Promoting Energy efficiency in Buildings in East Africa

Vincent Kitio
Chief, Urban Energy Unit
Urban Basic Service Branch
UN-Habitat
Presentation Overview

• The Mandate of UN-Habitat;
• Urbanization and urban energy poverty;
• Global Energy Challenge
• Energy use in buildings in SS Africa;
• African housing stock forecast;
• Introduction to the program on *Promoting Energy Efficiency in building in East Africa*;
• Strategies and achievements;
• Conclusions.
UN-HABITAT is the United Nations agency for human settlements (the built environment).

The agency is mandated by the UN General Assembly to promote:

- **Sustainable urban development** and
- **Adequate shelter for all**.

UN-Habitat assists local, regional and national authorities in their effort to increase access to decent housing.

We promote energy access, energy efficiency and the use of renewable energy in urban areas.
Urbanization and Urban Energy Poverty

• 10% of the global population lived in cities in 1900;
• 50% of people lived in cities in 2007;
• 75% of the population will be living in cities in 2050.
• Today, out of the 3.5 billion people living in cities, over one billion live in informal settlements and are mainly urban energy poor.

Over 60% of urban population in Africa are energy poor. They rely on traditional energy wood/charcoal for cooking and spend more on energy services (kerosene and electricity) compare to other citizens.

Urban energy demand increases annually by 7%.
The UN SG Ban Ki-moon’s initiative “Sustainable Energy for All” that calls for all actors to join their efforts to:

- Ensuring universal access to modern energy services by 2030;
- Doubling the rate of improving in energy efficiency;
- Doubling the share of renewable energy in the global energy mix.

2014-2024 is the UN decade on Energy Access for All.
Energy use in buildings in Sub Saharan Africa

Energy used in buildings in Africa is estimated at 56% of the total national electricity consumption. Big cities consume more than 75% of all electricity generated.

Majority of modern buildings in most African countries with tropical climates - are replica of building designs from western countries with cold and temperate climates.

Between 50-60% of power generation in the region come mainly from hydro-power plants.

Energy generation’s capacity is being stretched by rapid population growth, increased urbanization, growing industries and climate change.

Energy demand increases annually by 8% against an almost stable supply, creating a huge energy deficit. There is therefore, the need for energy efficiency and renewable energy.
Global Building Stock Forecast

About 80% of the buildings expected to exist in Sub Saharan Africa in 2050 have not been built.

Europe

- Built before 2010: 30
- Built between 2010 and 2050: 70

East Africa

- Built before 2010: 75
- Built between 2010 and 2050: 25
Promoting Energy Efficiency in Buildings in East Africa

- This project is an initiative of UN-Habitat in collaboration with UNEP and the five East African countries: Kenya, Tanzania, Uganda, Rwanda and Burundi.

- The program is designed to address the energy crisis in the region through the promotion of energy conscious building designs and energy demand management.
Objectives of the Programme

- To Mainstream Energy Efficiency Measures into Housing policies, Building Codes, Housing finance and building practices in East Africa;
- To achieve considerable avoidance of GHG emissions as a result of improved energy efficient building practices.

Targets:
- 400,000 units (including government mass housing, real estates, private home etc.),
- 100 buildings retrofitted (commercial and private sector), built under energy efficiency standards.
- Estimated Emission Reduction in 20 years:
  Direct CO2 reduction: 3,629,996 ton;
  Indirect CO2 saving: 3,937,500 ton.
Other targets:

- Energy saving in new building by 30% ;
- Energy savings in existing buildings by 20 %;
- Improved energy efficiency in at least 30% of new buildings;
- Energy efficient building code adopted by at least 3 African countries;
- Green mortgage systems established and adopted.
Main Components


3. Awareness Raising; Capacity Building, Guidelines and training tools.


5. Integration of EE measures in all new government housing projects, donor funded housing projects and encourage such practices in the private sector.
1. Baseline data and Benchmarking on energy use in buildings

- Assess energy consumption trends in buildings.

- Conduct energy audits in residential, public and commercial buildings.

- Establish energy consumption benchmarks per categories and typologies of buildings and climatic zones.

- Identify energy saving potentials.

Eastgate: Sustainable building in Harare.
Energy audit of buildings: You Can't Manage What You Don't Measure!
# Energy audit of buildings: You Can't Manage What You Don't Measure!

