,17%	4,17%
	8	700.001	800.000	8.400.001	9.600.000	1,35%	95,52%	
	9	800.001	900.000	9.600.001	10.800.000	0,94%	96,45%	
Q4	10	900.001	1.000.000	10.800.001	12.000.000	0,68%	97,13%	2,41%
	11	1.000.001	1.100.000	12.000.001	13.200.000	0,53%	97,66%	
	12	1.100.001	1.500.000	13.200.001	18.000.000	1,20%	98,87%	
Q5	13	1.500.001	2.000.000	18.000.001	24.000.000	0,52%	99,38%	1,13%
	14	2.000.001	2.500.000	24.000.001	30.000.000	0,23%	99,61%	
	15	2.500.001	<	30.000.001	<	0,38%	100,00%	

Exhibit 5a indicates that up to 54.92 % of the city's HH earn less than RWF 100,000 per month, and that 81.03% of HH concentrate in Q1, the lowest income quintile. Please also see exhibits 22 and 23.

Exhibit 5b: Kigali Baseline Income Segmentation (2012)



1.4.3. Household Size and Dwelling Units

It was assumed, for the purpose of this calculation, that HH size in Kigali will evolve following the trend of the last 10 years, as deduced from EICV3 and EICV2 (please see assumptions in exhibit 19). Therefore, HH size will vary from 4.75 in 2011 to 4.27 in 2022, as seen in the exhibit below:

Exhibit 6: Evolution of HH Size in Kigali, 2012-2022

Existing N° of HH in Kigali (2011) 223.000 EICV3 - Table 1.1.8

Change	Rwanda 2005/6 (1)	5,00
0,96%	Rwanda 2010/11 (2)	4,80
	Kigali 2011	4,75
	2012	4,70
	2013	4,66
	2014	4,61
	2015	4,57
	2016	4,53
	2017	4,48
	2018	4,44
	2019	4,40
	2020	4,35
	2021	4,31
	2022	4,27
	Kigali Average	4,51

(1) EICV2

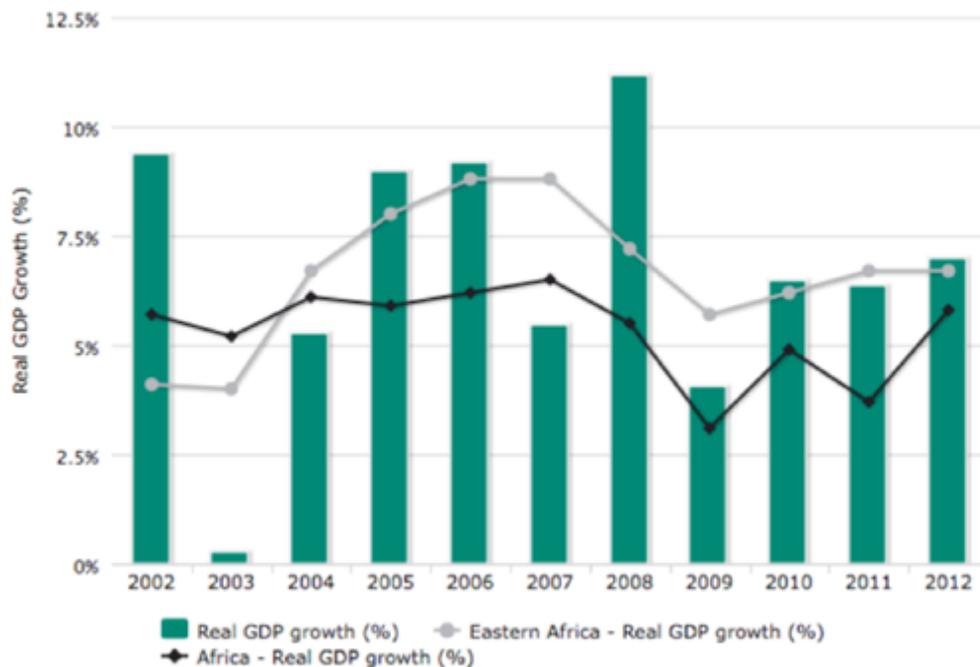
(2) EICV3

Furthermore, for the purpose of this calculation, it is assumed that each HH will demand one dwelling unit (DU). Therefore, the number of new HH in Kigali will provide the number of DU required (please see newl housing demand in numeral 1.7.1). Nevertheless, it is important to point out at characteristics of households in Rwanda, which normally include extended families. This fact is not reflected in available statistical data or in this calculation, but is a fact that may affect the actual number of DU required.

1.4.4. Rate of Income Growth

It is assumed, for the purpose of this calculation, that income in Kigali will grow at a rate equal to the national target of 7% per year, as indicated by Vision 2020⁵. According with the IMF, Rwanda's economic growth in the period 2002 to 2012 has been around 7% on average, which provides support to the rate of economic growth assumed in this calculation (please see exhibit 7, following).

Exhibit 7: Rwanda Rate of Economic Growth 2002-2012



Source: IMF and local authorities' data
 Note: 2011 and 2012 data are estimates

Rate of income growth was used to estimate the change of the city's income structure in the period 2012-2022 and, hence, the evolution of housing demand per income segment.

⁵ The growth targets of Vision 2020 have been recently revised to 11.5% per annum, the 7% p.a. was the target in the original 2020 Vision document.

Evolution of the income structure for the period under analysis is presented in exhibit 24.

1.4.5. Backlog Housing Demand

Backlog demand has been determined by estimating the degree of overcrowding, low-quality and homelessness inherent to existing housing stock (see exhibit 21). Overcrowding was estimated as a proportion of existing informal settlements (62.6% of existing stock according to EICV3), where dwelling units could lodge several non-related households per unit. This is the case in compounds built by poor land-lords, including several rental rooms that share cooking and sanitary facilities. The percentage of households living in rental housing reaches more than 40% in Kigali, most of which corresponds to the type of rental unit described before⁶. Low quality was determined by analysing EICV3 data about wall and roof materials of existing housing stock. Homelessness was also deduced by analysing EICV3 data.

Backlog demand in Kigali 2012 is estimated at 108,807 DU, equivalent to almost one half of the existing housing stock.

1.5. Forecasted Demand for New Dwellings

According with the present calculation, total demand for new dwellings in Kigali from 2012 to 2022 will reach 344,068 DU, which is equivalent to an average of 31,279 DU per year.

To crosscheck this calculation it is important to note that the Central Bank of Rwanda has estimated that 25,000 new DU need to be generated every year⁷, which is in a similar order of magnitude with this study's estimation.

A breakdown of total housing demand per income segment and per year is provided in exhibits 29 (in RWF) and exhibit 30 (in USD).

Housing demand for the period 2012-2022 is conformed as follows:

- **New Demand: 235,265 DU**

New demand is that which is created by population growth both from immigration and from “vegetative” growth, or growth from the existing population. A breakdown of new demand per income segment and per year is provided in exhibit 25 (in RWF) and 26 (in USD).

⁶ The proportion of rental comes from EICV3. The information about poor land-lords comes from the Qualitative Assessment of the Housing Sector conducted by the World Bank.

⁷ See “Assessment of Affordable Housing through Real Estate Development”, Ministry of Infrastructure 2012 (numeral 2.6)

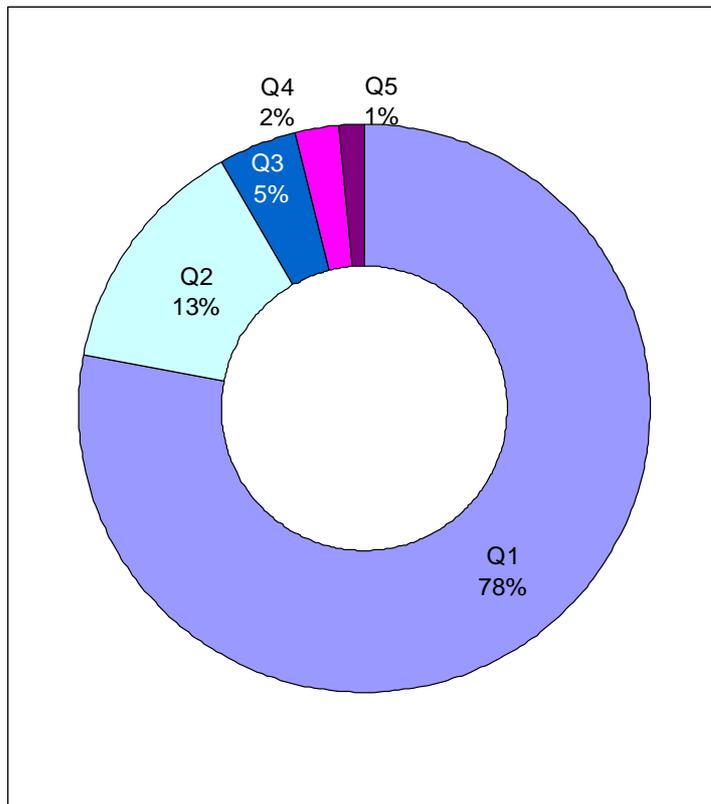
- **Backlog Demand: 108,807 DU**

As explained earlier, this is the unsatisfied demand in the market. As benchmark for this figure, it is important to note that The Kigali City Council estimates that “about 100,000 homes (are) required to narrow the (demand) gap⁸”, which is in line with this study’s estimation.

A breakdown of backlog demand by year and by income segment is provided in exhibits 27 (in RWF) and 28 (in USD)

Around 80% of demand is concentrated in the lowest income quintile (Q1) as show by the following graph:

Exhibit 8: Total Housing Demand per Income Quintile (in relative terms)



⁸ Idem

1.6. Affordable Housing Demand

1.6.1 A Definition of Affordable Housing

The human right to adequate housing is the right of every woman, man, youth and child to acquire and sustain a secure home and community in which to live in peace and dignity. The right to housing is codified as a human right in the Universal Declaration of Human Rights:

"Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, **and housing** and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control." (Article 25(1))

Population growth, migration to urban areas, conflicting needs for existing land, and insufficient financial and natural resources have resulted in a situation where housing of adequate quality standards is not *affordable* to wide segments of the population, a situation which is not alien to Kigali.

In order to determine the demand for affordable housing, it is important to first define *what* affordable housing is.

There is no single definition of affordable housing. However, **payment capacity** is the key element defining affordability, as shown below.

UN Habitat considers that "the generally accepted definition of affordability is for a household **to pay no more than 30 percent of its annual income on housing**. Families who pay more than 30 percent of their income for housing are considered cost burdened and may have difficulty affording necessities such as food, clothing, transportation and medical care."⁹ This is the same definition adopted by the **US Department of Housing and Urban Development**.

EUROCITIES¹⁰, the network of major European cities -- bringing together the local governments of more than 140 large cities in over 30 European countries – considers that the concept of "affordable housing" is applicable to all forms of housing provided via the private market or otherwise for rent or for sale. It also refers to housing that is affordable and available to all individuals and families who require it, including low-income groups, **without this causing a disproportionate burden on their disposable income**. It includes rented and intermediate social housing for those who

⁹ Fact Sheet 21 on the Right to Adequate Housing, OHCHR & UN-HABITAT, 2010

¹⁰ EUROCITIES is supported by the European Community Programme for Employment and Social Solidarity - PROGRESS (2007-2013).

are unable to meet their housing needs through the market. Affordable housing should: be available at an affordable cost for low income groups and allocated on the basis of a calculation that takes local incomes and house prices into account. The costs involved in running the household should also be affordable and remain affordable in the future. This includes an adequate relationship between housing costs and income or financial opportunities of households.

Furthermore EUROCITIES indicates that, apart from policies to regulate local housing markets, there are primarily two types of affordable housing: rented social housing and intermediate affordable housing for sale or rent¹¹.

Social Housing: these are *rented homes owned by local authorities and managed directly (or through specified agents) by Non-Governmental Organisations (NGOs), registered social landlords, housing associations or housing co-operatives*. The aim is to provide affordable housing. The organisation sets guidelines for rents, which are subsidised through governmental funding and which may be determined through a national rent programme. It also includes rented accommodation owned or managed by other organisations or individuals, such as private housing companies, as well as funds which may be provided under rental arrangements.

Intermediate affordable housing: This is housing which meets the criteria described above for social housing but which is *for rent at rates higher than social rents but below market rates*. It also includes housing available for low cost home ownership through “shared equity products”, “shared ownership” or other means to purchase low-cost homes. Intermediate affordable housing provisions still require some form of public intervention.

Therefore, for the purpose of this calculation, it will be assumed that ***affordable housing is that for which households pay 30% of their income, or less.***

In consequence, non-affordable housing is that for which a HH have to pay **more** than 30% of its income, in which case government intervention would be desirable to increase affordability.

¹¹ EUROCITIES Position Paper on Affordable Housing, December 2009.

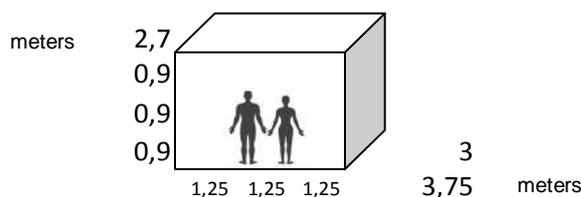
1.6.2 Affordable Housing Demand in Kigali

Demand for affordable housing in Kigali has been estimated through a three step process, which basically consists on defining costs for different dwelling unit types and then determining if households could afford those units or not. More details are provided in the following.

A. Modelling of Housing Typology

Based on parameters detailed in chapter 3 of this study, the modelling of housing typology adopted assumes a process of gradual growth of DU over time and adaptation of technology and cost to HH income.

The basis for typology modelling is a module with surface of 11.25 m². This module was selected for anthropomorphic reasons, considering minimum inhabitable space (please see exhibit 31 and exhibit 32).



Two basic types of DU have been retained for calculation purposes: row houses and apartments. It is assumed that row houses will be developed for lower income HH and apartments for higher income HH. This assumption is based on economic factors (such as cost of energy, maintenance and building costs), on cultural preferences (see Chapter 4, Focus Group Survey) and experiences in more advanced societies, which indicate that higher income HH are better prepared to handle the limitations of high-rise living and more able to afford the costs of living in apartments¹². In the context of Kigali, higher income HH are better equipped to pay for energy and maintenance costs linked with apartments (such as electricity, electric appliances, elevators, communal areas, and so on).

Another important idea behind this modelling is adaptation to HH income and preferences (see chapter 2 Focus Group Survey), by using a dwelling unit that could evolve from a basic, smaller and less expensive form, into a larger, better quality DU by gradually adding surface, over time, with higher quality materials. The parcel used for all DU has surface of 90m² (7,5m front x 12m depth), equivalent to 6 modules of 3m x 3.75m.

Three types of building technology were considered in the modelling:

¹². See "In Search of Adequate Policy Responses and Actions", UN Habitat 2008

- **Temporary building with services**: a serviced parcel (water, electricity, sewerage and roads) and a basic roof with lower cost materials (stabilized mud bricks and metal sheet roofing), with enclosure wall built with cement blocks.
- **Hybrid building with services**: a serviced parcel and a building (in variable size depending on type) constructed with standard cement blocks and concrete foundations and concrete slab. Higher quality and higher cost materials for a more durable building that allows up to 2 (or even 3 floors).
- **Reinforced concrete frame** (RCF): a serviced parcel and building of 4 floors (G+3), with apartment dwellings built with RCF.

