Lions on the move: The progress and potential of African economies

By Charles Roxburgh, Norbert Dörr, Acha Leke, Amine Tazi-Rifii, Arend van Wamelen, Susan Lund, Mutsa Chironga, Tarik Aiatovik, Charles Atkins, Nadia Tefous, Till Zeino-Mahmalat

Africa’s economic growth is creating substantial new business opportunities that are often overlooked by global companies. Consumer-facing industries, resources, agriculture, and infrastructure together could generate as much as $2.6 trillion in additional annual GDP growth from 2012 to 2022.
2.5 Billion People

2050
CAN AFRICA **TRANSLATE** ITS HUGE POPULATION GROWTH INTO ECONOMIC DEVELOPMENT, AND THEN **INVEST** THIS WEALTH TO IMPROVE **QUALITY OF LIFE**?
ARCHITECTURE IS **NEVER** NEUTRAL. IT EITHER **HEALS** OR **HURTS**.

WE RESEARCH, BUILD, AND ADVOCATE FOR ARCHITECTURE THAT PROMOTES **JUSTICE** AND **HUMAN DIGNITY**.

WE HELP ORGANIZATIONS **AMPLIFY** THEIR
1. THE MISSION

Each architectural project must achieve a simple, legible, and transmissible idea.
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Each architectural project must achieve a simple, legible, and transmissible idea.

2. IMMERSION IN CONTEXT
If we do not ask the right questions or build consensus we may fail the very people we seek to serve.
1. THE MISSION
   EACH ARCHITECTURAL PROJECT MUST ACHIEVE A SIMPLE, LEGIBLE, AND TRANSMISSIBLE IDEA.

2. IMMERSION IN CONTEXT
   IF WE DO NOT ASK THE RIGHT QUESTIONS OR BUILD CONSENSUS WE MAY FAIL THE VERY PEOPLE WE SEEK TO SERVE.

3. PROOF OF IMPACT
   THE QUESTION IS NOT IF, BUT IN WHAT WAY AND BY HOW MUCH.
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Who benefits from architectural services, and at what cost?
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Who benefits from architectural services, and at what cost?

5. JUSTICE IS BEAUTY
Everyone has a fundamental right to a built world that is beautiful, and one that improves our quality of life.
MASAKA MIXED NEIGHBORHOOD

14 Attached Lots
8 Semidetached Lots
4 Detached Lots
With On-site Parking
Site Water Treatment
New Bus Stop
Nursery
Community Park / Garden
Below Power Corridor
Main gateway entry
Public Plaza
Restaurant & Market
Restaurant & Market
161 Apartment Units
42 Townhouses
16 Semidetached Lots
3 Detached Lots
Playground

ESTABLISHING A MODEL FOR AFFORDABLE HOUSING
“THE GROWING POPULATION AND INCREASING URBANIZATION WILL RESULT IN AN INCREASE IN URBAN AREA IN RWANDA. IF THIS IS NOT ACHIEVED IN A HIGH DENSITY MANNER, RWANDA WILL FACE UNPRECEDENTED LEVELS OF URBAN SPRAWL, PARTLY DUE TO HILLY TERRAIN.”

Sir David King - Green Growth Strategy, Rwanda
1. A MODEL FOR AFFORDABLE HOUSING
2. CONCEPT
3. MASTERPLAN
4. HOUSING
5. IMPACT
1. A MODEL FOR AFFORDABLE HOUSING
1. A MODEL FOR AFFORDABLE HOUSING

CURRENT STATUS OF HOUSING

HOUSING DEMAND

Figure 1. A Model For Population Growth in Kigali, 2002-2075

297,000
NEW HOUSES IN FIVE (5) YEARS

37,000
HOUSES PER YEAR

Source: Memo for Discussion, prepared by Keightley Reynolds and Sally Murray with Laura Wainer and Robert Buckley.
1. EXTENSION OF UNITS

2. THE SPLITTING OF CURRENT HOUSES INTO MULTIPLE DWELLING UNITS

3. THE SHARING OF DWELLING UNITS BETWEEN MULTIPLE FAMILIES
1. A MODEL FOR AFFORDABLE HOUSING

CURRENT STATUS OF HOUSING
OVERCROWDING AND INFORMALITY

LARGE INCREASE OF HOUSEHOLDS IN HIGH RISK
PERIPHERAL SITES PRONE TO LANDSLIDES, LESS SAFE, LESS CLEAN.
TOTAL DWELLING UNITS BEING BUILT IN THE LAST TWO YEARS: 2,000 UNITS. ONLY 25% OF WHICH WERE AFFORDABLE HOUSING.