## BUILDING ENVELOPE

<table>
<thead>
<tr>
<th>BUILDING TYPOLOGY</th>
<th>Informal Settlement</th>
<th>Single dwelling (Bungalow)</th>
<th>Single dwelling (Maisonette)</th>
<th>Multiple Dwelling</th>
<th>Commercial building</th>
<th>Institution Building (School)</th>
<th>Institution Building (Hospital)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING MATERIALS</td>
<td>Makuti roof</td>
<td>Iron sheets</td>
<td>Stone coated tiles</td>
<td>Clay roofing tiles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Earth/ Mud walls</td>
<td>Masonry stone</td>
<td>Iron sheets</td>
<td>Concrete walls</td>
<td>Clay Bricks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wooden walls</td>
<td>Stabilised earth blocks</td>
<td>Glass and steel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## BUILDING OCCUPANCY

- < 5 occupants
- 5-10 occupants
- >10 occupants

## BUILDING AREA (m²)

- Hot and Humid
- Hot and Semi-Arid / Savannah and low Savannah
- Hot arid
- Upland / High Upland
- Great lakes

## CLIMATE PROFILE

## ENERGY BILLS

<table>
<thead>
<tr>
<th>COST OF ENERGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPG Bill</td>
</tr>
<tr>
<td>Charcoal/ Firewood/ Biomass Bill</td>
</tr>
<tr>
<td>Kerosene Bill</td>
</tr>
</tbody>
</table>

## ENERGY DEMAND

<table>
<thead>
<tr>
<th>ENERGY SOURCE</th>
<th>MONTHLY CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>kWh</td>
</tr>
<tr>
<td>LPG</td>
<td>Kg</td>
</tr>
<tr>
<td>Charcoal</td>
<td>Kg</td>
</tr>
<tr>
<td>Kerosene</td>
<td>Litres</td>
</tr>
</tbody>
</table>

---

Additional information is continued in the appendix.
2. Housing policies and regulations: building code / standards

• Review country specific housing policy to include EE measures.

• Prepare EEB policies, session papers and by-laws for enactment, adoption and enforcement.

Energy/Resource efficient Building Code has the highest potential of saving energy in buildings over a long run.
3. Education: Awareness creation and capacity building in EEB

Guidelines for Green Building Design

Step 1: Site Analysis

Site analysis helps to identify opportunities or constraints which will influence the outcome of the urban design.

- Sun Path: understanding the movement of the sun during the day and seasonally. The use of tools for a qualitative analysis of the daylight or shading of a specific part of a building is very useful for estimating the effects of the neighboring building shading or sun casts. In the planning, the shading of the solar access should be developed along the building site.

- Prevailing Winds: knowledge of the wind speed and direction of the prevailing wind will facilitate natural ventilation. The use of wind simulations should be followed by the prevailing wind direction to ensure natural ventilation and direct removal to all buildings along the road. A compromise should be taken in case the prevailing wind is on one in conflict with the site.

- Topography: the outcomes of each, streams, valleys, hill, mountain, etc. may exist on different natural conditions, land, and sun shading. These will be analyzed in relation to the concept of the building design.

Development of tools and awareness materials on sustainable building design and technical notes to promote passive building measures/strategies.
3. Education: Awareness creation and capacity building in EEB
KAM Green Buildings Training Nairobi– August 2013.
4. Financing instruments of EEB

- Sensitize financial institutions, investment banks, private developers and power utilities on the economic benefits of EE measures.
- Facilitate the adoption and establishment of green mortgage systems.
- Encourage governments to create fiscal and administrative incentives; subsidies program and to allocate national budget for promoting EEB.
5. Demonstration projects

- Facilitate the construction of more EEB in the region through advocacy and capacity building;
- Ensure that majority of new buildings comply with EE principles;
- Work with governments, donors and developers to make sure that new housing projects are EE;
- Conduct practical training with real estate developers and other housing stakeholders to sensitize and provide them with technical assistance on EEB.
- Incorporated EE in all ongoing new housing schemes.

Pilot projects in Dar es Salaam Tanzania that integrate passive building design strategies
East Africa Energy Efficient Building Award (EAAEEBA)

- Create a **Regional Energy Efficiency Award Systems** to acknowledge best practices and reward excellent achievement;

- Using internationally agreed green building rating systems as criteria for the award;

- Develop Green building certification system for the region.

- Facilitate the creation of other awards and competition systems on sustainable architecture.
Conclusion

• A roadmap towards low carbon buildings in Africa must include the following action points:

• The establishment of a baseline on energy performance in building. This can be done through energy audit to identify saving potentials;

• Governments should set green requirements for resource efficient buildings. **Building permit** requirements should include environmental design strategies and passive building measures. **Energy efficient building code** should be adopted;

• Awareness to stimulate consumer demand for sustainable products and to promote behavior change;

• Capacity building and tools development for architects, engineers and other building practitioners on sustainable building design are needed to bridge the gap. **Universities to initiate training courses on sustainable built environment.**

• **Engage investors to finance resources efficient buildings** and appliances through green mortgage. This will help remove financial barriers;

• Engage other stakeholders such as **power utilities** to promote energy efficiency and responsive consumption.
THANK YOU FOR YOUR ATTENTION

Vincent Kitio
Chief, Urban Energy Unit
Urban Basic Service Branch
UN-Habitat
Vincent.kitio@unhabitat.org