The modelling considers that households could start at different stages of the process, depending on their income. For instance, lower income households would start with a Typology A1 unit, which is an enclosed parcel, with services. A higher income household could start with an apartment. The following table provides details of the 8 different modelling types considered in the calculation:

Type	Building Technology	Description	Land Surface	Building Surface
A1 A2	Temporary	Row House. Parcel with basic utilities (water, sewerage, electricity and road), plus a basic roof (4 modules), plus surrounding wall.	90m ²	45m ²
B1	Temporary + Hybrid	Row House. Parcel with basic utilities, plus a basic roof (4 modules), plus one module with hybrid materials plus surrounding wall.	90m ²	56,25m ²
B2	Hybrid	Row House. Parcel with basic utilities plus 4 modules with hybrid materials, plus surrounding wall.	90m ²	45m ²
B3	Hybrid	Row House. Parcel with basic utilities plus 6 modules with hybrid materials, plus surrounding wall.	90m ²	67,5m ²
B4	Hybrid	Row House. Parcel with basic utilities plus 8 modules with hybrid materials, plus	90m ²	90m ²

		surrounding wall.		
C1	RCF	Apartment. Parcel with basic utilities plus 6 modules with RCF.	90m ²	67,5m ²
C2	RCF	Apartment. Parcel with basic utilities plus 10 modules with RCF.	90m ²	112,5m ²
C3	RCF	Apartment. Parcel with basic utilities plus 12 modules with RCF.	90m ²	135m ²

B. Cost Structure

As part of this study, field research was conducted to determine a cost per square meter for each of the three technologies retained, using materials under current supply conditions in Kigali. These local costs were grouped in two basic categories: direct costs (building and land) and indirect costs (professional, administrative costs and developer margin). Detailed cost considerations are provided in Chapter 3. The costs per m² determined by the calculation are as follows:

Technology	RWF/m ²	USD/m ²
Temporary	51.572,92	\$85
Hybrid	175.255,60	\$288
RCF	517.242,80	\$850

C. Affordable Housing Demand

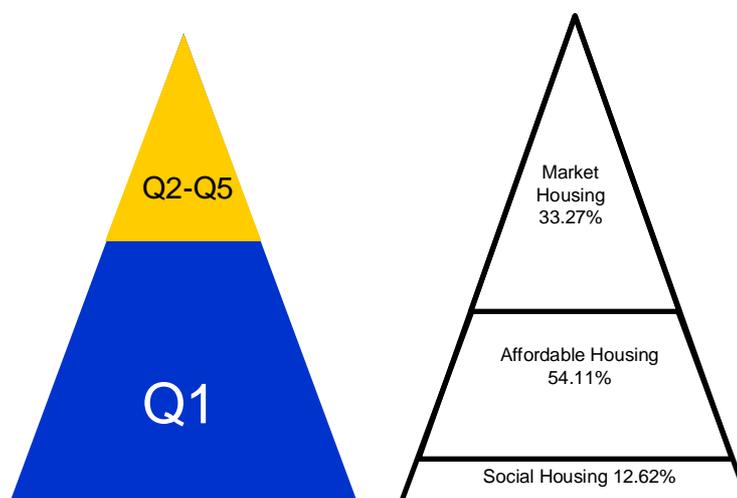
Affordable housing is defined as that for which households do not pay more than 30% of their gross income. Affordable housing demand in Kigali for 2012-2022 will reach 186,163 DU (an average of 16,923 affordable DU per year). All the affordable housing demand concentrates in the lower income segments of Q1. Affordable housing demand is equivalent to 54.11% of total new demand.

In the lowest income segment of Q1, below the poverty line, there is a demand for 43,436 DU (12.62%), which are classified as “social demand” since these households need full subsidy in order to access housing

Market demand -- formed by households that can afford payment of DU without outside support -- reaches 114,468 DU, and consist on demand from households in the upper segment of Q1, and Q2 to Q5 (33.27%).

Detailed affordability estimations could be found in Chapter 5 and in the forecast model.

Exhibit 9: Housing Market Structure 2012-2022



As shown in the exhibit above, the housing market in Kigali is split in two almost equal portions (affordable and market housing). However, most of housing demand concentrates in Q1 (78%), which is the lowest income quintile.

1.6.3 Housing Demand per DU Type

The same calculation used to determine affordable housing demand yielded the number of DU per type and income quintile to be built in the period under analysis. Results are shown in the table below. Notice that 229,599 DU (equivalent 68.30% of the total) correspond to Type A1/A2, that is, a parcel with basic services, basic roof and enclosing wall, which may be built by the end-user (assisted auto construction).

Exhibit 10: Housing Demand 2012-2022 per DU Type

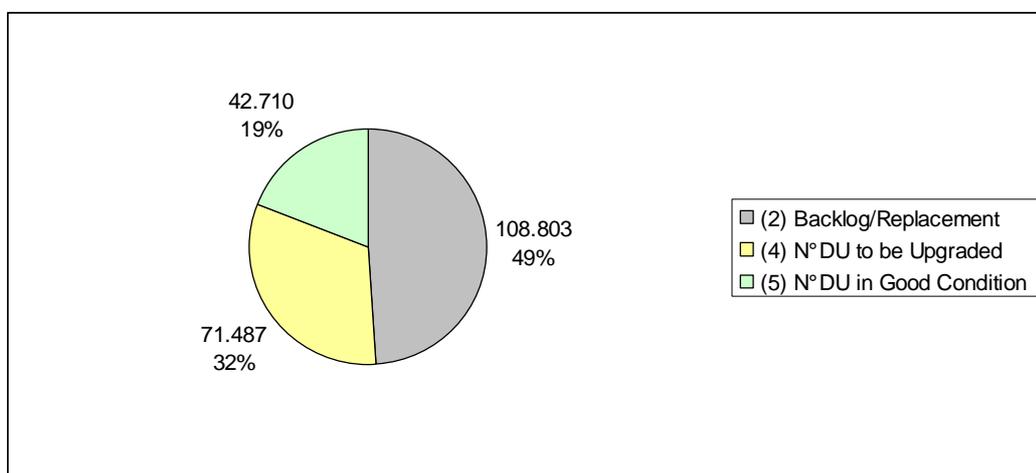
Type	DU to be Built 2012-2022	
	Total	m ² building
A1 / A2	229.599	10.331.955
B1	39.266	2.208.687
B2	37.013	1.665.592
B3	16.261	1.097.586
B4	13.359	1.202.331
C1	3.669	247.650
C2	3.300	297.006
C3	1.601	216.190
Total	344.068	17.266.997

1.6.4 Upgrading and/or Replacement of Existing Housing Stock

EICV3 indicates that 62.6% of the city's population lives in informal areas. Hence, it is possible to conclude that a similar proportion corresponds to informal housing units. Units to be upgraded are estimated by subtracting backlog demand (which already includes 24.2% replacement) from existing stock. The remainder are units in good condition. These assumptions allow conducting estimation for the baseline year of 2011, a detail of which is shown below.

Exhibit 10a: Estimation of Upgrading and Replacement of Existing Housing Stock in Kigali (2011)

Replacing / Upgrading Existing Stock	
(1) Estimated Existing Stock in 2011 (DU)	223.000
(2) Backlog/Replacement	108.803
(3) = (1)-(2) Diference Existing - Replacement	114.197
Proportion Upgrading (EICV3)	62,60%
(4) N° DU to be Upgraded	71.487
(5) N° DU in Good Condition	42.710



1.7. Demand Forecast Model

Estimation of new housing demand was accomplished with the aid of a mathematical model prepared for the purpose. The mathematical model is structured in two modules. The first module is used to forecast demand in terms of the number of DU per income segment and per year. The second module serves to estimate inputs required to meet demand, in terms of investment and land, and to estimate affordable housing demand.

In both modules, present conditions are used as starting points. These present conditions are then projected in time by virtue of selected indicators. The mathematical model is contained in an Excel calculation spreadsheet presented in a separate document. The following exhibit illustrates the structure of the model:

Exhibit 11: Forecast Model Structure

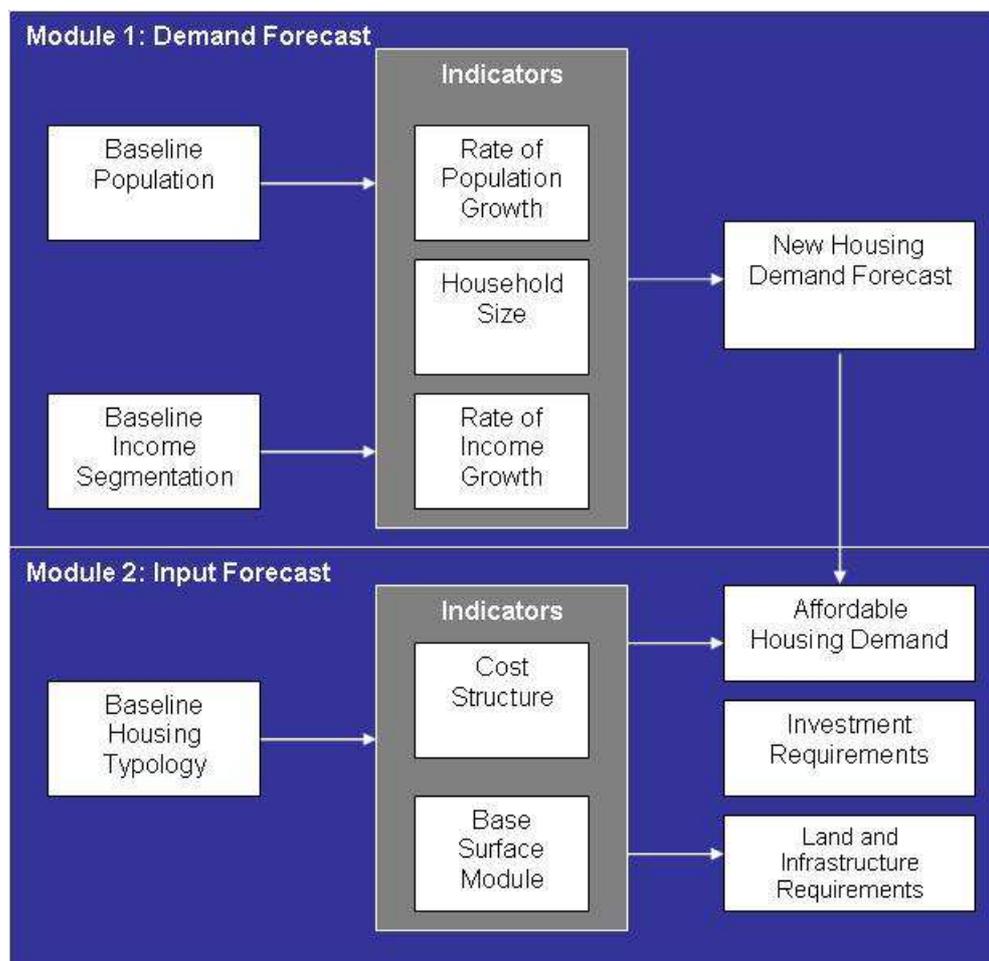


Exhibit 12: Population Assumptions

TOPIC	ASSUMPTION		METHOD OF ESTIMATION	INDICATOR			SOURCE OF INFORMATION
POPULATION	BASELINE POPULATION	Existing Population in Kigali in 2011	Existing Statistical Data	Population		1.059.000	EICV3 - Table 1.1.1
	KIGALI RATE OF POPULATION GROWTH	Scenario 1: Population grows at intercensal rate in the next 10 years	Calculation based on existing statistical data	Rate of Growth	5,74%	1.957.312	Exhibit 1
		Scenario 2: Population follows trend estimated by NISR Population Projections - High Scenario	Calculation based on existing statistical data	Rate of Growth	5,79%	3.132.205	Population Projections NISR - Table II 5.3 - Exhibit 2
		Scenario 3: Average of Scenario 1 and Scenario 2	Calculation based on existing statistical data	Rate of Growth	5,77%	2.544.759	Exhibit 3

Exhibit 13: Population Growth Scenario 1: Observed Facts

		Kigali Rate of Growth	
		Year	Population
AnnualRate of Growth		2002	608.141 (1.)
5,74%		2003	643.061
		2004	679.987
		2005	719.032
		2006	760.320
		2007	803.979
		2008	850.144
		2009	898.960
		2010	950.580
		2011	1.059.087 (2.)
		2012	1.119.901
		2013	1.184.207
		2014	1.252.206
		2015	1.324.109
		2016	1.400.141
		2017	1.480.539
		2018	1.565.553
		2019	1.655.449
		2020	1.750.507
		2021	1.851.024
		2022	1.957.312
		2023	2.069.703
		2024	2.188.548
		2025	2.314.217
		2026	2.447.102
		2027	2.587.618
		2028	2.736.202
		2029	2.893.319
		2030	3.059.457
		2031	3.235.134
		2032	3.420.900
		2033	3.617.332
		2034	3.825.044
		2035	4.044.683
		2036	4.276.933
		2037	4.522.520
		2038	4.782.209
		2039	5.056.809
		2040	5.347.178

(1) Third General Population and Housing Census
 (2) EICV3

Exhibit 14: Population Growth Scenario 2: NISR Projection

YEAR	POPULATION						Annual Rate of Growth National Population
	NATIONAL (1)	URBAN		KIGALI		% National	
		%	Population	% of URBAN	Population		
2011	10.718.379	14,80%	1.586.320	66,20%	1.050.087	9,80%	5,79%
2012	11.033.141	15,62%	1.723.622	67,02%	1.155.148	10,47%	
2013	11.355.940	16,44%	1.867.421	69,32%	1.294.488	11,40%	
2014	11.686.013	17,27%	2.017.785	71,62%	1.445.148	12,37%	
2015	12.022.635	18,09%	2.174.761	73,92%	1.607.615	13,37%	
2016	12.365.180	18,91%	2.338.393	76,22%	1.782.378	14,41%	
2017	12.713.052	19,73%	2.508.709	78,52%	1.969.921	15,50%	
2018	13.084.188	20,56%	2.689.528	80,82%	2.173.790	16,61%	
2019	13.459.227	21,38%	2.877.284	83,13%	2.391.747	17,77%	
2020	13.838.421	22,20%	3.072.129	85,43%	2.624.400	18,96%	
2021	14.221.792	23,02%	3.274.173	87,73%	2.872.334	20,20%	
2022	14.591.018	23,84%	3.479.147	90,03%	3.132.205	21,47%	

Based on Rwanda National Population Projections 2007-2022, NISR

Exhibit 15: Population Growth Scenario 3: Average Scenario

YEAR	Scenario 1	Scenario 2	Scenario 3
2011	1.059.087	1.050.087	1.054.587
2012	1.119.901	1.155.148	1.137.524
2013	1.184.207	1.294.488	1.239.348
2014	1.252.206	1.445.148	1.348.677
2015	1.324.109	1.607.615	1.465.862
2016	1.400.141	1.782.378	1.591.260
2017	1.480.539	1.969.921	1.725.230
2018	1.565.553	2.173.790	1.869.672
2019	1.655.449	2.391.747	2.023.598
2020	1.750.507	2.624.400	2.187.454
2021	1.851.024	2.872.334	2.361.679
2022	1.957.312	3.132.205	2.544.759

Exhibit 16: Income Segmentation Assumptions

TOPIC	ASSUMPTION		METHOD OF ESTIMATION	INDICATOR			SOURCE OF INFORMATION
INCOME STRUCTURE	POPULATION PER INCOME RANGE	Income range of population registered with RSSB reflects the overall income distribution in Kigali, given that it corresponds to 75% of the overall city's population	RSSB Statistics	PROPORTION OF POPULATION PER INCOME RANGE	See Exhibit		RSSB Statistics
		Migrant Population represents the informal, non-RSSB registered population in the city	Review of Existing NISR Statistics	Migrant Population 2005/6 - 2010/11	661.000	See Exhibit 5	EICV3 - Table 1.2.1
				Migrant Population 2000/2 - 2005/6	557.000	See Exhibit 5	EICV3 - Table 1.2.1
		Income structure will remain relatively unchanged due to the fact that growth in the city is due to immigration (about 3% annually) plus natural growth (about 3% annually), which will create a stable structure. A slight modification will be introduced due to income growth (see table 3)	Review of Existing NISR Statistics				EICB3 - Table 1.2.1
	LIMITATIONS OF THIS ASSUMPTION	The actual composition of non-RSSB registered population is unknown. It is assumed that it represents the informal market and that it is at least one half of the city's overall population (See Exhibit 5)					