TOTAL DWELLING UNITS IN THE PIPELINE: 15,000 UNITS
A. SOCIAL: 150 UNITS
B. AFFORDABLE: 8,000 UNITS
C. HIGH END: 6,850 UNITS

TOTAL DWELLING UNITS IN THE PIPELINE FOR THE NEXT FIVE (5) YEARS: 17,000 UNITS

GAP OF 280,000 DWELLING UNITS BY 2022.
1. A MODEL FOR AFFORDABLE HOUSING

CURRENT STATUS OF HOUSING
INCOME CURVE AND AFFORDABILITY

[Diagram showing the current status of housing income curve and affordability, with segments for IDP, Urban Upgrade, Incremental, Affordable, and High End, along with borrowing capacity and monthly income USD.]
1. A MODEL FOR AFFORDABLE HOUSING

CURRENT STATUS OF HOUSING
INCOME CURVE AND AFFORDABILITY

- **8000 Affordable Housing**
- **6750 High End**

**MARKET GAP**

**150 Social Houses GoR**
1. A MODEL FOR AFFORDABLE HOUSING

CURRENT STATUS OF HOUSING
HOUSING DEMAND AND BORROWING
CAPACITY BY SELLING PRICE

<table>
<thead>
<tr>
<th>Selling price</th>
<th>I&amp;M BANK</th>
<th>IDP Social Housing</th>
<th>Cap on Affordable Housing</th>
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<tr>
<td>5,000</td>
<td>20.0 %</td>
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- % down payment
- Interest rate
- Mortgage length (years)
- Down payment
- Loan amount
- Payment with principal
- HH Salary
- Affordable to num. of HH
- Percentage of demand

Masaka

Housing Demand

Kigali Median Income

Selling Price
LESS THAN 3.8% OF HOUSEHOLDS HAD ACCESS TO HOUSING FINANCE.

2012 FIGURES

TO ACCESS A LOAN YOU NEED TO HAVE A REGULAR STREAM OF INCOME. ONLY ABOUT 100,000 PEOPLE IN RWANDA PAY TAXES REGULARLY THROUGH FORMAL EMPLOYMENT.
1. A MODEL FOR AFFORDABLE HOUSING

BARRIERS TO HOUSING
LAND AVAILABILITY AND COST

IN KIGALI, CURRENTLY THERE IS A TOTAL APPROXIMATE AREA OF 250HA OF VACANT PLOTS ABOVE 1HA.

IF DEVELOPED AT 80DU/HA THAT WOULD BE ONLY 17,264 DWELLINGS UNITS.

LAND COSTS WILL RISE FASTER THAN POPULATION GROWTH.
CONSTRUCTION IS INSTRUMENTAL IN MEETING THE COUNTRY’S DEVELOPMENT TARGETS IN PRIORITY AREAS SUCH AS ECONOMIC TRANSFORMATION, URBANIZATION, RURAL AND SOCIAL DEVELOPMENT.

RWANDA IS A LANDLOCKED COUNTRY HIGHLY RELIANT ON IMPORTS DUE TO A LIMITED SUPPLY OF LOCALLY PRODUCED MATERIALS.

IMPORTS ARE EXPENSIVE AND HAVE HUGE CARBON FOOTPRINT ASSOCIATED TO TRANSPORT.

