“GREEN BASED” PLANNING THAT INTEGRATES URBAN AGRICULTURE INTO ELDORET MIXED LANDSCAPE IN RESPONSE TO CLIMATE CHANGE.

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CONTEXT

• According to the NEMA Kenya, Kenya is a net carbon dioxide sink. However, her urban centres are net greenhouse gases emitters, whose vulnerabilities vary spatially and over time.
• Over 70% of the natural disasters that have affected Kenya are climate related.
• The multidisciplinary urban planning in Kenya focuses on building developments and infrastructure without taking into consideration integration of different urban living patterns, hydrological functioning, energy capture and organic waste cycling processes.
QUESTIONS EXPLORED

• How vulnerable is Eldoret town to climate change?
• Are there any vacant urban spaces such as in between buildings, roadside verges and other buffer zones that can be used for urban agriculture?

METHODOLOGY

• Study was conducted from late 2008 and early 2009.
• A reconnaissance survey around the town focusing on available open spaces.
• Key informant interviews with the selected government departments representatives such as Uasin Gishu District physical planner, Director of Environment at Eldoret Municipal Council, North Rift Red Cross disaster manager, Chief meteorological officer (Kapsoya weather station).
METHODOLOGY

- Focussed group discussion and peer review between University of Nairobi and Moi University members of staff via internet
- Literature review
- SWOT analysis was conducted for all resources, highlighting the emerging opportunities.

STUDY AREA

- Study was conducted in Eldoret, the 5th largest town of Kenya and covers 147 sq.km with a current estimated about 300,000 people.
- It lies at an altitude of 2,085 metres above sea level and traverses latitude 00 31’North and longitude 35016’ East.
- Eldoret is 312kms, NW of Nairobi on the main Kenya-Uganda highway
RESULTS

- Eldoret has no records of climate related disasters linked to deaths and/or property losses.
- Human health is likely to be affected by various climate change-related health factors, including the altered distribution of some infectious diseases and disease vectors.
- The direct effects of instantaneous voluminous stormwater runoff are subtly felt in the town since the town is considered upstream. Annual flash floods appear downstream around Budalangi along River Nzoia where River Sosiani joins have been affected.
- Socio-political conflicts coupled with climate change impacts have threatened food security in Eldoret and its environs.
RESULTS

• The road network has been adversely affected by heavy rains.
• The uncontrolled municipal landfill is a big source of methane.
• Urban agriculture is practiced among all cadres of people, the rich and the poor alike.
• Urban agriculture is so much intertwined in the general functioning of the town.

RESULTS

It is clear from the climate change impact assessment above that there is need for adaptation in the following forms in Eldoret:

1. “hardening up” of the infrastructure systems, including storm-drainage systems, water supply and treatment plants
2. protection or relocation of solid waste management facilities, energy generation and distribution systems
3. hydro-geological consolidation works
4. promote the waste reuse and recycling and raising public awareness
5. fuel technology improvements with alternative fuels from biomass, wind and solar energy.
RESULTS

PRIVATE
PUBLIC
VERTICAL GARDEN/BALCONY
FRONT/BACK YARD

(ROOF TOP GARDENTS)

VERTICAL GARDEN/BALCONY
FRONT/BACK YARD

PRIVATE
PUBLIC

COLLECTIVE (CLUSTER)
COOPERATIVE
INDIVIDUAL PLOTS

PRIVATE
PUBLIC

COLLECTIVE (CLUSTER)
COOPERATIVE
INDIVIDUAL PLOTS

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PUBLIC

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PRIVATE
PUBLIC

COLLECTIVE (CLUSTER)
COOPERATIVE
INDIVIDUAL PLOTS

PRIVATE
PUBLIC

PRIVATE/
PRIVATE

SQUARTER

MULTIPLIER EFFECT OF IMPROVED SUSTAINABLE URBAN AGRICULTURE

CARBON CREDITS TO TRANSPORT SECTOR

Hydrogen generated on-site for fuel use
* Thermocatalytic conversion
* Hydrogen storage
* Hydrogen fuel cell for transport

CARBON CREDITS TO ENERGY SECTOR

Combined heat and power generation system
* Thermochemical
* Methane purification and compression for mobile use
* Connection to power grid

CARBON CREDITS TO WASTE SECTOR

Waste to energy
* Recycling of waste products
* Anaerobic digestion of organic waste

CONCEPTUAL FRAMEWORK
**POLICY CONSEQUENCES**

- Integration of permissible urban land-use zoning practices.
- Need to develop new standards, codes and layouts for regenerative agricultural practices that applied in residential areas.
- Decentralization of agricultural markets in every municipal ward promoting econeighbourhoods.

### AGRICULTURAL ZONE SUPPORT TARGET AREAS

<table>
<thead>
<tr>
<th>AGRICULTURAL ZONE</th>
<th>SUPPORT</th>
<th>TARGET AREAS</th>
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</thead>
<tbody>
<tr>
<td>Precision agriculture zone</td>
<td>In this demonstration zone all production processes such as irrigation, fertilization etc are monitored and managed by a nerve centre equipped with GPS, GIS and Remote sensing technologies, hydropponics and greenhouse technologies.</td>
<td>Eldoret Agricultural showground (ASK), Chepkoile Campus – Moi University science park</td>
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<tr>
<td>Flower producing zone</td>
<td>Technologically supported by the Horticultural Crops Development authority and Ministry of Agriculture</td>
<td>Chepkoilel zone, Ziea area</td>
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<tr>
<td>Tree nursery zone</td>
<td>Technologically supported by the Kenya Forest Service and Kenya Forest Research Institute</td>
<td>Along roadside verges, anti-malarial drain canals, flood zones</td>
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<tr>
<td>Aquaculture zone</td>
<td>Technologically supported by the Kenya marine and fresh water research institute</td>
<td>Along stormwater drainage canals, anti-malarial drains, dykes, dams, swamps</td>
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<tr>
<td>Livestock raising zone</td>
<td>Technologically supported by the Ministry of Livestock for improved breeding and rearing</td>
<td>Centre around the abattoir (slaughter house), Uasin Gishu Veterinary centre, Selected residential area</td>
</tr>
<tr>
<td>Agricultural product-processing zone</td>
<td>Technologically supported Ministry of Trade and Industry</td>
<td>Moi international airport, Industrial area, markets, home based cottage industries</td>
</tr>
<tr>
<td>Crop zone</td>
<td>Technologically supported by Ministry of Agriculture.</td>
<td>Vacant plots both private and public, buffer zones, deferred land use areas</td>
</tr>
<tr>
<td>Agro-tourism</td>
<td>Supported by the Ministry of Tourism and Kenya Tourism Development Authority, Kerio Valley Development Authority, School of Tourism, Moi University</td>
<td>Niche specialized agricultural units such as Ampath, homestays at farms</td>
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RECOMMENDED FUTURE RESEARCH

• Urban landscape rehabilitation to capitalize on the biosequestration of urban agriculture and urban forestry for Eldoret.
• Integration of regenerative urban agriculture in urban residential land use towards a low carbon Eldoret municipality, Kenya.
• Incorporation of sustainable organic urban agriculture in global carbon trading.

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