Exhibit 17: RSSB Registered Workers Salaries for Kigali, July 2011 to March 2012

Monthly Salary range(Frw)	Sector of activity		Total	%	Cumulative
	Private	Public			
1 - 100,000	61.479	40.829	102.308	60,89%	60,89%
100,001 - 200,000	13.527	9.171	22.698	13,51%	74,40%
200,001 - 300,000	6.610	5.879	12.489	7,43%	81,83%
300,001 - 400,000	3.816	4.386	8.202	4,88%	86,72%
400,001 - 500,000	2.877	2.591	5.468	3,25%	89,97%
500,001 - 600,000	1.885	2.007	3.892	2,32%	92,29%
600,001 - 700,000	1.522	1.642	3.164	1,88%	94,17%
700,001 - 800,000	1.141	1.130	2.271	1,35%	95,52%
800,001 - 900,000	836	736	1.572	0,94%	96,46%
900,001 - 1,000,000	629	507	1.136	0,68%	97,13%
1,000,001 - 1,100,000	491	401	892	0,53%	97,67%
1,100,001 - 1,500,000	1.168	856	2.024	1,20%	98,87%
1,500,001 - 2,000,000	643	225	868	0,52%	99,39%
2,000,001 - 2,500,000	308	81	389	0,23%	99,62%
2,500,001 - 3,000,000	154	67	221	0,13%	99,75%
3,000,001 - 3,500,000	86	37	123	0,07%	99,82%
3,500,001 - 4,000,000	54	24	78	0,05%	99,87%
4,000,001 - 4,500,000	51	13	64	0,04%	99,91%
4,500,001 - 5,000,000	35	3	38	0,02%	99,93%
5,000,001 - 5,500,000	18	3	21	0,01%	99,94%
5,500,001 - 6,000,000	12	1	13	0,01%	99,95%
6,000,001 - 6,500,000	11	-	11	0,01%	99,96%
6,500,001 - 7,000,000	9	2	11	0,01%	99,96%
7,000,001 - 7,500,000	5	-	5	0,00%	99,97%
7,500,001 - 8,000,000	8	-	8	0,00%	99,97%
8,000,001 - 8,500,000	6	-	6	0,00%	99,97%
8,500,001 - 9,000,000	3	-	3	0,00%	99,98%
9,000,001 - 9,500,000	3	-	3	0,00%	99,98%
9,500,001 - 10,000,000	2	-	2	0,00%	99,98%
10,000,001 - 10,500,000	3	-	3	0,00%	99,98%
10,500,001 - 11,000,000	5	1	6	0,00%	99,98%
11,500,001 - 12,000,000	1	-	1	0,00%	99,99%
12,500,001 - 13,000,000	5	-	5	0,00%	99,99%
13,000,001 - 13,500,000	2	-	2	0,00%	99,99%
13,500,001 - 14,000,000	2	-	2	0,00%	99,99%
14,000,001 - 14,500,000	2	-	2	0,00%	99,99%
14,500,001 - 15,000,000	1	1	2	0,00%	99,99%
> 15,000,000	12	-	12	0,01%	100%
Total	97.422	70.593	168.015	100%	

Source: RSSB

Exhibit 18: Proportion of City's Population Registered with RSSB

HH Size	4,7
Registered Workers	168.015
HH per Worker	1
Earners per HH	1
Total Population	789.671
Proportion of City's Population	75%
Migrant Population 2010/11	661.000
Proportion of City's Population	62,42%

Exhibit 19: Assumption about Household Size and Dwellings per Household

TOPIC	ASSUMPTION		METHOD OF ESTIMATION	INDICATOR		SOURCE OF INFORMATION
HOUSEHOLD SIZE	HOUSEHOLD SIZE	HH size will decrease over time in Kigali, following the trend observed in the 5 years between EICV2 and EICV3	Review of NISR Statistical Data	Household size produced by the rate of variation between surveys	See Exhibit 6	EICV3 - Summary Table of Key Indicators, page 12
DWELLING UNIT (DU)	DU per HH	It is assumed that one DU will be inhabited only by one HH				

Exhibit 20: Forecasted Household Size in Kigali 2012 - 2022

Existing N° of HH in Kigali (2011) 223.000 EICV3 - Table 1.1.8

Change	Rwanda 2005/6 (1)	5,00
0,96%	Rwanda 2010/11 (2)	4,80
	Kigali 2011	4,75
	2012	4,70
	2013	4,66
	2014	4,61
	2015	4,57
	2016	4,53
	2017	4,48
	2018	4,44
	2019	4,40
	2020	4,35
	2021	4,31
	2022	4,27
	Kigali Average	4,51

Exhibit 21: Assumptions about Backlog Demand

TOPIC	ASSUMPTION		METHOD OF ESTIMATION	INDICATOR		SOURCE OF INFORMATION
BACKLOG HOUSING DEMAND	It is demand that has not been met by supply. It is constituted by the following items:		Review of NISR Statistical Data	Proportion of of Multiple HH dwelling units	20,70%	EICV3 - Table
	1. Overcrowding	HH living under crowded conditions, as described by the World Bank's Qualitative Assessment, poor-land lords, where DU are parceled into several sub-units. It will be assumed that half of currently rented units are overcrowded subdivisions.				
	2. Quality	It is assumed that DU with uncovered walls (mudbrick + turuncks) need to be replaced because of low-quality	Review of NISR Statistical Data	Proportion of informal DU	62,60%	EICV3 - Table 3.1.2
				Proportion of informal DU that need to be replaced	24,20%	EICV3 - Table 3.1.7
3. Homelessness		Review of NISR Statistical Data	Proportion living in temporary camp or settlement	0,40%	EICV3 - Table	
			Proportion in other type of occupancy status	0,40%		
				Total Proportion of Backlog	45,70%	
Estimation of Backlog						
N° of DU in 2012	238.091					
Backlog Housing Demand in 2012 in DU	108.807					

Exhibit 22: Kigali Baseline Income Segmentation in RwF (extended)

Breakdown of Segment 1 - Q1 (or Q1-1)

Sub-segment	Monthly Salary Range		Estimated % of HH	Adjusted % of HH According with N° of Income Earners
	From	To		
Q1-1-1	100.000	less	0,40%	0,40%
Q1-1-2	100.000	200.000	3,10%	3,10%
Q1-1-3	200.000	400.000	13,40%	13,40%
Below Poverty Line			16,90%	16,90%
Q1-1-4	400.000	600.000	10,75%	5,97%
Q1-1-5	600.000	800.000	10,75%	10,55%
Q1-1-6	800.000	1.000.000	10,75%	10,75%
Q1-1-7	1.000.000	1.200.000	10,75%	10,75%
			60,89%	38,02%
				54,92%

Quintile	Segment	Monthly Salary Range in RwF		Annual Salary Range in RwF		Estimated % of HH	Cumulative
		From	To	From	To		
Q1	1	<	100.000	<	1.200.000	54,92%	54,92%
	2	100.001	200.000	1.200.001	2.400.000	18,28%	73,20%
	3	200.001	300.000	2.400.001	3.600.000	7,83%	81,03%
Q2	4	300.001	400.000	3.600.001	4.800.000	5,47%	86,50%
	5	400.001	500.000	4.800.001	6.000.000	3,46%	89,97%
	6	500.001	600.000	6.000.001	7.200.000	2,32%	92,28%
Q3	7	600.001	700.000	7.200.001	8.400.000	1,88%	94,17%
	8	700.001	800.000	8.400.001	9.600.000	1,35%	95,52%
	9	800.001	900.000	9.600.001	10.800.000	0,94%	96,45%
Q4	10	900.001	1.000.000	10.800.001	12.000.000	0,68%	97,13%
	11	1.000.001	1.100.000	12.000.001	13.200.000	0,53%	97,66%
	12	1.100.001	1.500.000	13.200.001	18.000.000	1,20%	98,87%
Q5	13	1.500.001	2.000.000	18.000.001	24.000.000	0,52%	99,38%
	14	2.000.001	2.500.000	24.000.001	30.000.000	0,23%	99,61%
	15	2.500.001	<	30.000.001	<	0,38%	100,00%

50000

Breakdown of Q5 / Segment 15			
2.500.000	3.000.000		0,13%
3.000.001	3.500.000		0,07%
3.500.001	4.000.000		0,05%
4.000.001	5.000.000		0,04%
5.000.001	5.500.000		0,02%
5.500.001	6.000.000		0,01%
6.000.001	6.500.000		0,01%
3,000,001 - 3,500,000			0,01%
3,500,001 - 4,000,000			0,01%
4,000,001 - 4,500,000			0,00%
4,500,001 - 5,000,000			0,00%
5,000,001 - 5,500,000			0,00%
5,500,001 - 6,000,000			0,00%
6,000,001 - 6,500,000			0,00%
6,500,001 - 7,000,000			0,00%
7,000,001 - 7,500,000			0,00%
7,500,001 - 8,000,000			0,00%
8,000,001 - 8,500,000			0,00%
8,500,001 - 9,000,000			0,00%
9,000,001 - 9,500,000			0,00%
9,500,001 - 10,000,000			0,00%
10,000,001 - 10,500,000			0,00%
10,500,001 - 11,000,000			0,00%
11,500,001 - 12,000,000			0,00%
12,500,001 - 13,000,000			0,00%
13,000,001 - 13,500,000			0,00%
13,500,001 - 14,000,000			0,00%
14,000,001 - 14,500,000			0,00%
14,500,001 - 15,000,000			0,00%
> 15,000,000			0,00%
Total			0,38%

Exhibit 23: Kigali Baseline Income Segmentation in USD

Exchange Rate USD/RwF

608,27

Quintile	Segment	Monthly Salary Range in USD		Annual Salary Range in USD		Estimated % of HH	Cumulative
		From	To	From	To		
Q1	1	<	164	<	1.973	54,92%	54,92%
	2	165	329	1.974	3.946	18,28%	73,20%
	3	330	493	3.947	5.918	7,83%	81,03%
Q2	4	494	658	5.919	7.891	5,47%	86,50%
	5	659	822	7.892	9.864	3,46%	89,97%
	6	823	986	9.865	11.837	2,32%	92,28%
Q3	7	987	1.151	11.838	13.810	1,88%	94,17%
	8	1.316	1.315	13.811	15.782	1,35%	95,52%
	9	1.316	1.480	15.783	17.755	0,94%	96,45%
Q4	10	1.481	1.644	17.756	19.728	0,68%	97,13%
	11	1.645	1.808	19.729	21.701	0,53%	97,66%
	12	1.809	2.466	21.702	29.592	1,20%	98,87%
Q5	13	2.467	3.288	29.593	39.456	0,52%	99,38%
	14	3.289	4.110	39.457	49.320	0,23%	99,61%
	15	4.111	<	49.321	<	0,38%	100,00%

Exhibit 24: Estimated Proportional Change of Income Segments in Kigali 2012-2022

		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022										
Rate of Income Growth		7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%										
Quintile	Segment																					
Q1	1	54,92%	3,84%	51,07%	3,58%	47,50%	3,32%	44,17%	3,09%	41,08%	2,88%	38,21%	2,67%	35,53%	2,49%	33,04%	2,31%	30,73%	2,15%	28,58%	2,00%	26,58%
	2	18,28%	1,28%	20,85%	1,46%	22,96%	1,61%	24,68%	1,73%	26,04%	1,82%	27,10%	1,90%	27,87%	1,95%	28,41%	1,99%	28,73%	2,01%	28,87%	2,02%	28,85%
	3	7,83%	0,55%	8,56%	0,60%	9,42%	0,66%	10,37%	0,73%	11,37%	0,80%	12,40%	0,87%	13,43%	0,94%	14,44%	1,01%	15,42%	1,08%	16,35%	1,14%	17,23%
Q2	4	5,47%	0,38%	5,64%	0,39%	5,84%	0,41%	6,09%	0,43%	6,39%	0,45%	6,74%	0,47%	7,14%	0,50%	7,58%	0,53%	8,06%	0,56%	8,57%	0,60%	9,12%
	5	3,46%	0,24%	3,60%	0,25%	3,75%	0,26%	3,89%	0,27%	4,05%	0,28%	4,21%	0,29%	4,39%	0,31%	4,58%	0,32%	4,79%	0,34%	5,02%	0,35%	5,27%
	6	2,32%	0,16%	2,40%	0,17%	2,48%	0,17%	2,57%	0,18%	2,66%	0,19%	2,76%	0,19%	2,86%	0,20%	2,97%	0,21%	3,08%	0,22%	3,20%	0,22%	3,33%
Q3	7	1,88%	0,13%	1,91%	0,13%	1,95%	0,14%	1,98%	0,14%	2,03%	0,14%	2,07%	0,14%	2,12%	0,15%	2,17%	0,15%	2,23%	0,16%	2,29%	0,16%	2,35%
	8	1,35%	0,09%	1,39%	0,10%	1,43%	0,10%	1,46%	0,10%	1,50%	0,10%	1,54%	0,11%	1,57%	0,11%	1,61%	0,11%	1,65%	0,12%	1,69%	0,12%	1,73%
	9	0,94%	0,07%	0,96%	0,07%	0,99%	0,07%	1,02%	0,07%	1,06%	0,07%	1,09%	0,08%	1,12%	0,08%	1,15%	0,08%	1,18%	0,08%	1,21%	0,09%	1,25%
Q4	10	0,68%	0,05%	0,69%	0,05%	0,71%	0,05%	0,73%	0,05%	0,75%	0,05%	0,77%	0,05%	0,80%	0,06%	0,82%	0,06%	0,84%	0,06%	0,87%	0,06%	0,89%
	11	0,53%	0,04%	0,54%	0,04%	0,55%	0,04%	0,56%	0,04%	0,57%	0,04%	0,59%	0,04%	0,60%	0,04%	0,61%	0,04%	0,63%	0,04%	0,64%	0,05%	0,66%
	12	1,20%	0,08%	1,16%	0,08%	1,11%	0,08%	1,07%	0,08%	1,04%	0,07%	1,01%	0,07%	0,98%	0,07%	0,95%	0,07%	0,93%	0,06%	0,91%	0,06%	0,89%
Q5	13	0,52%	0,04%	0,56%	0,04%	0,61%	0,04%	0,64%	0,04%	0,67%	0,05%	0,70%	0,05%	0,72%	0,05%	0,74%	0,05%	0,75%	0,05%	0,76%	0,05%	0,77%
	14	0,23%	0,02%	0,25%	0,02%	0,27%	0,02%	0,30%	0,02%	0,32%	0,02%	0,35%	0,02%	0,37%	0,03%	0,39%	0,03%	0,42%	0,03%	0,44%	0,03%	0,46%
	15	0,38%	0,03%	0,40%	0,03%	0,42%	0,03%	0,44%	0,03%	0,46%	0,03%	0,48%	0,03%	0,51%	0,04%	0,53%	0,04%	0,56%	0,04%	0,59%	0,04%	0,62%
		100,00%		100,00%		100,00%		100,00%		100,00%		100,00%		100,00%		100,00%		100,00%		100,00%		100,00%

Exhibit 25: Forecasted New Housing Demand (RWF) 2012 – 2022 / Number of DU per Income Segment

Quintile	Segment	Monthly HH Income RwF		Year											TOTAL DU
		From	To	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Q1	1	<	100.000	8.287	8.229	8.171	8.113	8.056	7.999	7.942	7.886	7.830	7.775	7.720	88.007
	2	100.001	200.000	2.759	3.359	3.950	4.533	5.107	5.673	6.231	6.780	7.322	7.855	8.381	61.947
	3	200.001	300.000	1.182	1.380	1.621	1.905	2.230	2.596	3.002	3.446	3.929	4.448	5.004	30.742
Q2	4	300.001	400.000	826	908	1.005	1.119	1.253	1.411	1.595	1.808	2.053	2.332	2.648	16.960
	5	400.001	500.000	523	581	645	715	794	882	981	1.093	1.221	1.366	1.530	10.330
	6	500.001	600.000	350	386	427	472	522	578	640	708	785	871	967	6.705
Q3	7	600.001	700.000	284	308	335	365	397	433	474	518	567	622	683	4.986
	8	700.001	800.000	204	224	245	269	294	321	352	385	421	460	503	3.677
	9	800.001	900.000	141	155	171	188	207	227	250	274	301	330	362	2.609
Q4	10	900.001	1.000.000	102	112	123	135	148	162	178	195	215	236	259	1.863
	11	1.000.001	1.100.000	80	87	95	103	113	123	134	147	160	175	191	1.409
	12	1.100.001	1.500.000	182	186	192	197	204	211	218	227	236	247	258	2.358
Q5	13	1.500.001	2.000.000	78	91	104	118	132	146	161	176	192	208	225	1.631
	14	2.000.001	2.500.000	36	41	48	54	64	72	83	94	108	120	135	855
	15	2.500.001	<	58	65	71	80	89	101	113	127	142	160	180	1.186
TOTAL DU				15.091	16.112	17.202	18.366	19.609	20.936	22.353	23.865	25.481	27.205	29.046	235.265

Indicator / Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rate of Income Growth			7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
City's Population	1.059.087	1.119.901	1.184.207	1.252.206	1.324.109	1.400.141	1.480.539	1.565.553	1.655.449	1.750.507	1.851.024	1.957.312
HH Size	4,75	4,70	4,66	4,61	4,57	4,53	4,48	4,44	4,40	4,35	4,31	4,27
N° HH	223.000	238.091	254.202	271.405	289.771	309.380	330.316	352.669	376.534	402.014	429.219	458.265
Required DU	223.000	238.091	254.202	271.405	289.771	309.380	330.316	352.669	376.534	402.014	429.219	458.265
New DU		15.091	16.112	17.202	18.366	19.609	20.936	22.353	23.865	25.480	27.205	29.046