1. A MODEL FOR AFFORDABLE HOUSING

BARRIERS TO HOUSING
HIGH CONSTRUCTION COSTS
1. A MODEL FOR AFFORDABLE HOUSING

BARRIERS TO HOUSING
HIGH CONSTRUCTION COSTS

- Selling Price: 670 $/m²
- 350 $/m² (52%)
- Land
- Site Infrastructure
- Construction
- Design Fees (5%)
- Developer Costs (2%)

- Loan Interest (16%)
- Contingency & Risk (5%)
- Profit (12%)
1. A MODEL FOR AFFORDABLE HOUSING

THE GOV OF RWANDA IS SUBSIDING THE COST OF INFRASTRUCTURE AND/OR COST OF LAND OF AFFORDABLE HOUSING PROJECTS MEETING THE FOLLOWING CRITERIA:

1. OFFER A VARIETY OF HOUSING UNIT TYPES AND SIZES;

2. EXCEED THE MINIMUM REQUIRED NUMBER OF UNITS PER HECTARE AS PER URBAN PLANNING CODE BY AT LEAST 25%;

3. NO HOUSING UNIT AS A TOTAL FLOOR AREA LARGER THAN ‘95 SQUARE METERS’;

4. DESIGNED UNDER PREDOMINANT USE OF LOCALLY MINED AND PRODUCED, AND/OR LOCALLY PREFABRICATED CONSTRUCTION MATERIALS AS FAR AS THIS IS POSSIBLE;

5. THE DEVELOPER INCLUDES A CAPACITY BUILDING AND ON-SITE TRAINING.
1. A MODEL FOR AFFORDABLE HOUSING

POLICY IN PLACE

PRIME MINISTER INSTRUCTION ON AFFORDABLE HOUSING

6. CONTRACT LOCAL OR NATIONAL SMALL AND MEDIUM ENTERPRISES FOR MORE THAN HALF OF THE CONSTRUCTION WORKS.

7. AT LEAST ONE OF THE THREE BELOW CRITERIA IS FULFILLED:

A. THE PURCHASE PRICE OF A SQUARE METER OF ONE HOUSING UNIT, EXCLUDING COST OF PUBLIC INFRASTRUCTURE, IS BELOW A VALUE SET BY THE MINISTER IN CHARGE OF HOUSING ON AN BI-ANNUAL BASIS (450$/M²);

B. OFFER A PAYMENT MODE WHICH IS AFFORDABLE TO THE TARGETED BENEFICIARIES AND ENABLES THE BENEFICIARY TO PURCHASE OR RENT ONE OF THE OFFERED HOUSING UNITS;

C. THE DEVELOPER IS A COOPERATIVE FORMED BY THE INDIVIDUAL LAND HOLDERS OF THE HOUSING PLANNING AREA.
1. A MODEL FOR AFFORDABLE HOUSING

POLICY IN PLACE

RWANDA GREEN GROWTH STRATEGY

RWANDA’S FUTURE SOCIO-ECONOMIC DEVELOPMENT IS UNCERTAIN AS ITS POPULATION GROWS AND THE CLIMATE CHANGES. THIS STRATEGY IS THE FIRST ATTEMPT AT PILOTING A CLIMATE RESILIENT AND LOW CARBON DEVELOPMENT PATHWAY FOR RWANDA. RWANDA IS CHOOSING TO LEAPFROG THE DETRIMENTAL DEVELOPMENT PATHWAYS OF THE PAST AND TAKE THE OPPORTUNITIES THAT TECHNOLOGY TRANSFER AND CLIMATE FINANCE OFFER.

RWANDA VISION 2020

THE RWANDA VISION 2020 RECOGNIZES THE SOCIAL, ECONOMIC AND ENVIRONMENTAL DEFICITS THAT RWANDA FACES AND AS SUCH, EMPHASIZES DEVELOPMENT OPTIONS THAT DEMONSTRATE HOW PRO-POOR SUSTAINABLE USE OF NATURAL RESOURCES, INCLUDING PREVENTION OR MITIGATION OF ENVIRONMENTAL DEGRADATION CAN HELP ACHIEVE DEVELOPMENT GOALS.