Exhibit 26: Forecasted Natural Housing Demand (**USD**) 2012 – 2022 / Number of DU per Income Segment

Quintile	Segment	Monthly HH Income USD		Year										TOTALS	
		From	To	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		2022
Q1	1	<	164	8.287	8.229	8.171	8.113	8.056	7.999	7.942	7.886	7.830	7.775	7.720	88.007
	2	165	329	2.759	3.359	3.950	4.533	5.107	5.673	6.231	6.780	7.322	7.855	8.381	61.947
	3	330	493	1.182	1.380	1.621	1.905	2.230	2.596	3.002	3.446	3.929	4.448	5.004	30.742
Q2	4	494	658	826	908	1.005	1.119	1.253	1.411	1.595	1.808	2.053	2.332	2.648	16.960
	5	659	822	523	581	645	715	794	882	981	1.093	1.221	1.366	1.530	10.330
	6	823	986	350	386	427	472	522	578	640	708	785	871	967	6.705
Q3	7	987	1.151	284	308	335	365	397	433	474	518	567	622	683	4.986
	8	1.316	1.315	204	224	245	269	294	321	352	385	421	460	503	3.677
	9	1.316	1.480	141	155	171	188	207	227	250	274	301	330	362	2.609
Q4	10	1.481	1.644	102	112	123	135	148	162	178	195	215	236	259	1.863
	11	1.645	1.808	80	87	95	103	113	123	134	147	160	175	191	1.409
	12	1.809	2.466	182	186	192	197	204	211	218	227	236	247	258	2.358
Q5	13	2.467	3.288	78	91	104	118	132	146	161	176	192	208	225	1.631
	14	3.289	4.110	36	41	48	54	64	72	83	94	108	120	135	855
	15	4.111	<	58	65	71	80	89	101	113	127	142	160	180	1.186
TOTALS				15.091	16.112	17.202	18.366	19.609	20.936	22.353	23.865	25.481	27.205	29.045	235.265

Exhibit 27: Backlog Housing Demand (RWF) 2012-2022 / Number of DU per Income Segment

Quintile	Segment	Monthly HH Income Rwf		Proportion	Year												
		From	To		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021	2022	
Q1	1	<	100.000	54,92%	59.754	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432
	2	100.001	200.000	18,28%	19.891	1.808	1.808	1.808	1.808	1.808	1.808	1.808	1.808	1.808	1.808	1.808	1.808
	3	200.001	300.000	7,83%	8.523	775	775	775	775	775	775	775	775	775	775	775	775
Q2	4	300.001	400.000	5,47%	5.954	541	541	541	541	541	541	541	541	541	541	541	541
	5	400.001	500.000	3,46%	3.770	343	343	343	343	343	343	343	343	343	343	343	343
Q3	6	500.001	600.000	2,32%	2.520	229	229	229	229	229	229	229	229	229	229	229	229
	7	600.001	700.000	1,88%	2.049	186	186	186	186	186	186	186	186	186	186	186	186
	8	700.001	800.000	1,35%	1.471	134	134	134	134	134	134	134	134	134	134	134	134
Q4	9	800.001	900.000	0,94%	1.018	93	93	93	93	93	93	93	93	93	93	93	93
	10	900.001	1.000.000	0,68%	736	67	67	67	67	67	67	67	67	67	67	67	67
	11	1.000.001	1.100.000	0,53%	578	53	53	53	53	53	53	53	53	53	53	53	53
Q5	12	1.100.001	1.500.000	1,20%	1.311	119	119	119	119	119	119	119	119	119	119	119	119
	13	1.500.001	2.000.000	0,52%	562	51	51	51	51	51	51	51	51	51	51	51	51
Q5	14	2.000.001	2.500.000	0,23%	252	23	23	23	23	23	23	23	23	23	23	23	23
	15	2.500.001	<	0,38%	416	38	38	38	38	38	38	38	38	38	38	38	38
					108.803	9.891	9.891	9.891	9.891	9.891	9.891	9.891	9.891	9.891	9.891	9.891	9.891

Exhibit 28: Backlog Housing Demand (**USD**) 2012-2022 / Number of DU per Income Segment

Quintile	Segment	Monthly HH Income USD		Proportion	Year												
		From	To		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021	2022	
Q1	1	<	164	54,92%	59.754	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432	5.432
	2	165	329	18,28%	19.891	1.989	1.989	1.989	1.989	1.989	1.989	1.989	1.989	1.989	1.989	1.989	1.989
	3	330	493	7,83%	8.523	852	852	852	852	852	852	852	852	852	852	852	852
Q2	4	494	658	5,47%	5.954	595	595	595	595	595	595	595	595	595	595	595	595
	5	659	822	3,46%	3.770	377	377	377	377	377	377	377	377	377	377	377	377
	6	823	986	2,32%	2.520	252	252	252	252	252	252	252	252	252	252	252	252
Q3	7	987	1.151	1,88%	2.049	205	205	205	205	205	205	205	205	205	205	205	205
	8	1.316	1.315	1,35%	1.471	147	147	147	147	147	147	147	147	147	147	147	147
	9	1.316	1.480	0,94%	1.018	102	102	102	102	102	102	102	102	102	102	102	102
Q4	10	1.481	1.644	0,68%	736	74	74	74	74	74	74	74	74	74	74	74	74
	11	1.645	1.808	0,53%	578	58	58	58	58	58	58	58	58	58	58	58	58
	12	1.809	2.466	1,20%	1.311	131	131	131	131	131	131	131	131	131	131	131	131
Q5	13	2.467	3.288	0,52%	562	56	56	56	56	56	56	56	56	56	56	56	56
	14	3.289	4.110	0,23%	252	25	25	25	25	25	25	25	25	25	25	25	25
	15	4.111	<	0,38%	416	42	42	42	42	42	42	42	42	42	42	42	42
					108.803												

Exhibit 29: Total Housing Demand (RWF) 2012-2022 / Number of DU per Income Segment

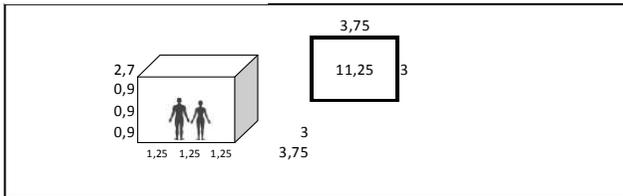
Quintile	Segment	Monthly HH Income Rwf		Year											TOTAL DU	Total DU per Quintile	Proportion
		From	To	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Q1	1	<	100.000	13.720	13.661	13.603	13.545	13.488	13.431	13.374	13.318	13.262	13.207	13.152	147.761	268.865	78%
	2	100.001	200.000	4.567	5.167	5.758	6.341	6.915	7.481	8.039	8.588	9.130	9.663	10.189	81.838		
	3	200.001	300.000	1.957	2.155	2.396	2.680	3.005	3.371	3.777	4.221	4.703	5.223	5.778	39.266		
Q2	4	300.001	400.000	1.367	1.449	1.546	1.660	1.795	1.953	2.137	2.350	2.594	2.874	3.189	22.914	46.239	13%
	5	400.001	500.000	866	924	987	1.058	1.136	1.224	1.324	1.436	1.563	1.708	1.873	14.100		
	6	500.001	600.000	579	615	656	701	751	807	869	938	1.014	1.100	1.196	9.225		
Q3	7	600.001	700.000	470	495	521	551	583	620	660	704	754	808	869	7.035	15.809	5%
	8	700.001	800.000	338	357	379	402	428	455	485	518	554	594	637	5.147		
	9	800.001	900.000	234	248	264	281	299	320	342	367	394	423	455	3.627		
Q4	10	900.001	1.000.000	169	179	190	201	215	229	245	262	281	302	325	2.599	8.254	2%
	11	1.000.001	1.100.000	133	140	147	156	165	176	187	199	213	228	244	1.987		
	12	1.100.001	1.500.000	301	306	311	317	323	330	338	346	355	366	377	3.669		
Q5	13	1.500.001	2.000.000	129	142	155	169	183	197	212	227	243	259	276	2.193	4.901	1%
	14	2.000.001	2.500.000	59	63	71	77	87	95	106	117	131	143	158	1.107		
	15	2.500.001	<	95	103	109	118	127	139	151	164	179	198	218	1.601		
TOTAL DU				24.982	26.003	27.094	28.257	29.501	30.827	32.244	33.756	35.372	37.096	38.936	344.068		

Exhibit 30: Total Housing Demand (**USD**) 2012-2022 / Number of DU per Income Segment

Quintile	Segment	Monthly HH Income USD		Year											TOTAL DU
		From	To	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Q1	1	<	164	13.720	13.661	13.603	13.545	13.488	13.431	13.374	13.318	13.262	13.207	13.152	147.761
	2	165	329	4.567	5.167	5.758	6.341	6.915	7.481	8.039	8.588	9.130	9.663	10.189	81.838
	3	330	493	1.957	2.155	2.396	2.680	3.005	3.371	3.777	4.221	4.703	5.223	5.778	39.266
Q2	4	494	658	1.367	1.449	1.546	1.660	1.795	1.953	2.137	2.350	2.594	2.874	3.189	22.914
	5	659	822	866	924	987	1.058	1.136	1.224	1.324	1.436	1.563	1.708	1.873	14.100
	6	823	986	579	615	656	701	751	807	869	938	1.014	1.100	1.196	9.225
Q3	7	987	1.151	470	495	521	551	583	620	660	704	754	808	869	7.035
	8	1.316	1.315	338	357	379	402	428	455	485	518	554	594	637	5.147
	9	1.316	1.480	234	248	264	281	299	320	342	367	394	423	455	3.627
Q4	10	1.481	1.644	169	179	190	201	215	229	245	262	281	302	325	2.599
	11	1.645	1.808	133	140	147	156	165	176	187	199	213	228	244	1.987
	12	1.809	2.466	301	306	311	317	323	330	338	346	355	366	377	3.669
Q5	13	2.467	3.288	129	142	155	169	183	197	212	227	243	259	276	2.193
	14	3.289	4.110	59	63	71	77	87	95	106	117	131	143	158	1.107
	15	4.111	<	95	103	109	118	127	139	151	164	179	198	218	1.601
TOTAL DU				24.982	26.003	27.094	28.257	29.501	30.827	32.244	33.756	35.372	37.096	38.936	344.068

Exhibit 31: Housing Typology Modelling

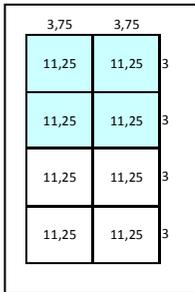
BASIC MODULE



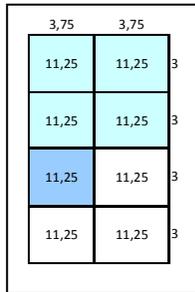
A1 = Temporary Technology
 B1 = Temporary + Hybrid Technology
 B2/B3/B4 = Hybrid Technology
 C1/C2/C3 = Reinforced Concret Frame

DU type and technology/cost adapts to HH income and evolves over time

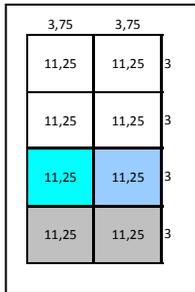
A1-2



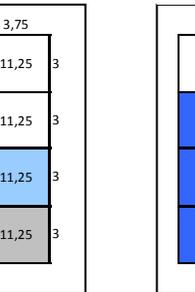
B1



B2

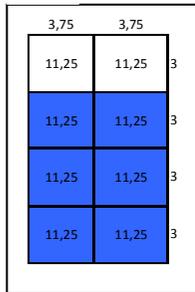


B3

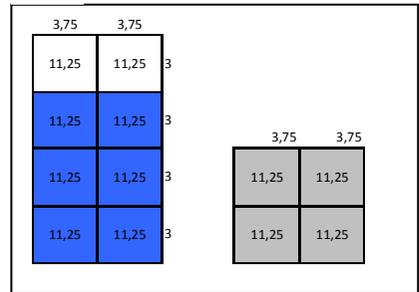


B4

C1



C2



C3

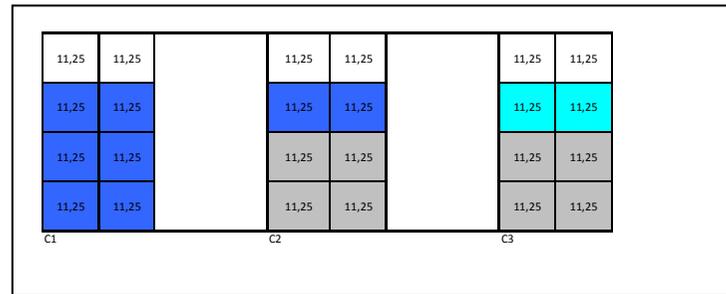
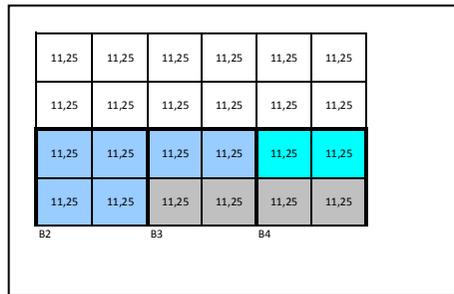
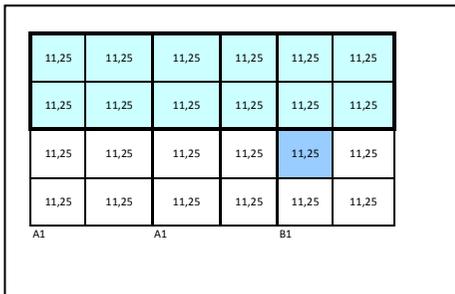
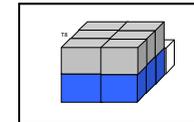
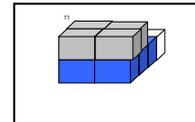
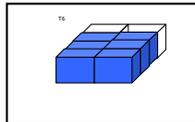
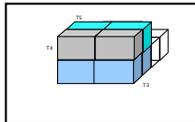
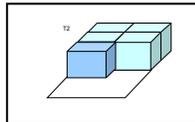
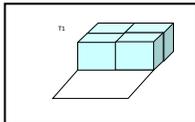
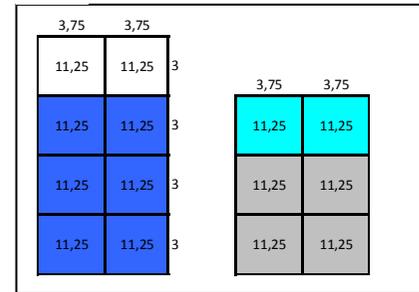


Exhibit 32: Housing Typology Modelling - Quantities

A1				
Surface	M ²		Land Requirements	
	Unit	m ²	Ha	
Land	90	20.663.910	2.066	
Built (1)	45			
Tech.	Cost/M ²		Total Cost	
Temp	RwF	51.573	2.320.781	
	USD	85	3.815	
Total N° of DU			229.599	

(1) land+utilities+basic roof

B1				
Surface	M ²		Land Requirements	
	Unit	m ²	Ha	
Land	45	1.766.950	177	
Built	11,25			
Tech.	Cost/M ²		Total Cost	
Temp	RwF	51.573	2.320.781	
Hybrid	RwF	175.256	1.971.626	
	USD		7.057	
Total N° of DU			39.266	

B2				
Surface	M ²		B3	
	Unit	m ²	Ha	
Land	45	1.665.592	167	
Built (1)	45			
Tech	Cost/M ²		Total Cost	
Hybrid	RwF	175.256	7.886.502	
	USD	288	12.965	
Total N° of DU			37.013	

B3				
Surface	M ²		Land Requirements	
	Unit	m ²	Ha	
Land	45	731.724	73	
Built (1)	67,5			
Tech	Cost/M ²		Total Cost	
Hybrid	RwF	175.256	11.829.753	
	USD	288	19.448	
Total N° of DU			16.261	

B4				
Surface	M ²		Land Requirements	
	Unit	m ²	Ha	
Land	45	601.165	60	
Built (1)	90			
Tech	Cost/M ²		Total Cost	
Hybrid	RwF	175.256	15.773.004	
	USD	288	25.931	
Total N° of DU			13.359	