EDPRS2

PURSUE A GREEN ECONOMY APPROACH TO ECONOMIC TRANSFORMATION. THE GREEN ECONOMY APPROACH FAVORS THE DEVELOPMENT OF SUSTAINABLE CITIES AND VILLAGES. KEY INNOVATIONS INCLUDE PILOTING A GREEN CITY, ATTRACTING INVESTORS IN GREEN CONSTRUCTION. INTERVENTIONS WILL FOCUS ON GREEN URBANIZATION AND THE PROMOTION OF GREEN INNOVATION IN INDUSTRIAL AND PRIVATE SECTORS.
GOAL 13
CLIMATE ACTION
TAKE URGENT ACTION TO
COMBAT CLIMATE CHANGE AND
ITS IMPACTS. CLIMATE CHANGE
PRESENTS THE SINGLE BIGGEST
THREAT TO DEVELOPMENT,
AND ITS WIDESPREAD,
UNPRECEDENTED EFFECTS
DISPROPORTIONATELY BURDEN
THE POOREST AND THE MOST
VULNERABLE. URGENT ACTION
IS NEEDED NOT ONLY TO
COMBAT CLIMATE CHANGE AND
ITS IMPACTS, BUT ALSO TO BUILD
RESILIENCE IN RESPONDING TO
CLIMATE-RELATED HAZARDS
AND NATURAL DISASTERS.

GOAL 1
NO POVERTY
RWANDA MET MOST OF THE
MILLENNIUM DEVELOPMENT
GOALS (MDGs) BY THE END
OF 2015. THE POVERTY RATE
DROPPED FROM 44% IN 2011 TO
39% IN 2014 WHILE INEQUALITY
MEASURED BY THE GINI COEF-
ICIENT REDUCED FROM 0.49 IN
2011 TO 0.45 IN 2014.
BUT CONTINUED WORK
NEEDS TO BE DONE TO
END POVERTY IN ALL ITS
MANIFESTATIONS, INCLUDING
EXTREME POVERTY. ONE WAY OF
ACHIEVING THIS IS THROUGH
CAPACITY BUILDING AND
CREATION OF NEW GREEN JOBS.

GOAL 11
SUSTAINABLE
CITIES AND
COMMUNITIES
TODAY, MORE THAN HALF THE
WORLD'S POPULATION ARE IN
CITIES. BY 2030, IT IS PROJECTED
THAT 6 IN 10 PEOPLE WILL BE
URBAN DWELLERS. DESPITE
NUMEROUS PLANNING CHAL-
LENGES, CITIES OFFER MORE
EFFICIENT ECONOMIES OF
SCALE ON MANY LEVELS,
INCLUDING THE PROVISION
OF GOODS, SERVICES AND
TRANSPORTATION. GOAL 11 AIDS
TO MAKE CITIES AND HUMAN
SETTLEMENTS INCLUSIVE, SAFE,
RESILIENT AND SUSTAINABLE.

1. A MODEL FOR AFFORDABLE HOUSING

POLICY IN PLACE
SUSTAINABLE DEVELOPMENT GOALS
2. CONCEPT

“THE GREAT CHALLENGE OF THE 21ST CENTURY URBAN DESIGN IS MASTERING ECOLOGICAL AND SOCIAL DESIGN”

GEO MULGAN, NESTA
2. CONCEPT

MISSION
ENVIRONMENTALLY, CULTURALLY AND SOCIALLY RESPONSIVE AFFORDABLE HOUSING

MASAKA
Mixed Neighborhood
2. CONCEPT

ITERATIVE DESIGN METHODOLOGY
ENVIRONMENTALLY, CULTURALLY
AND SOCULLY RESPONSIVE
AFFORDABLE HOUSING

PROVIDE AFFORDABLE HOUSING THAT IS
ENVIRONMENTALLY, CULTURALLY AND SOCIALLY

CHANGE THE MINDSET OF
DEVELOPERS AND RESIDENTS.
MORE DEVELOPERS ENGAGE AND
BUILD AFFORDABLE HOUSING.
POVERTY REDUCTION BY JOB
CREATION.
INFLUENCE FUTURE GOR
POLICIES

DESIGN DWELLINGS THAT RESPOND
TO SPACIAL NEEDS, LIFESTYLE AND
CULTURE IN AN EFFICIENT WAY;

INCREASE DENSITY IN A
CULTURALLY RESPONSIVE MANNER;

DESIGN A NEIGHBOURHOOD
THAT IS CLIMATE ADAPTED AND
PROVIDES A HEALTHY AND SAFE
ENVIRONMENT.