C1				
Surface	M ²		Land Requirements	
	Unit	m ²	Ha	
Land	22,5	82.550	8	
Built (1)	67,5		0	
Tech	Cost/M ²		Total Cost	
RCF	RwF	517.243	34.913.889	
	USD	850	57.399	
Total N° of DU			3.669	

C2				
Surface	M ²		Land Requirements	
	Unit	m ²	Ha	
Land	22,5	74.251	7,4	
Built (1)	90			
Tech	Cost/M ²		Total Cost	
RCF	RwF	517.243	46.551.852	
	USD	850	76.532	
Total N° of DU			3.300	

C3				
Surface	M ²		Land Requirements	
	Unit	m ²	Ha	
Land	22,5	36.032	3,6	
Built (1)	135			
Tech	Cost/M ²		Total Cost	
RCF	RwF	517.243	69.827.778	
	USD	850	114.797	
Total N° of DU			1.601	

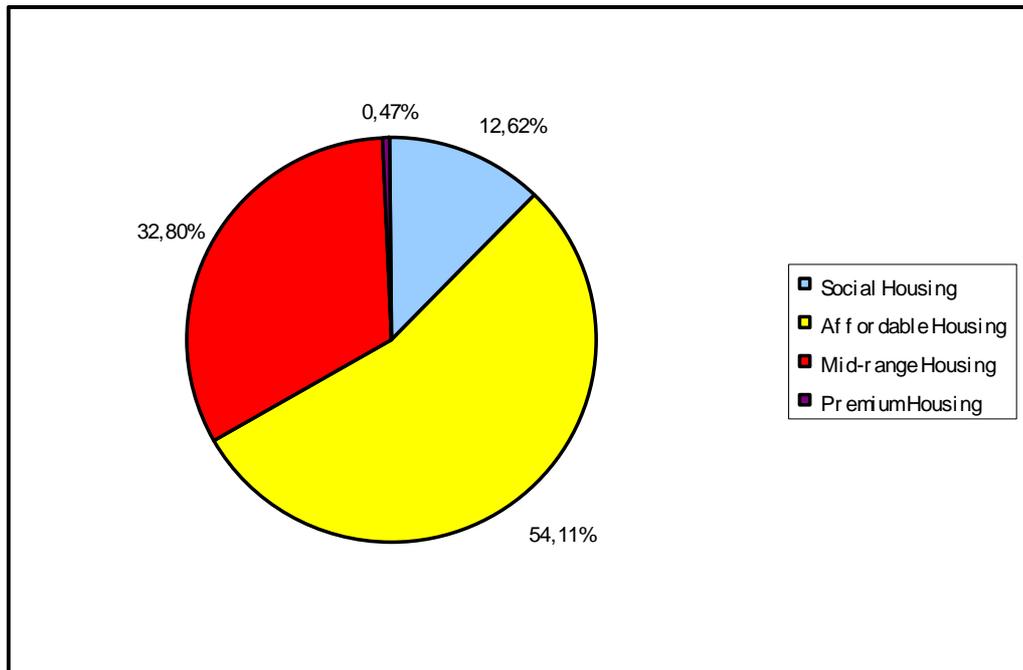
1.8 Classification of New Dwellings

Demand for new dwellings was classified according with income level and with the type of financing (please see housing finance in Chapter 5) into four categories:

- **Social Housing : 43,436 DU (12.62% of new demand)**
For households below the poverty line, earning less than RWF 35,500 per month (USD 59 per month). This type of demand will be attended by the government through a subsidy system.
- **Affordable Housing: 186,163 DU (54.11% of new demand)**
This is demand from households earning up to 200,000 RWF per month (USD 329 per month). It is the largest segment of the market. Households have some payment capacity and could access a special rental market which may include, for instance, leasing or rent-to-own mechanisms.
- **Mid-range Housing: 112, 867 DU (32.80% of new demand)**
This subcategory includes a wide variety of income segments from approximately USD 400 per month up to 2,500,000 RWF per month (USD 4,111 per month). It is the second largest segment and most of it would be eligible for traditional mortgage financing.
- **Premium Housing: 1,601 DU (0.47% of new demand)**
This is housing demand for the highest income segments of Kigali, in Q4 and Q5.

Exhibit 32a: Classification Demand of New Dwellings

	New Dwellings (including backlog) to be built 2012-22	DU	%
	Social Housing	43.436	12,62%
	Affordable Housing	186.163	54,11%
	Mid-range Housing	112.867	32,80%
	Premium Housing	1.601	0,47%
		344.068	100,00%



2. HOUSING SUPPLY

UN Habitat in its guide for preparation of City Housing Profiles indicates that “by widening housing choices and enabling the provision of housing opportunities at appropriate scale, affordable price, with sufficient diversity of size, price and typology, and at suitable locations vis-à-vis access to employment and income generation, housing will directly impact the future of cities. It also directly influences the ecological and economic footprint of cities and their overall sustainability. ***The scale of housing supply is considered fundamental as it impacts on housing prices and overall housing market performance and thus likely to increase choices and broaden affordability.*** If housing supply is sufficient, it can also act as an alternative to slum formation and as a viable alternative to informal land and housing developments. However, the debate is not only framed by issues around quantity but also quality – the socio-cultural aspects of housing supply are important insofar that they meet people’s needs for not only a roof above their heads but an improved quality of life. In this way, therefore, enabling the housing sector to work will impact directly on urban sustainability and social equity.”¹³

Field observations made during preparation of this study and comments obtained during interviews with stakeholders hint at the importance of the challenge that will represent for the City of Kigali to build 344,068 DU in 2012-2022.

The supply of housing supply, through formal mechanisms, will determine the future of Kigali either as an example to be imitated – as an engine of economic activity and improving quality of life -- or as a city overwhelmed by rural immigration and negative externalities, such as environmental decay, crime and social tensions.

Therefore, housing supply calls for careful attention and consideration of the City of Kigali and stakeholders.

Housing supply investment required from 2012 to 2022 reaches Rwf 1,618 Billion, equivalent to USD 2.6 billion (see Chapter 5).

To provide perspective on this numbers, it is necessary to consider that annual GDP in Rwanda is about USD 4.23 billion¹⁴ at constant 2006 prices (or about USD 6 billion in current prices). This means that, if housing investment is done through the formal sector and with the quality requirements proposed in this study, Kigali would have to invest the equivalent of 4.5% of the annual national GDP in housing. This number does not include expenses in infrastructure for utilities and investment related to increased production or import of building materials, which estimation is beyond the scope of this analysis.

On the other hand, supply investment will create an important socio-economic impact on Kigali, through the generation of employment, taxes and through the

¹³ A Practical Guide for Conducting Housing Profiles, UN Habitat, 2010

¹⁴ Source : Rwanda National Bank, Annual Report 2011 (NISR data)
CHAPTER 1 – DEMAND AND SUPPLY STUDY – FINAL REPORT
HOUSING MARKET DEMAND, HOUSING FINANCE, AND
HOUSING PREFERENCES FOR THE CITY OF KIGALI
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overall multiplier effect on the city's economy. According with our own calculation, housing development could generate up to 60,000 employment post in Kigali in the next years:

- 30, 000 DU/year divided by 3 building shifts/year = 10,000 DU per shift x 5 workers/DU = 50,000 workers;
- Assuming 0,2 indirect employment (i.e. services, administration), then 50,000 x 0,2 = 10,000;
- 50,000 workers + 10,000 indirect employment = 60,000 jobs/year.

2.1 Current Housing Supply in Kigali

2.1.1 Formal and Informal Market

A. Definition of Housing Market Sectors

The housing market is divided into four basic sectors according with the legal status and the origination of the dwelling unit:

Legal Status

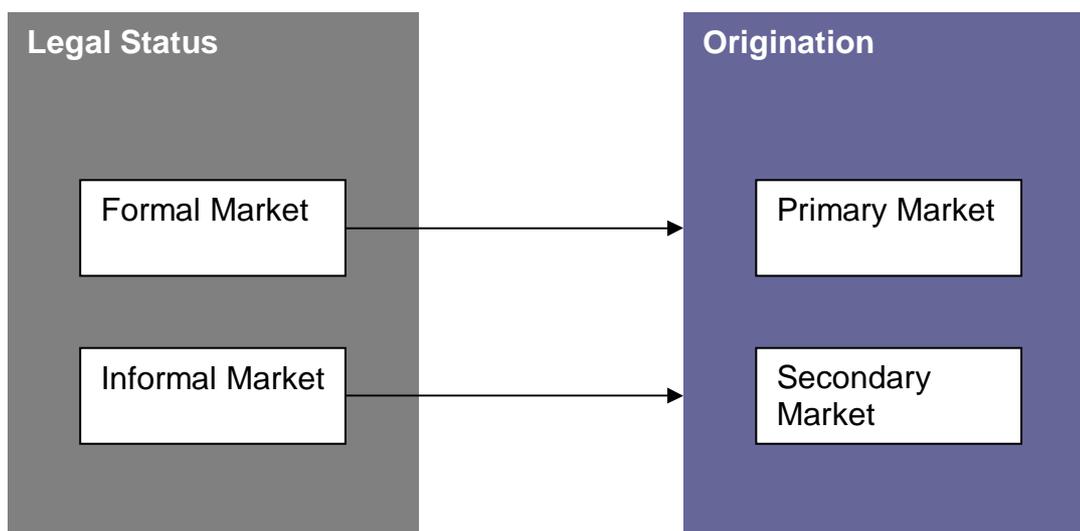
The **formal** market includes housing that is legally occupied; built and maintained in accordance with prevailing laws; complies with requirements for access to land; and has clear and transferable title (was purchased and can be conveyed legally). The formal housing market is defined primarily by the "legality" of the transactions that define the development, construction, sale and purchase, occupation and transference of the housing real estate. Insofar as the property is unencumbered during each phase of its existence, it presents, at each stage, an asset with a clear title. This enables a legally enforceable, contractually based housing market to develop, in which buyers and sellers have clear ownership of the property. The **informal** market, on the other hand, is that which does not comply with legal regulation, building standards or transferable property title.

Origination

The **primary** market is that formed by newly built dwelling units ready for first occupancy. The **secondary** market is formed by all dwelling units sold after first occupancy. Primary and secondary market analysis in Kigali is beyond the scope of this study.

This section will address only the market according to legal status (formal and informal) given the difficulty to assess the characteristics of primary and secondary markets in Kigali.

Exhibit 33: Market Sectors by Legal Status and Origination



B. Estimating the Size of Formal and Informal Market in Kigali

According with the *Qualitative Assessment of the Housing Sector* prepared by the World Bank in 2011, only around 20% of existing housing stock in the city could be considered as formal. The remaining 80% is informal housing occupying up to 62% of the city's land area. This estimation is further supported by the *Kigali City Conceptual Master Plan (2009)*, which says that up to 83% of the city's population is housed by the informal sector, including all economic segments of the population, from lower to higher income households.

Most of housing in the informal sector are single-storey units built with traditional local materials, such as non-stabilized mud bricks and metal roofing. However, the informal sector includes a wide spectrum of typology, a good percentage of which is in reasonable good quality and others which closely resemble slum housing in other developing countries¹⁵

EICV3, on the other hand, indicates that 62.60% of the housing stock could be considered as informal (see table 3.1.2 in EICV3).

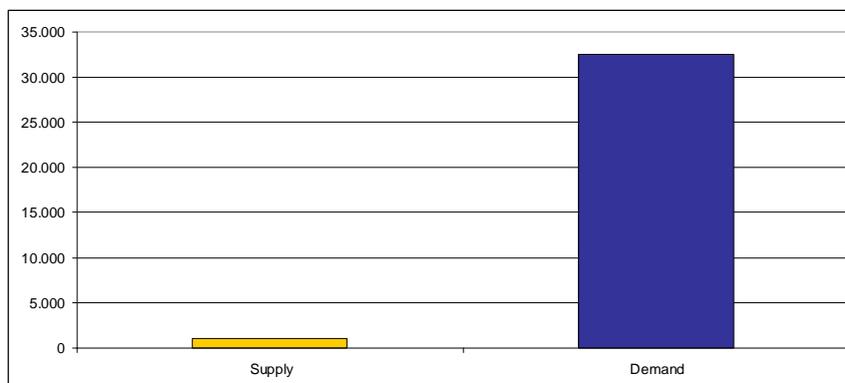
2.1.2 Volume of Supply in the Formal Market

Annual volume of supply in the formal market in Kigali ranges from 800 to 1,000 DU per year, and is concentrated in the upper income segments (Q4

¹⁵ World Bank Qualitative Assessment of the Housing Sector in Rwanda, 2011
CHAPTER 1 – DEMAND AND SUPPLY STUDY – FINAL REPORT
 HOUSING MARKET DEMAND, HOUSING FINANCE, AND
 HOUSING PREFERENCES FOR THE CITY OF KIGALI
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and Q5). The rest of the market is, for practical purposes, unattended by formal supply.

Exhibit 34: Formal Supply and Total Demand



Volume of formal supply was deduced by analysing information collected in the *Assessment of Affordable Housing through Real Estate Development*, prepared by the Rwanda Housing Authority, Ministry of Infrastructure in 2012, which includes a list of real estate projects in the city of Kigali. This information was completed and validated through interviews with key developers and professionals active in the real estate market in Kigali.

The information above was compared with construction permit's data bases from the One-Stop Centre (OSC) of the City of Kigali (2010-2012) and those from Gasabo and Kicukiro districts. The data base from One-Stop Centre contains updated information about larger housing project developments (detached dwellings and apartments). The district's data bases contain information about permits for individual dwellings. The following table provides a summary of information contained in OSC data base:

Exhibit 35: Summary of OSC Data Base about Housing Developments (2010-2012)

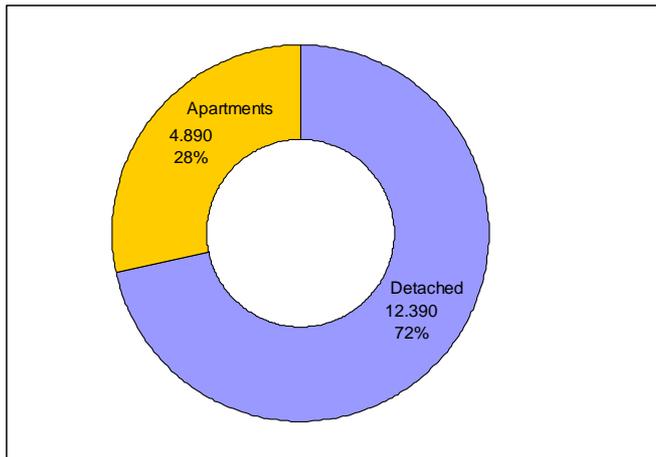
	2010/2011	2012 (May)	Total	Monthly Average
N° of Permits	56	19	75	4
Apartments	18	6	24	1
Detached Dwellings	38	13	51	3
Estimated Number of Dwellings	680	621	1,301	72
Annual Average Number of Dwellings				867

Exhibit 35, above, shows that between 2010 and May 2012, OSC granted 1,301 permits for housing developments, of which 47% correspond to apartments and the rest are detached units. Estimated average number of dwellings in the period is 867 annually.

In Exhibit 38, which summarizes the RHA survey of housing developments in the city of Kigali and data collected with developers, it is estimated that,

between 2013 and 2018 17,280 DU, an average of 1,234 DU per year, will be supplied into the formal housing of Kigali, of which 28% are apartments and the rest are detached units, as illustrated by the graph below. Notice that the overall percentage of apartments is lower than what is indicated by OSC data base. This could be due to the fact that RHA survey contains projects that are still in the planning stage.

Exhibit 36: Typology of Supply in the Formal Market in Kigali



The same data in exhibit 38, indicates that RSSB will remain the main supplier of housing in the formal market, with an estimated participation of 95% of formal supply¹⁶, if projects in the planning stage are actually executed and if there would be no new entrants in the market.

It is important to signal that ongoing and planned projects concentrate on units costing USD 25,000 (equivalent to about RWF 15,000,000) and more, addressing demand in Q3 and Q4 and Q5 (see exhibit 37).

¹⁶ Based on information provided by RSSB and own estimations about unit size and number.

In Q1 and Q2, formal supply has not been very significant. However, there are some interesting examples in this segment, such as the Batsinda Housing project, which includes a 250 DU pilot project developed by the City of Kigali in the Gasabo district, on a site of about 154 Ha, 15 minutes away from the city center (according with the City's official website).