PIONEER THE USE OF LOCAL LOWER
COST HOUSING TECHNOLOGIES;

• INCREASE NUMBER OF FAMILIES THAT CAN
ACCESS A HOME;
• FULL OCCUPANCY RATE BY PROJECT COMPLETION;
• TONNES OF CO2 AVOIDED;
• ON-SITE CAPACITY TRAINING AND NUMBER OF
JOBS CREATED

INFLUENCE FUTURE GOR
POLICIES
## 2. Concept

### Affordability

**Environmentally, Culturally and Socially Responsive Affordable Housing**

<table>
<thead>
<tr>
<th>Status Quo</th>
<th>Real Affordability</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ MAX 1/3 OF INCOME IN HOUSING</td>
<td>✓ MAX 1/3 OF INCOME IN HOUSING</td>
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<tr>
<td>✓ MAX SELLING PRICE OF 450$/M²</td>
<td>✓ MAX SELLING PRICE OF 450$/M²</td>
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<tr>
<td>✓ MAX DWELLING SIZE OF 95M²</td>
<td>✓ MAX DWELLING SIZE OF 95M²</td>
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<tr>
<td>✗ ECONOMIC VIABILITY</td>
<td>✓ ECONOMIC VIABILITY</td>
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<td>✗ ECONOMIC GROWTH</td>
<td>✓ ECONOMIC GROWTH</td>
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<td>✗ JOB CREATION</td>
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<tr>
<td>✗ CLIMATE RESILIENCE</td>
<td>✓ CLIMATE RESILIENCE</td>
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<tr>
<td>✗ SOCIAL COHESION</td>
<td>✓ SOCIAL COHESION</td>
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<tr>
<td>✗ CULTURALLY ADAPTED</td>
<td>✓ CULTURALLY ADAPTED</td>
</tr>
</tbody>
</table>
MIXED NEIGHBORHOOD

A NEIGHBOURHOOD THAT ACCOMMODATES A VARIETY OF DIFFERENT HOUSEHOLD MODELS THAT CAN HOUSE EXTENDED FAMILIES AND SINGLES, NEW COUPLES WITH AND WITHOUT CHILDREN.
2. CONCEPT

TYPOLOGY VARIETY
CROSS SUBSIDY = AFFORDABILITY
MIXED TYPOLOGIES = SOCIAL COHESION
2. CONCEPT

SYSTEMIC CHANGE
FUTURE GOVERNMENT POLICY
INFLUENCE
3. MASTERPLAN

DENSITY = AFFORDABILITY
MASSING = CULTURALLY SENSITIVE
AMENITIES = SOCIALLY RESPONSIVE
BIODIVERSITY AND ECOSYSTEM SERVICES ARE ESSENTIAL FOR LIFE. BIOPHILIA RESPECTS LIFE AND LANDSCAPE, IT IS AN ASPECT OF ECO-URBANISM, WHICH IS A WHOLE SYSTEM APPROACH TO DESIGN THAT AIMS TO DO MORE WITH LESS.

3. MASTERPLAN

NEIGHBORHOOD DESIGN
WHOLE SYSTEM APPROACH
3. MASTERPLAN

NEIGHBORHOOD DESIGN

STRATEGIC LOCATION
**NEIGHBORHOOD DESIGN**

**DEVELOPABLE AREA**

**AREAS**

- SITE AREA: 4.96 HA
- SETBACKS: 0.37 HA
- HV BUFFER ZONE: 0.21 HA

**DEVELOPABLE AREA: 4.38 HA**
3. MASTERPLAN

NEIGHBORHOOD DESIGN
OPENNESS. NO BOUNDARIES.
3. MASTERPLAN

NEIGHBORHOOD DESIGN
CONNECTIVITY - ACCESS, CONNECT, ACTIVATE.

COK REQUIREMENTS

PARKING: 200 BAYS
APARTMENTS: 1P EVERY 2D
TOWN-HOUSE: 1P PER 1D
SEMI: 1P PER 1D
DETACHED: 1P PER 1D
SHOPS: 1P PER 1D

LOTS
ALL LOTS NEED TO HAVE A DIRECT ACCESS TO A STREET
3. MASTERPLAN

GREEN SPACES
GREEN SPINE - STRUCTURING ELEMENT.
3. MASTERPLAN

GREEN SPACES
LIFE BLOOD OF THE NEIGHBORHOOD

Parks
Playgrounds
Edible Landscape
GREEN SPACES
PUBLIC DOMAIN PROMOTE HEALTHY LIVING STYLE

3. MASTERPLAN

Running Paths = 1km

Trail Exercise
Kigali maintains a stable, equatorial climate with seasonal variation. Two periods of rainy season with heavy rainfall in short periods of time can also be an opportunity for two harvesting seasons.
3. MASTERPLAN

OPTIMIZED MASSING
MINIMIZE CUT AND FILL
APARTMENT DENSITY
78 DWELLING UNITS/ HA

COK REQUIREMENTS
MINIMUM DENSITY: 40 DU/HA

PM INSTRUCTIONS
EXCEED MINIMUM DENSITY BY +25%

MASAKA
EXCEEDS MINIMUM DENSITY +65%
PM INSTRUCTION
THE DEVELOPMENT OFFERS A VARIETY OF HOUSING UNIT TYPES AND SIZES.

CULTURALLY RESPONSIVE TYPOLOGY
TOWN-HOUSES OFFER A FRONT AND BACK GARDEN TO EACH DWELLING. GUARANTEES THE CONTACT WITH THE GROUND.
COMMUNITY BUILDINGS
SOCIALLY SENSITIVE AMENITIES.

3. MASTERPLAN
ECONOMIC ACTIVITIES
SHOPS AND OFFICES ON THE GROUND FLOOR OF APARTMENTS ACTIVATE THE STREETS AND PROVIDE SPACE FOR BOTH INDIVIDUAL AND COLLECTIVE ECONOMIC ACTIVITIES THAT ARE ATTRACTIVE TO ALL.
3. MASTERPLAN

IMBUGA COURTYARDS
SOCIAL COHESION COMMUNAL SPACES

- Playgrounds
- Akagoroba k’Ababyeyi
- Planting

[Diagram of IMBUGA COURTYARDS showing social cohesion communal spaces and activities like play areas and green spaces]
3. MASTERPLAN

IGIKARI | BACK GARDENS
DEFENSIBLE SPACES KITCHEN GARDENS AND CHORES ACTIVITY SPACE

Akarima k'igikoni
Imbabura
Drying Lines
“THERE ARE PLENTY OF FURTHER OPPORTUNITIES TO USE NATURAL ECOSYSTEMS FOR AESTHETIC, BIODIVERSITY, INCOME GENERATION, COMMUNITY-BUILDING AND FOOD SECURITY PURPOSES.

EXAMPLES INCLUDE CONSTRUCTED WETLANDS, RAIN GARDENS, PARKS, PLANTINGS OF NATIVE AND MEDICINAL SPECIES AND KITCHEN GARDENS”
3. MASTERPLAN

LANDSCAPE
STORM WATER MANAGEMENT

Rain Gardens
Swales
Retention Ponds
SAFE INCLUSIVE WALKABLE STREETS

A NEIGHBORHOOD THAT PROVIDE SAFE WALKABILITY FOR CHILDREN (TO PRIMARY SCHOOL), WOMEN AND ELDERS, SHADED BY NATIVE TREES.
3. MASTERPLAN

STREET SCAPING
MAIN BOULEVARD

FUNCTIONAL LANDSCAPE INFRASTRUCTURE

USE OF POROUS SURFACES TO MAXIMIZE STORM WATER ABSORPTION. NATIVE TREES AND GREENERY TO PROVIDE SHADE, SOIL STABILIZATION AND CARBON FIXING.