Units built cost USD 10,000 and are built with stabilized earth bricks produced on site (to decrease costs) and metal roofing.



Typical housing unit in Batsinda

However, apart from 20,404 DU planned by MINELOC in Imidugudu projects¹⁷, future supply in Q1 and Q2 is basically unattended by the formal market.

¹⁷ The consultant was unable to obtain further details about MINELOC's Imidugudu projects. The exact number of units, production schedule and unit characteristics have to be confirmed with MINELOC.

Exhibit 37: Formal Supply Gap

Projected Structure of Supply under Current Conditions 2012-2022		
	Formal Supply	Formal Supply Gap
Q3+Q4+Q5	17.280	11.685
Q1 + Q2	20.404	294.699
	37.684	306.384
Totals	344.068	

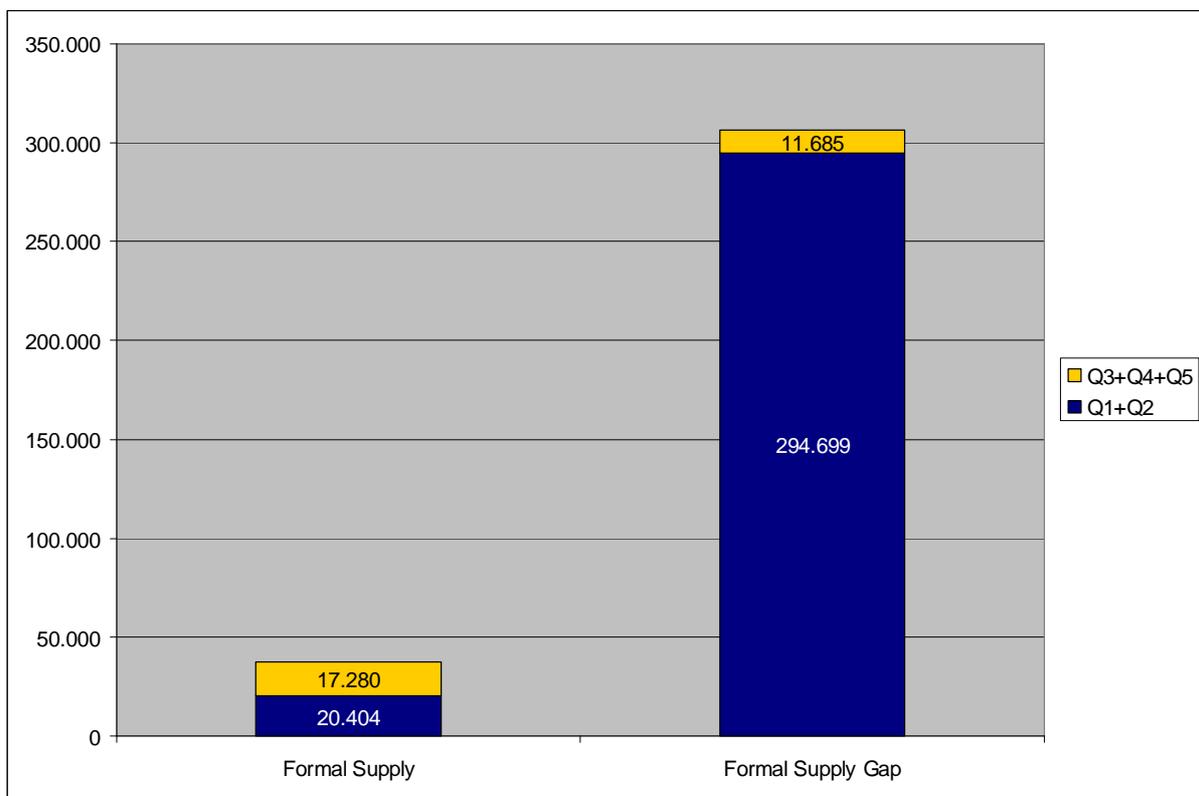


Exhibit 38:
Summary Analysis of RHA Survey of Housing Projects in Kigali and Developer Data

Exchange rate USD/RwF

608,27

	Developer	Location/Project Name	Unit Cost (USD)	Typology	Stage	N° DU	Detached	Apartments	Estimated Investment (USD)
1	RSSB	Gaculiro	45.000	Detached Dwelling	Completed	300	300		13.500.000
2	RSSB	Kacyiro (3)	50.000	Apartment rental	Completed	50		50	2.500.000
3	Real Contractors	Kagugu	160.000	Detached Dwelling	Completed	21	21		3.360.000
4	Real Contractors	Nyaraturama	145.000	Detached Dwelling	Completed	18	18		2.610.000
5	Kigali Top Mountain	Gaculiro	100.000	Detached Dwelling (4)	Completed	65	65		6.500.000
6	DN International	Masaka	90.000	Detached Dwelling (4)	Completed	28	28		2.520.000
7	Global Village Investments	Kagugu	175.000	Detached Dwelling (4)	Completed	6	6		1.050.000
8	Goboka Cooperative	Gacuriro	46.000	Detached Dwelling (4)	Completed	150	150		6.900.000
				Subtotal	2004-2008 (4)	638	588	50	38.940.000
								Estimated Investment	31.152.000
9	Rwanda Housing Bank	Kagugu	90.000	Detached Dwelling	Ongoing	250	250		22.500.000
10	Rwanda Housing Bank	Kimisange	n.a.	Serviced plots of 15m ²	Ongoing	n.a.			
11	Real Contractors	Rusororo	140.000	Detached Dwelling	Ongoing	500	500		70.000.000
12	Kigali Top Mountain	Gaculiro	180.000	Detached Dwelling (4)	Ongoing	60	60		10.800.000
13	DN International	Rusororo	150.000	Detached Dwelling (4)	Ongoing	150	150		22.500.000
14	Ujenge Rwanda Ltd 2011	Kagugu	46.000	Detached Dwelling (4)	Ongoing	170	170		7.820.000
15	Gate Hill Estate	Kanombe	76.000	Detached Dwelling (4)	Ongoing	100	100		7.600.000
16	COHAKI (Housing Cooperative)	Kinyinya	46.000	Detached Dwelling (4)	Ongoing	200	200		9.200.000
17	CODENYA (Housing Coop.)	Nyamirambo	59.000	Apartments	Ongoing	218	218	218	12.862.000
				Subtotal	2008 -Present (4)	1.648	1.648	218	163.282.000
								Estimated Investment	130.625.600
18	RSSB	Vision City	50.000	Detached Dwelling + Apartments	Planning	3.000	2.100	900	150.000.000
19	RSSB	Kinyinya (1)	25.000	Detached Dwelling + Apartments	Planning	6.000	4.200	1.800	150.000.000
20	RSSB	Batsinda (2)	20.000	Detached Dwelling + Apartments	Planning	7.000	4.900	2.100	140.000.000
21	Real Contractors	Kinyinya	n.a.	Detached Dwelling	Planning	300	300		
22	Real Contractors	Kiyovu	200.000	two storey apartment buildings	Planning	n.a.			
23	Real Contractors	Kagarama	n.a.	5 storey apartment	Planning	n.a.			
24	Bond Trading	Kagugu	n.a.	Apartments	Planning	54	54	54	
25	DN International	Gisozi	60.000	Detached Dwelling (4)	Planning	800	800		48.000.000
26	Olive Properties	Gaculiro	n.a.	Apartments	Planning	36	36	36	
				Subtotal	2013-2018 (4)	17.280	12.390	4.890	488.000.000
					Average	1.234	14.626	5.158	390.400.000
							72%	28%	552.177.600
							RSSB	16.350	
								95%	

n.a. = not available

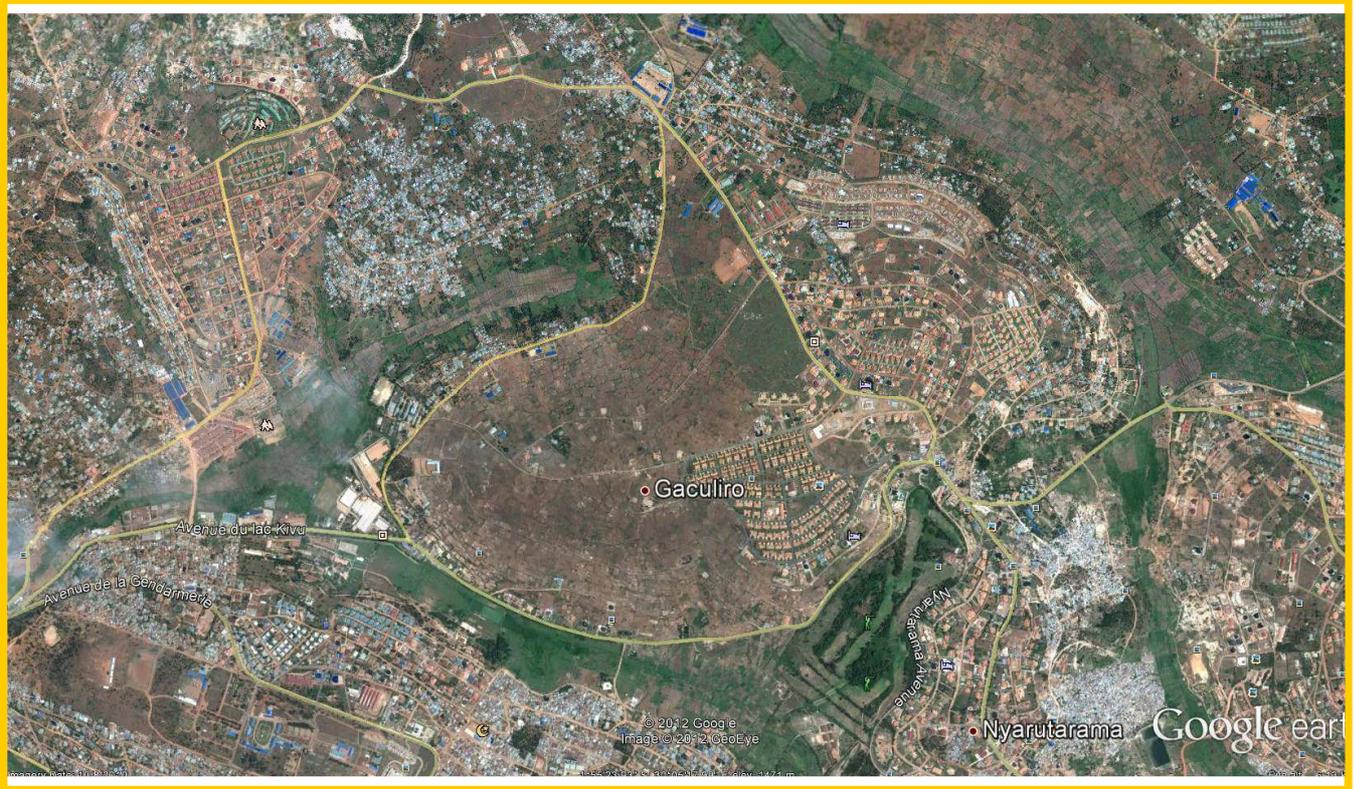
(1) 100 Ha. Middle to Low cost. Estimated: 6.000 DU. Estimated price: USD 25,000/DU

(2) 100 Ha. Low cost. Estimated: 7.000 DU. Estimated price: USD 20,000/DU

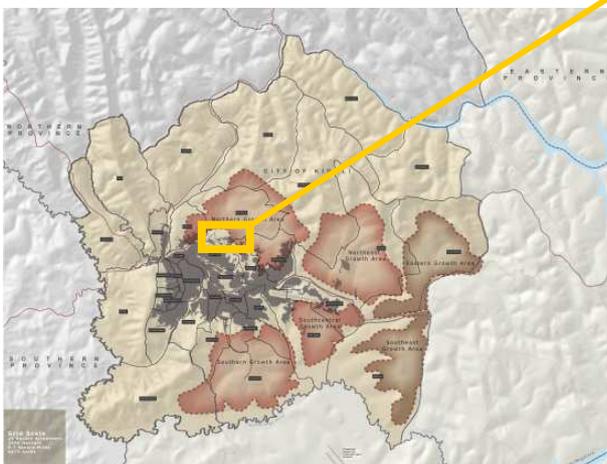
(3) Estimated cost

(4) Estimated

Exhibit 39: Formal Supply in the Northern Growth Area of Kigali



Kigali Conceptual Master Plan
Growth Areas



The pictures in the previous page show an area of great development in Gaculiro, in Kigali's northern section, where RSSB has already developed 300 detached dwellings priced at USD 45,000 to USD 55,000. That project is completed and inhabited. Next to it, there is a large plot of about 120 Ha, where RSSB plans to develop 2,600 apartments and detached units, priced at between USD 60,000 and 160,000. This project, known as *Vision City* is still in its planning phase and it is by far the largest project of its kind in Kigali today. The land where this project is going to be built was occupied by a low-cost informal settlement that was relocated.

In this same area, there are other completed projects, such as Top Mountain (65 detached units priced between USD 100,000 and 180,000) and an apartment project from Olive Properties in the planning phase (price not yet determined). Also, there is a completed project by Goboka Cooperative (150 detached units) priced at USD 46,000 per unit.

It could be said that this section of the city concentrates a good portion of current formal housing supply. Also, the area contains at least 4 large plots of land, of similar size of that of Vision City, which may be subject to development once RSSB project is under way.

2.1.3 Volume of Supply in the Informal Market

If the formal market supplies around 1,000 DU per year, and the city demands around 31,000 DU per year, therefore, around 30,000 DU must be supplied through the informal market. However, not all housing demand should be transferred into new DU. For instance; a poor land owner could add one or two additional rental rooms to his property, thereby generating two new "housing solutions". For the purpose of this calculation, it will be estimated that only 80% of informal supply generates complete new DU, which is equivalent to 25,000 new DU produced by the informal sector every year. The remaining 5,000 DU, if unattended by the formal market, will increase backlog demand.

2.2 Increasing Housing Supply

As show in the previous numeral, the formal supply of housing in Kigali is between 800 to 1000 DU per year. Annual demand in Kigali is about 31,000 DU¹⁸. This means that the formal market is barely able to meet about 3% of annual demand and is mostly concentrated in the higher income quintiles.

Even though housing demand in Kigali is strong, the market has not responded with proportional supply. It is, therefore, very pertinent to posse the following question:

Why has the housing market in Kigali not responded to demand with proportional supply?

A possible answer to this question is that, in fact, ***the housing market in Kigali is at a very early stage of development and needs to be nurtured*** in order to yield the results expected in terms of housing supply. Early stage development of the housing market may be caused by political and economic priorities and prevalence of poverty amongst most of the city's population .

Market nurturing is one of the roles of the state. Hence, the City of Kigali -- in coordination with RHA and other relevant Government stakeholders, and also in coordination with the Private Sector and the Community -- must undertake the necessary actions to increase housing supply.

The first action needed to foster housing supply is to identify what the barriers to supply are. The World Bank's *Qualitative Assessment of the Housing Sector* indicates in its recommendations (see chapter 3 of the assessment) that there are two main supply barriers:

- ***High cost of inputs***

To eliminate or reduce this barrier to supply, the World Bank's study suggests the following actions:

- To reduce the cost of construction by using "green" technologies and by improving existing local technology¹⁹,
- To reduce cost of construction by adopting a low-rise and high density housing typology,
- To encourage incremental improvement of existing housing stock,
- To adapt Master Plan standards so that they allow gradual development.

¹⁸ Demand for 10-year period. See table 29

¹⁹ improved production One example is the use of clay bricks.

- **High cost and scarcity of housing finance**

To increase access to housing finance, the World Bank's Study suggest the following actions:

- To reduce the net rate of interest and increase the maturity term of mortgage loans,
- To increase the use of microfinance, especially for self-built or self-improved dwellings,
- To increase construction loans.

However, this study considers that there are at least six additional factors that should be taken into account to allow increases to housing supply in Kigali:

- **Policies, regulations and institutions**

- Clear policies and regulations, including specific housing production and cost targets should be adopted in order to provide **guidance to the market**. A clearly defined **housing plan** has to be designed, including priorities, schedules and responsibilities for both the public and private sectors. Regulations have to be formulated, including specific building codes, housing typologies, building technologies and materials and contractors, especially for affordable housing.
- A **coordinating structure** in charge of implementing the housing plan has to be set up. This structure will be also responsible of coordinating the different stakeholders in the market and to provide **direction** to housing production process and **monitor** demand and supply.

- **Urban land for residential use**

- The City of Kigali needs to adopt policies that will ensure availability of land for housing, at reasonable cost. The price of land in Kigali is increasing very fast and controls need to be put in place, at least for land for affordable housing.

Following, estimation is presented about land requirements, based on the proposed housing typology (please see following exhibit and chapter 2):

Exhibit 40: Residential Land Requirements 2010-2022

Type	Cost		Description	Units	m ² /Unit	Net Residential Land	
	RwF	USD				Total m ²	Total Ha
A1	2.320.781	3.815	Low-rise Row House	229.599	90	20.663.910	2.066
B1	4.292.407	7.057	Low-rise Row House	39.266	45	1.766.950	177
B2	7.886.502	12.965	High-rise Row House	37.013	45	1.665.592	167
B3	11.829.753	19.448	High-rise Row House	16.261	45	731.724	73
B4	15.773.004	25.931	High-rise Row House	13.359	45	601.165	60
C1	34.913.889	57.399	Appartment	3.669	22,5	82.550	8
C2	46.551.852	76.532	Appartment	3.300	22,5	74.251	7
C3	69.827.778	114.797	Appartment	1.601	22,5	36.032	4
Total						344.068	25.622.174

According with the Kigali City Conceptual Master Plan (KCMP), available land for the city's growth is 35,590 Ha (see exhibit 41, following).

Exhibit 41: KCMP Estimation of Available Land for Growth in Kigali

District	Sector	Hectares	Urban Area	Natural Constraints	Growth Potential(Ha)	Growth Potential(%)	Notes
Gasabo	BUMBOGO	6,019	0.3%	48.65%	3,075	51.1%	high growth potential
	GATSATA	603	26.7%	69.05%	25	0%	
	GIKOMERO	3,487	0.0%	53.25%	1,630	47%	
	GISOZI	850	17.2%	40.20%	362	42.6%	
	JABANA	3,651	2.7%	57.57%	1,452	40%	
	JALI	3,758	1.0%	68.93%	1,131	30%	
	KACYIRU	582	70.9%	23.39%	33	6%	
	KIMIHURURA	489	60.2%	10.61%	143	29%	
	KIMIRONKO	1,146	44.0%	2.37%	614	53.6%	
	KINYINYA	2,464	7.3%	19.62%	1,800	73.1%	
	NDERA	5,026	2.2%	37.02%	3,055	60.8%	high growth potential
	NDUBA	4,681	0.0%	64.28%	1,671	35.7%	
	REMERA	704	63.1%	0.32%	258	36.6%	
	RUSORORO	5,256	2.4%	39.59%	3,051	58.0%	high growth potential
RUTUNGA	4,286	0.2%	66.14%	1,443	34%		
Subtotal	43,002	5.5%	36.09%	25,122	58.4%		
Kicukiro	GAHANGA	3,669	0.8%	45.64%	1,966	53.6%	
	GATENGA	1,133	16.8%	29.82%	605	53.4%	
	GIKONDO	352	74.0%	35.41%	0	0%	33 Ha targeted for redevelopment
	KAGARAMA	968	18.9%	26.67%	527	54.4%	
	KANOMBE	2,460	11.4%	46.57%	1,035	42.1%	
	KICUKIRO	213	93.6%	1.99%	9	4%	
	KIGARAMA	778	25.8%	31.53%	332	43%	
	MASAKA	5,240	3.4%	54.16%	2,221	42.4%	high growth potential
	NIBOYE	504	63.9%	11.67%	123	24%	
	NYARUGUNGA	1,384	26.7%	30.39%	594	42.9%	
Subtotal	16,702	13.3%	42.56%	7,379	44.2%		
Nyarugenge	GITEGA	117	100.0%	45.55%	0	0%	53 Ha targeted for redevelopment
	KANYINYA	2,465	0.4%	77.74%	538	22%	
	KIGALI	3,031	1.1%	71.54%	828	27%	
	KIMISAGARA	320	61.0%	51.78%	0	0%	
	MAGERAGERE	5,502	0.4%	69.57%	1,655	30.1%	
	MUHIMA	292	85.7%	45.94%	0	0%	92 Ha targeted for redevelopment
	NYAKABANDA	240	65.4%	32.78%	4	2%	
	NYAMIRAMBO	895	34.7%	33.71%	283	32%	
	NYARUGENGE	456	90.9%	16.19%	0	0%	32 Ha targeted for redevelopment
	RWEZAMENYO	103	100.0%	0.70%	0	0%	
Subtotal	13,423	12.0%	64.97%	3,089	23.0%		
TOTAL	73,128	8.5%	42.87%	35,590	48.7%		

Source: Kigali Conceptual Master Plan, chapter 3, exhibit 3.7a

- **Utility Infrastructure**

Supplying 344,068 new DU in the next years requires a **proportional effort in the building of utility infrastructure**. Dwelling units need to be connected to utility networks in order to function properly and offer an adequate quality of living. A brief calculation, shown in exhibit 47, illustrates utility infrastructure needs in Kigali for 2012-2022:

- **Water**
Every year, water supply in Kigali will have to be increased in 29,598 m³/day.
- **Electricity**
Additional capacity for 123 Mwh will have to be installed every year.
- **Liquid Waste**
Additional 22,199 m³ of liquid waste will have to be treated (and if possible recycled) every day (on average).
- **Solid Waste**
Every year, new dwelling units in Kigali will increase by 67 tons/day solid waste produced in the City. This waste has to be collected, sorted and recycled.
- **Streets**
1,480 m² of street have to be built daily over the next 10 years.
- **Transport**
Kigali has to set in place a transport system capable of carrying an additional 177,588 trips per day (on average), over the next 10 years.

Exhibit 42:
Basic Utility Infrastructure Requirements per Year (2012-2022)

Utility	Average N° of New DU per year	Requirements per DU/year	Unit	Total Requirement per year	Unit	Total Requirement per Day	Unit
Water Supply (1)	31.279	180	m ³	5.630.201	m ³	15.639	m ³
Electricity (2)	31.279	1.000	Kwh	31.279	Mwh	87	Mwh
Liquid Waste (3)	31.279	135	m ³	4.222.651	m ³	11.730	m ³
Solid Waste (4)	31.279	810	kg	25.335.904	kg	70	Ton
Streets (5)	31.279	18	m ²	563.020	m ²	1.564	m ²
Transport (6)	31.279	2.160	trips	67.562.410	trips	187.673	trips

(1) Assuming 0.5m³/DU/day

(2) Average demand is estimated as 1/3 of European Consumption

(3) Assuming that 75% of used water converts into liquid waste

(4) 0,5 Kg/person/day. Source: USAID

(5) Assuming 18 m²/DU

(6) Assuming 6 trips/day/DU

- **Long term funds**

Supply of 344,068 DU in the period under analysis requires availability of long-term funds to allow the financing of credits to end-users, both in the affordable housing and market demand categories. It is estimated that about 2.6 billion USD will be required (this point is discussed in detail in chapter 5).

- **Key Building Materials**

Housing typology proposed for Kigali requires three key building materials for construction. The first one is cement. It is estimated that, for the period 2012-2022, about 200,000 tons of cement will be required. The second material is steel bars. In the same period, about 13,000 tons of steel bars will be required. The third material is metal sheets for roofing (to be used in A1, which account for about 50% of demand). Around 2.2 million m² of metal roofing will be required in the same period.

These are critical materials which will require the increasing of existing production capacity or the setting up of special conditions for import at the lowest possible price. Please see estimation in exhibit 43.

Another important material, not quantified because of local availability is clay soil for stabilized bricks (mostly used in A1, for walls). A detailed account of building materials available in Rwanda is provided in numeral 2 of Annex 1 of this chapter. Current efforts to improve traditional materials should be supported by the city in order to ensure adequate supply of local materials.

Exhibition 43:
Estimation of Key Building Materials Requirements (2012-2022)

TYPOLOGY		A1+A2	B1	B2	B3	B4	C1	C2+C3	TOTAL
SCENARIO 1		HYDRAFORM	HYDRAFORM + HYBRIDE	HYBRIDE	HYBRIDE	HYBRIDE	RCF	RCF	
SCENARIO 2		HYDRAFORM	HYDRAFORM	HYDRAFORM	HYDRAFORM	HYDRAFORM	RCF	RCF	
Unit to be built/11 years (2012-2022)		229.599	39.266	37.013	16.261	13.359	3.669	4.901	
1 year		20.873	3.570	3.365	1.478	1.214	334	446	

CEMENT

SCENARIO 1	Bags/unit	90	104	166	220	256	241	370	
Bags of 50 kg	Total/year	1.997.775	360.863	533.786	334.550	325.144	133.546	95.571	
Tons	Total/year	99.889	18.043	26.689	16.727	16.257	6.677	4.779	189.062
SCENARIO 2	Bags/unit	90	119	209	231	275	241	370	
Bags of 50 kg	Total/year	1.997.775	412.190	670.896	351.616	348.817	133.546	95.571	
Tons	Total/year	99.889	20.610	33.545	17.581	17.441	6.677	4.779	200.521

STEEL BAR

SCENARIO 1	Tons/unit	0,06	0,23	1,38	1,70	1,80	2,14	3,20	
SCENARIO 2	Tons/unit	0,06	0,23	1,30	1,58	1,68	2,05	3,11	
SCENARIO 1	Total/year	1.382,54	787,99	4.428,71	2.586,70	2.288,82	1.185,83	828,22	13.488,81
SCENARIO 2	Total/year	1.382,54	787,99	4.179,42	2.401,24	2.140,86	1.135,47	804,73	12.832,25

SHEETS

SCENARIO 1 AND 2	m2/unit	78,30	100,58	0,00	39,15	78,30	0,00	78,99	
SCENARIO 1 AND 2	Total/year	1.743.206,94	349.744,07	0,00	59.594,22	99.495,25	0,00	20.419,81	2.272.460,30

- **Construction Industry**

The construction industry will become the main executor of housing construction in Kigali. To that end, the city, in coordination with Workforce Development, must promote qualification of labor to achieve the quality results. Current efforts to codify the practice of professionals in the construction industry must be supported by the city. Close collaboration with technical schools to ensure proper supply of qualified labour is necessary. For the latter, it is estimated that around 50.000²⁰ labourers will be needed.

Furthermore, the construction industry should increase its execution capacity in order to deliver around 17 million m² of residential building. The table below shows the volume of building required (in m²) in the period under analysis.

Exhibit 44: Supply Requirements per Housing Typology and Total Surface (in m²)

SUMMARY OF COSTS AND QUANTITIES										
Type	Quintile	Cost		Description	Technology	Surface		DU to be Built 2012-2022		m ² building
		RwF	USD			Land	Building	Subtotal	Total	
A	Q1	2.320.781	3.815	Row House	Temporary	90	45	229.599	229.599	10.331.955
B1	Q1	4.292.407	7.057	Row House	Temporary and Hybrid	45	56,25	39.266	39.266	2.208.687
B2	Q2	7.886.502	12.965	Row House	Hybrid	45	45	37.013	37.013	1.665.592
B3	Q2	11.829.753	19.448	Row House	Hybrid	45	67,5	9.225	16.261	1.097.586
	Q3			Row House	Hybrid	45	67,5	7.035		
B4	Q3	15.773.004	25.931	Row House	Hybrid	22,5	90	8.774	13.359	1.202.331
	Q4			Row House	Hybrid	22,5	90	4.585		
C1	Q4	34.913.889	57.399	Appartment	RCF	22,5	67,5	3.669	3.669	247.650
C2	Q5	46.551.852	76.532	Appartment	RCF	22,5	90	3.300	3.300	297.006
C3	Q5	69.827.778	114.797	Appartment	RCF	22,5	135	1.601	1.601	216.190
								Total	344.068	17.266.997

A detailed account of the construction industry in Rwanda is provided in numeral 1 of Annex 1 in this document.

²⁰ 29,500 DU/year; estimated building time per DU = 4 months; labourers per unit = 5; total = 49,166 labourers.

ANNEXES

Annex 1 – The Construction Industry in Rwanda

Annex 1 – THE BUILDING INDUSTRY IN RWANDA

(Prepared by: Eng. Alexandre Ndahumba)

1. ORGANIZATION OF THE BUILDING INDUSTRY

Rwanda has embarked on a reconstruction and development process where the construction will lay a central role. Construction of infrastructure, housing, community facilities, schools, hospitals and factories is the basis upon which economic growth and social progress efforts rest. From the organizational point of view the building industry in Rwanda is strongly marked by a large number of companies and a multiplicity of agents involved in the production processes.

1.1 ENTREPRISES

1.1.1 Segmentation of production apparatus.

Construction firms substantially differ with regard to scale, organization, funding, and availability of resources. The lack of official categorization of companies raises issues about the control and guarantee of quality execution of different types of construction works.

In 2010, there were 330 building companies registered as members of the Association of the AEBTP “association of building and public works contractors” at national level (*Source: Permanent Secretariat of AEBTP*). This Association does not have enough data to give accurate information on available financial, technical, and administrative capacities of its members. For instance, figures alleging that its staff amounts to as many as 330 were contradicted by the last census of commercial establishments conducted by the national statistical service which found only 107 operational building companies in 2011, meaning that the remaining 223 are very small, have closed or operate informally. The same document gives us relevant information on the state of national building industry which we have summarized in the following tables:

Table 1: Percentage of the number of building companies out of the total of number of commercial establishments

KIGALI CITY	SOUTHERN	WESTERN	NORTHERN	EASTERN	TOTAL
0.3	0.0	0.0	0.0	0.0	0.1

Table 2: Distribution of firms per capital

RANGE	VALUE OF CAPITAL EMPLOYED IN MILLION Rwf						
	LESS THAN 0.5	0.5-15	15-75	75+	N/A	N/S	TOTAL
TOTAL	8	42	27	22	0	8	107

Table 3: Distribution of building companies by nationality

<i>Nationality</i>	<i>Rwandan</i>	<i>EAC</i>	<i>Other countries</i>	<i>Joint Rwanda-EAC</i>	<i>Joint Rwandan and Other Countries</i>	<i>Not specified</i>
89	6	8	1	1	1	2

Out of 107 companies, 88 are registered with Rwanda Social Security Board, 95 with Rwanda Revenue Authority, 85 with Rwanda Development Board, 56 with the Private Sector Federation.

1.1.2 Human and technical supervision of building companies

Supervision of various companies varies just as companies themselves, if we consider the staff, the area of farm buildings, technical equipment including construction equipment and rolling stock, capital, administrative management

Clearly the nature of projects a company performs is determined by its resources and vice versa. In general, it is said that companies may be relatively specialized regarding their scope and types of projects they perform and on the other hand, available resources can be varied and of distinct origins.

In the Rwandan context, this observation may be justified in relation to the operation of large companies that specialize in the field of public works. It should be noted that small business owners in Rwanda perform work in the entire country, given that competition between different companies in this group is very strong and on the other hand, their resources can be varied and of distinct origins.

The fact that coaching staff determines the ability to handle large sites or different sites simultaneously applies primarily to construction equipment and to a lesser extent to the rolling stock (rolling stock is relatively easy for rent). Since there are no business categories in Rwanda, the medium-sized enterprises engage both in public and in private works. They are generally favored over larger companies because they are less expensive, but this often results in them getting work beyond their capacity

Businesses, especially medium-scale and large ones often employ one to three engineers. Directors are normally experienced engineers who have gained exposure locally or abroad. Ongoing monitoring of projects is ensured through a foreman.

Table 4: Distribution of firms by number of employees

<i>Designation</i>	<i>STAFF</i>				
Portion	1	2- 4	5-9	10+	Total
Number of firms	15	31	19	42	107

Table 5: Distribution of staff employed in building sector per level of training and by nationality

<i>Qualification</i>	<i>Rwandan</i>	<i>Non Rwandans</i>	<i>Total</i>
Unqualified	195	0	195
Primary school	3667	4	3671
Secondary school	889	9	898
University studies	537	296	833
<i>Total</i>	<i>5288</i>	<i>309</i>	<i>5597</i>

In several instances contractors have their own consulting firm (including engineers, conductors, designers) responsible among other things for stability calculations, development of implementation plans and site monitoring.

This combination of tasks of professional engineers is fairly common in Rwanda. Large companies working in the sector of public works (foreign offices and some large Rwandan companies which, for fifteen years, have engaged in this market) all prefer to manage an overall market with a minimal input from subcontractors, but are most of the times forced to hire electricians and plumbers because these specialized tasks do not emerge from their building sites. This combination of entrepreneurial tasks does exist and is fairly common in Rwanda.