MASS.
3. MASTERPLAN

STREET SCAPING
SECONDARY STREET

ACCESSIBLE PEDESTRIAN FRIENDLY
STREETS WITH LOW GRADIENTS. SURFACES TO ENSURE PEDESTRIAN SAFETY AND PRIORITY. USE OF LOCAL VOLCANIC ROCK AS A PAVING MATERIAL.
4. HOUSING

FUNCTION = CULTURALLY SENSITIVE
FORM = ENVIRONMENTALLY RESPONSIVE
FABRICATION = AFFORDABILITY
Building Design
Holistic Approach to Affordability and Climate Resilience

4. Housing

- Orientation
- Materials
- Water & Power
- Heating & Cooling
- Ventilation
- Envelope
4. HOUSING

UNIT TYPES
FUNCTIONAL AFFORDABILITY

Shop or Studio
Demographic: Single Professional or Young Couple

Apartment
Demographic: Young Couple with children

Townhouse
Demographic: Middle Class Family

Townhouse
Demographic: Middle Class Family, Both Parents Working

Townhouse
Demographic: Government/Business Sector Employee

Semi-Detached
Demographic: Middle Class Family, Three Members Working
ENVIROMENTAL PERFORMANCE
AFFORDABLE PASSIVE COOLING

4. HOUSING

Evaporative cooling
-9°C

21 June

21 October

21 December

Stack Effect
Solar Water Heater

Evaporative cooling
-9°C

Rain garden for water infiltration

Cross Ventilation

Cross Ventilation

Cross Ventilation

Cross Ventilation

Orientation
Materials
Water & Power
Heating & Cooling
Envelope

MASS.
MAXIMIZE DAY LIGHT
GENEROUS FLOOR TO CEILING HEIGHTS, AND HIGH VERTICAL WINDOWS WILL ALLOW MAXIMUM DAYLIGHT PENETRATION. THE CORRECT LOCATION OF WINDOWS WILL ALSO MINIMIZE GLARE AND USE OF ARTIFICIAL LIGHTING DURING THE DAY.

LED LIGHTING
AT NIGHT, WHEN ARTIFICIAL LIGHT IS REQUIRED, WE WILL PROMOTE THE USE OF LED LIGHT-BULBS. LEDS USE ONLY ABOUT 10% OF THE ENERGY AN INCANDESCENT LAMP REQUIRES. IN ADDITION, IN THE LONG TERM THIS SAVES MONEY TO THE USER, AS THESE BULBS HAVE A MUCH LONGER LIFE-SPAN.

LOW FLOW APPLIANCES
AERATORS AND LOW-FLOW APPLIANCES ARE LOW-COST, NOT ONLY THEY CONSERVE WATER AND SAVE MONEY, BUT CAN ALSO REDUCE THE ENERGY USE OF UTILITY COMPANIES.

SOLAR WATER HEATERS
SOLAR WATER HEATERS A COST-EFFECTIVE WAY TO GENERATE HOT WATER. THEY ARE IDEAL FOR THIS CLIMATE AND THE FUEL THEY USE, SUNSHINE, IS FREE. THIS SYSTEM CAN PROVIDE THE HOT WATER OF A HOUSEHOLD FOR BOTH SHOWERING AND WASHING. THE HEATER AND THE SOLAR PANELS WILL BE INSTALLED ON THE ROOFS.
4. HOUSING

BUILDING ENVELOPE

LIVING FACADE

EVAPORATIVE COOLING

Plants and trees release large amounts of water from the pores in their leaves, and this evaporative cooling process can create a zone around the plant as much as 9°F cooler than the surrounding air temperature.

MAGIC BREEZE LANDSCAPE
PENDA | NARSINGI, HYDERABAD

SHADE & SECURITY

Trellises and plants can cast shadows and direct breezes. They will be set away from the apartment to allow air to circulate. Balustrades can have a double function, be a guide for the vines to grow and serve as security.

MFO PARK
ZÜRICH, SWITZERLAND

FOOD, KITCHEN HERBS PRODUCTION

With the ideal north-south orientation of the facade, several types of edible plants can grow on the planters, from basil, rosemary, oregano, parsley to tomatoes, onions, carrots and passion fruit.

PASSION FRUIT TRELLIS
“Locally fabricated (or lo-fab) building is a process that highlights not only the environmental footprint of a building but also the human hand-print on the building process of the men and women whose pride is sculpted into stone and whose dignity shines in the mortar placed between bricks.

By advocating for an inclusive process of building, that leverages labor and insight from Kigali, the building process can become the building itself: grounded in a place, filled with pride, and resonant of the people that helped make it real and will own its maintenance and stewardship.”

Mass Design Group
THE MANUFACTURING PROCESS PRODUCES NO WASTE OR POLLUTION.

THE FINAL PRODUCT IS COMPLETELY RECYCLABLE.¹

THE MANUFACTURING OF AAC ALSO RESULTS IN A PRODUCT THAT IS LIGHTWEIGHT, STRONG, NON-TOXIC, AND DOES NOT SHRINK, ROT, CORRODE, OFF-GAS OR OTHERWISE DETERIORATE.²

DUE TO ITS LIGHT WEIGHT AND DIMENSIONAL ACCURACY, AAC CAN BE ASSEMBLED WITH MINIMAL WASTE AND A REDUCED NEED FOR ADDITIONAL EQUIPMENT.

AAC IS ALSO TERMITE AND MOLD RESISTANT, AND FIREPROOF.³

¹ SEE EMERGING CONSTRUCTION TECHNOLOGIES – AUTOCLAVED AERATED CONCRETE, HTTP://WWW.NEWTECHNOLOGIES.ORG/ECT/CIVIL/AUTOCLAVED.HTM;
AUTOCLAVED AERATED CONCRETE: MANUFACTURED BUILDING BLOCK MADE OF ALL NATURAL MATERIALS, HTTP://WWW.TOOLBASE.ORG/TECHINVENTORY/TECHDETAILS.ASPX?CONTENTDETAILID=690
² ID.; PATH CASE STUDY, AUTOCLAVED AERATED CONCRETE: BETTER BUILDING BLOCKS MAKE BETTER HOMES (AUGUST 2006)
³ ID.
5. Impact
5. IMPACT

Environmental
Estimated Total Embodied Carbon
Per Squaremeter (m²)

Embodied Carbon (kgCO2e/m²)
*Cradle to Site

Approximately 57% less embodied CO₂ emissions than a typical comparable project in Kigali.
5. IMPACT

MATERIAL SOURCING
PERCENTAGE OF ESTIMATED KILOGRAMS OF MATERIALS

DOMESTICALLY PRODUCED MATERIALS (KG)

96% = Masaka Affordable Housing
84% = Typical Kigali housing projects

IMPOR TED MATERIALS (KG)

4% = Masaka Affordable Housing
16% = Typical Kigali housing projects
ECONOMIC CONSTRUCTION JOBS

$2,750,000 / $2,460 = 1,116 People

Approximate Construction cost on direct labor.*
Average annual salary for Masaka Housing construction worker
Approximate workers employed during construction

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Labor</td>
<td>$2,750,000</td>
<td>25%</td>
</tr>
<tr>
<td>Transportation</td>
<td>$440,000</td>
<td>4%</td>
</tr>
<tr>
<td>Materials</td>
<td>$7,810,000</td>
<td>71%</td>
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<tr>
<td>Total</td>
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<td></td>
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</tbody>
</table>
5. IMPACT

ECONOMIC CONSTRUCTION JOBS

“A Masaka housing construction worker earns 32% more than a typical construction worker in Kigali.”

$2,460 AVERAGE ANNUAL SALARY

$1,870 AVERAGE ANNUAL SALARY

MASAKA HOUSING CONSTRUCTION WORKER

TYPICAL HOUSING CONSTRUCTION WORKER
ARCHITECTURE IS MUCH MORE THAN A BUILDING.