Therefore large companies, as well as medium scale ones, often have a metal building workshop and a carpentry etc. To reduce and stabilize unit prices and strengthen their position vis-à-vis competitors, these companies make handcrafted metal frames, wood framing and other materials or construction components which vary in quality.

The skilled labor has a satisfactory qualification. Besides formal training in training centers, part of this skilled manpower has formed on the ground. The last form of training is considered very important. Nevertheless, the company does not always have the technical competence necessary to ensure proper performance, and quality of skilled labor and foreman reflect the overall quality of the company.

In this context it is also important to mention that most contractors are hesitant when it comes to undertake projects that require the application of appropriate construction techniques for the use of local materials (for instance construction using adobe bricks adobe, coatings, use of new binders, p. ex. pozzolana, lime, etc.).

1.1.3 Bidding and Technical documents

Bidding documents sent to contractors normally contain insufficient data. This inevitably results in lower-quality results. Moreover, the limited time that is often allotted for preparatory studies certainly play a role in the quality of work performed. The most common shortcomings are the following:

- Lack of preparatory geotechnical investigation,
- Readability and presentation of plans,

- Lack of detailed execution which, in effect, determines, to a large extent, the quality of execution. Specifications insufficiently detailed with references to some applicable standards,
- A bill of quantities that no longer corresponds to the plans because of program changes just before the tender.

1.1.4 Specifications

The specifications issued to contractors greatly vary in composition and data. Some are too brief; others are not developed at all. They are usually based on a compilation of donor's regulations or that of RPPA modeled on models of large financial institutions (World Bank, African Development Bank). At the level of technical clauses, due to lack of national specifications, local companies mainly refer to the English standard.

Regarding the methods used for structure design, the situation is not clearer. How engineers apply these methods depend on the university where they were educated. This creates so many discrepancies in the records that unification is necessary. As well as the specifications, file plans often suffer from insufficiencies either by their illegibility, or by being incomplete and not giving enough detail e.g. not enough technical details, cuts, etc.

1.1.5 Bill of quantities

The total expenditure mentioned in specifications that relate to the same specific project, can vary from 100 to 200 percent. The causes of this variability are very difficult to identify. Following this analysis, control and comparison of these estimates raises serious problems. Lack of a bid analysis, based on a comprehensive study, however, can be explained by the fact that one does not use systematic methods or types of analyzes.

Below are some elements that might explain the differentiation that characterizes the specifications submitted:

- Frequency of unexpected price fluctuations.
- The heterogeneity of the market for building materials: the price of a building material is influenced by many factors such as quality, size, origin, process or production methods, application and market supply, taxes, fluctuating exchange rates, the international political situation, etc..
- Variety of factors that play a role in the final price of a finite element of a building such as the price of raw materials, construction techniques, workers' performance, the embodiment, and availability of senior staff, etc.
- A relatively diverse interpretations on the part of entrepreneurs in quantities, quality and terms requested (technical) execution.
- It is obvious that speculation plays an important role in the problem of fluctuation of bids: almost all the contract do not contain any form of price revision and the Contractor anticipates and includes it in their initial offering

1.1.6 Execution of construction

A. Project planning

In the same way there is lack of planning when it comes to execution of medium and small-scale projects. Planning has many aspects: implementation planning, planning for the import of materials, planning of supply of materials, execution of construction (e.g. stability calculations), financial planning, and others. All these aspects must be coordinated and integrated in the overall process. Even where there is good planning in place, problems with delays and other difficulties in the planning field are frequent.

B. Supervision of Works

The task of supervising works must be defined carefully and should not be performed in combination with any other work: in many situations the construction supervisor who monitors public works sometimes also acts simultaneously as a representative of the administration, the architect and the client and often causes serious problems in the area of control and quality assurance.

C. Labor

While the building industry is generally known to be an industry workforce, labor in Rwanda is often of rural origin. Workforce gets involved in the building industry by the mechanisms of the rural exodus and the building industry then serves as a springboard to other activity sectors paying a little more money. It is this instability that is the source of high under qualification and the presence of a significant fringe of foreign coaching labor.

Lately, there are improvements thanks to grouping of skilled and unskilled workers into associations, which allowed them to set minimum daily wages. Thus, over the last two years, their daily wage increased from 700 to 2000 Rwf to 2000 to 5000 Rwf

C.1 Day work

There are three forms of day work in Rwanda building industry:

- Public authorities at national, regional and local levels that, from time to time, perform work under their own control with their own services that deal with architectural design, and are responsible for managing the project i.e. the commitment of managers and workforce capacity required, purchase or production of building materials. In other words, clients are their own contractors.
- Faith-based communities which perform most of their construction using day work.
- The work done in the form of community service (Umuganda), may also be considered as day work.

Day work represents only a small percentage of the overall construction market.

Advantages:

- often used for in a short term works with a moderate budget
- the quality of work is quite satisfactory depending on the quality of supervision.

Disadvantages:

- This form can only apply for small public sector projects

C.2 Shift-work

Construction activities are directed by owners themselves who organize the supply of materials and the intervention of jobbers.

This is very common for construction of individual houses. Increasingly, master masons that have received vocational training or acquired professional experience in large companies assume the role of contractor and enter contracts with the owner to assume full responsibility for the execution of works. For this, they hire the necessary labor. The performing team thus formed is not a fixed form and is set up for each new construction, dispersing after the execution of works .

These two work modalities were at times confused in the building industry in Rwanda, especially in urban areas it is no longer possible to speak of self construction strictly speaking but rather of shift-work. Indeed in traditional society and in some rural areas today, building one's own house existed and still exist today where the owner himself, with the help of their wife and / or children build their own house.

2. AVAILABILITY AND COST OF MAIN BUILDING MATERIALS

Natural materials (sand, rubble, wood, etc ...) are available at reasonable distances from construction sites around the country (from 5 km to 20 km) but until now no comprehensive study has been conducted in order to determine the actual volumes and mechanical and chemical specifications of the existing materials stock. Rwanda Housing Authority plans to conduct surveys for this purpose.

As for traditional and industrial materials, many production units are put in place but the percentage of imported materials, especially for finishing materials, remains important.

Generally, natural products and handcrafted products are sold directly by the producer, while locally produced industrial products and imported ones are sold by commercial firms. Prices of imported materials are often cheaper than the local products of the same quality. However, quality varies according to the supplier.

The following table provides an overview of the availability of building materials, their production chains and distribution and their unit prices.

AVAILABILITY OF BUILDING MATERIALS COMMONLY USED IN HOUSING (Current 2012 Prices)

<i>N°</i>	<i>Materials</i>	<i>Nature/ Characteristics</i>	<i>Production</i>	<i>Sale Agency</i>	<i>Units</i>	<i>Production Capacity</i>	<i>Unit Costs (RWF x 000)</i>	<i>Comments</i>	<i>Future Availability</i>
1	Water	Tap	EWSA	Kiosks, Private	m3	limited	0.8	Access at times difficult	-
		River, well, marsh		Manual or by vehicle		Unlimited			-
		Rain water	-		-	Seasonal			-
2	Power	Electricity	EWSA	Direct connection or through private	KWH	limited	134	Some interruptions	-
		Generator					600		
3	Aggregates	Fine Sand	Sand quarries	Supplier/ Transport by truck	m3	On request	10 -13 following season	Generally with clay	Available within 15 Km of Kigali
		Coarse sand	Sand quarries /Rivers/Crushing Factory	Supplier/ Transport by truck	m3	On request	10- 16	Good	Available within 15 Km of Kigali
		Gravel and crushed aggregate	Quarries /Rivers/Crushing Factory or Manual	Supplier/ Transport by truck	m3	On request	20- 24	River gravel is good. Crushed of variable	Available within 15 Km of Kigali

								quality.	
4	Stone	Quarry	Manual, dynamite, calcinations	Supplier/ Transport by truck	M3	Unlimited	10-13	At times bad (quartz, schist)	Available within 15 Km of Kigali
5	Mud, soil ...	Adobe bricks	Private, local labour	-	piece		0.05		
		Compressed blocks	Hydraform	-	piece		0.1		
6	Burned clay materials	Artisanal brick (19 x 9 x 6)	Clay quarries	Private, Cooperatives	piece		0.025-0.04		
		Improved bricks (19 x 9 x 6)	Clay quarries	Private, Cooperatives (MUYUNZWE)	piece		0.04-0.06		
		Industrial bricks (various sizes, derived products...)	2 production units in operation in Kigali (RULIBA CLAY, EPSE MAKUZA BERTIN)	Production units, Transport by truck	m2		6.5-8		
		Hollow floor blocks	RULIBA CLAY	Production units, Transport by truck	piece				
		Artisanal roof tile	Private, Cooperative	Supplier, Transport by truck	piece				
		Improved roof tile	MUYUNZWE	Supplier Transport by truck	piece		7		
		Industrial roof tile	RULIBA CLAY	Supplier Transport by truck	m2		13.5		

7	Binder	Pozzolana Cement	2 production units in Kigali (KCC), and Musanze (GLC Limited). Largest part imported from Uganda (HIMA, TORORO).	Factory and sale points	Bags of 50kg	KCC: 100 tons/day GLC Limited: 50 tons/day	8.5-10		.
		Portland Cement (usually type P325 or P425 following order)	1 factory in Bugarama (CIMERWA). Portland cement is also imported from neighbouring countries (Uganda, Tanzania, and Kenya) and at time from Egypt, India and China.	Factory and sale points (certified traders)	Bags of 50kg	CIMERWA: 300 tons/day	9-11.5		CIMERWA to be extended. Capacity will be doubled.
		Lime	Locally produced	Shops	Bags of 50kg		6	Seldom used for lack of confidence	To be promoted for mortar and plastering

8	Concrete products	Manual hollow sand and cement (various dimensions)	Privates, Contractors	Manually produced on site or at contractors yards (often not covered)		On request	0.6	Poor quality	
		Hollow Blocs produced Automatic or semi automatic machines	Contractors	Produced on site or at contractors warehouse		On request	0.7	Acceptable quality	
		Hollow Blocs industrial (automatic machine)	Formal contractors (NPD COTRACO, DUHANGE, CAISSE SOCIALE at Gaculiro, other private firms)	Produced in dedicated plants.		On request	0.8-0.85		
		Concrete roof tiles	Private firms, such as Entreprise SEBULIKOKO	Produced in dedicated plants.		On request	8-10		
		Pavement concrete blocs	Private firms, formal contractors (NPD COTRACO,	Either produced on site or bought at factory or	m2	On request	5-7		

			DUHANGE, CAISSE SOCIALE at Gaculiro, others)	dedicated plant (seldom properly cured in hangars.					
		Concrete wall coating	Entreprises professionnelles (NPD COTRACO, DUHANGE, CAISSE SOCIALE A GACULIRO, PARTICULIERS)	Produced at dedicated plants.	m2		6		
		Buses, bordures	Formal contractors (NPD COTRACO, DUHANGE, CAISSE SOCIALE at Gaculiro, other private firms)	Produced at dedicated plants	m				
9	Reinforcement steel	Round smooth	Imported from Uganda, Kenya, South Africa, Turkey, India and China	Selling points of construction materials	m, kg		1.6/kg		Infrequently used, mostly for reinforcement mesh
		High resistance standard bars	Imported from Uganda, Kenya,	Either bought at factory or at	m, kg		2/kg		Unreliable quality,

			South Africa, Turkey, India and China	selling points of construction materials					especially when produced in neighbouring countries.
		Standard and recycled steel bars	Imported from Uganda, Kenya, or locally produced (Uprotur, Ufamental, recently created unit in Rwamagana)				1.6/kg		To be used only in specific conditions in small constructions.
10	Metal tubes and special sections	Square or rectangular tubes, HS, "bottle" profile, L, T, etc.	Imported from Uganda, Kenya, or locally produced (Uprotur, Ufamental, recently created unit in Rwamagana)	Either bought at factory or at selling points of construction materials.	m				Generally used for roof structure, external doors and windows. Often of poor quality and insufficient thickness (1.2 mm)
		Full profiles IPN, U, L, etc.	Imported mainly by SONATUBE	SONATUBE	m				Acceptable quality

11	Aluminium profiles		Imported mainly from Uganda, Kenya, locally manufactured (MANUMETAL, Kigali Steel and Aluminium Works, Systems Aluminium and Glass Rwanda)	At the factories	m				
12	Roof Sheets	Corrugated, galvanised or pre-paint	Imported mainly from Uganda, Kenya, locally manufactured (TOLIRWA, SAFINTRA, UPR OTUR, UFAMETAL)	Either bought at factory or at selling points of construction materials.	m2		2.8-4		
		Self-supporting pre-paint	Imported mainly from Uganda, Kenya, locally manufactured (TOLIRWA, SAFINTRA, UPR OTUR, UFAMETAL)	Either bought at factory or at selling points of construction materialsd	m2		4-5.8		
13	Wood	Rough	Locally produced,	Mainly at	piece		1.5-2		

		Sawed (boards, beams in pine, umusave, eucalyptus, red timber: muvula, libuyu)	except for red timber, imported from DRC	artisan market in Gakinjira.	piece		3-4 plain timber 25-35 red timber	Quality is essential (especially dryness) and also assembling and finishing techniques	Quality is essential (especially dryness) and also assembling and finishing techniques
		Panels, conglomerated and plywood	Imported	At selling points of construction materials	m2		2.5-3.5		
14	Ceramics (tiles, granitos, etc...)	Wall and floor cladding of different dimensions	Imported mainly from China, Italy and Spain	At selling points of construction materials	m2	Wall and floor cladding of different dimensions	6 -13		Production unit under construction in Nyagatare, East Rwanda
15	Plumbing and sanitary	Galvanised pipes							
			Imported mainly from China, India, Egypt, East Europe	At selling points of construction materials n	ml		1.5-2.5		
		PPR pipes	Imported mainly from China, India, Egypt, East Europe	At selling points of construction materials	ml		2-3		
	PVC pipes	Imported mainly from China, India,	At selling points of		ml		2-3		

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			Egypt, East Europe	construction materials					
		Bathroom fittings	Imported mainly from China, India, Egypt, East Europe	At selling points of construction materials					
		Shower			piece		30-40		
		WC			piece		35-200		
		Basin			piece		20-80		
		Urinal			piece		20-60		
		Kitchen Sink			piece		30-70		
16	Glass								
		2mm	Imported mainly from China, India, Egypt, East Europe	At selling points of construction materials	m2		6-8		
		4mm	Imported mainly from China, India, Egypt, East Europe	At selling points of construction materials	m2		8-10		
		6mm	Imported mainly from China, India, Egypt, East Europe	At selling points of construction materials	m2		10-14		
17	Hardware	Locks	Imported mainly from China, India, Egypt, East Europe	At selling points of construction materials	piece		3.5-12		
		Door Handles	Imported mainly	At selling	piece		1.5-6		

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			from China, India, Egypt, East Europe	points of construction materials					
18	Assembling and fixation accessories	(screws, bolts, nails)	Imported from neighbouring countries and from China, Turkey, Egypt, East Europe	At selling points of construction materials	kg				
19	Paint, Varnish, Glues Peintures, anti-fungus	Imported mainly from Uganda, Kenya, / locally produced (SADOLIN, AMEKI, RWANDA COLOR, SIGMA COACH, RUBIALAC,....)	Artisanal, Industrial	Factories and selling points of construction materials	kg		1-2.5		

20	Electricity								
		Cables 1.5,2.5	Imported mainly from Uganda, Kenya, and from China, Turkey, Egypt, East Europe	Selling points of construction materials	m		0.2-.04		
		Wall pipe 3/8	Imported from neighbouring countries, China, Turkey, Egypt, East Europe / Locally produced: Sonatube – Kist	Selling points of construction materials	pieces		0.8-1.2		
		Incandescent lamp (complete)	China, Turkey, Egypt, EU	Selling points of construction materials	pieces		1.5-3		
		Fluorescent lamp (complete)	China, Turkey, Egypt, EU	Selling points of construction materials	pieces		4.5-12		
		switch	China, Turkey, Egypt, EU	Selling points of construction materials	pieces		2.5-5		
		socket	China, Turkey, Egypt, EU	Selling points of construction materials	pieces		2.5-5		
21	Special techniques								
		Elevator	Imported from China, Japan, EU, (FUJI, OTIS)	Certified representatives	units		7.5-15		