



*The Low Carbon Development and climate resilient strategy of KCCA*

# **Plenary Session 1 - Climate profile and vulnerabilities of Kampala**

*Stakeholder's Dialogue  
October 14<sup>th</sup> 2015*



*With the support of*



# Climate change and cities

- Cities have a crucial role in climate change
- On the one hand, urban-based residents and their activities generate a high proportion of global greenhouse gas emissions.
- On the other hand, much of key climate risks are concentrated in urban areas. Furthermore, urban climate change-related risks are increasing.
- Kampala has received considerable attention over recent years, particularly on flooding as well as on impacts of climate change on infrastructure, livelihoods and ecosystems

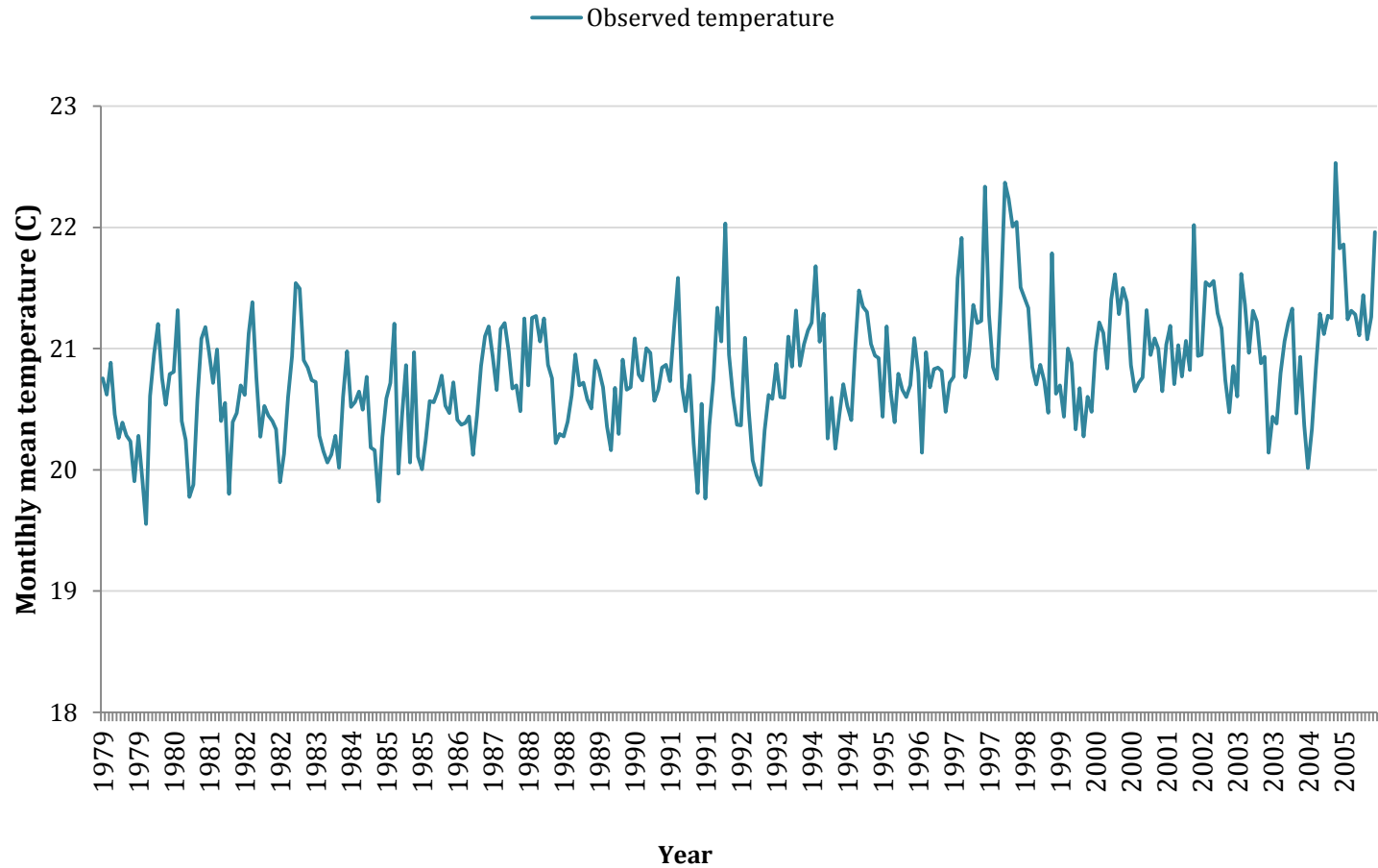
# Observed climate profiles- global and regional

	Temperature	Precipitation	Extreme weather events
<b>Global</b>	<ul style="list-style-type: none"> <li>Average temperature on the surface: + 1°C (1901-2012 )</li> <li>Annual mean temperature of sea surface : + 0.44°C in less than 40 years</li> </ul>	<ul style="list-style-type: none"> <li>No clear trends</li> </ul>	<ul style="list-style-type: none"> <li>Global mean sea level rise Over the period 1901 to 2010 - 0.19 [0.17 to 0.21]m; i.e 1.7 mm/year;</li> <li>Increase in sea level almost twice as fast since 1993 (3.2mm/year)</li> </ul>
<b>Africa/ Eastern Africa</b>	<ul style="list-style-type: none"> <li>Africa's surface temperatures has increased by 0.5–2°C over the past hundred years.</li> <li>Eastern Africa have experienced a significant increase in temperature since the early 1980s.</li> </ul>	<ul style="list-style-type: none"> <li>No clear trends but a decrease in annual rainfall in the western and eastern Sahel region an increase over parts of eastern and southern Africa.</li> <li>In Eastern Africa, rainfall is very variable in time and space.</li> </ul>	<ul style="list-style-type: none"> <li>Increase in the magnitude and frequency of droughts and floods, although there is a general lack of data for Africa.</li> </ul>

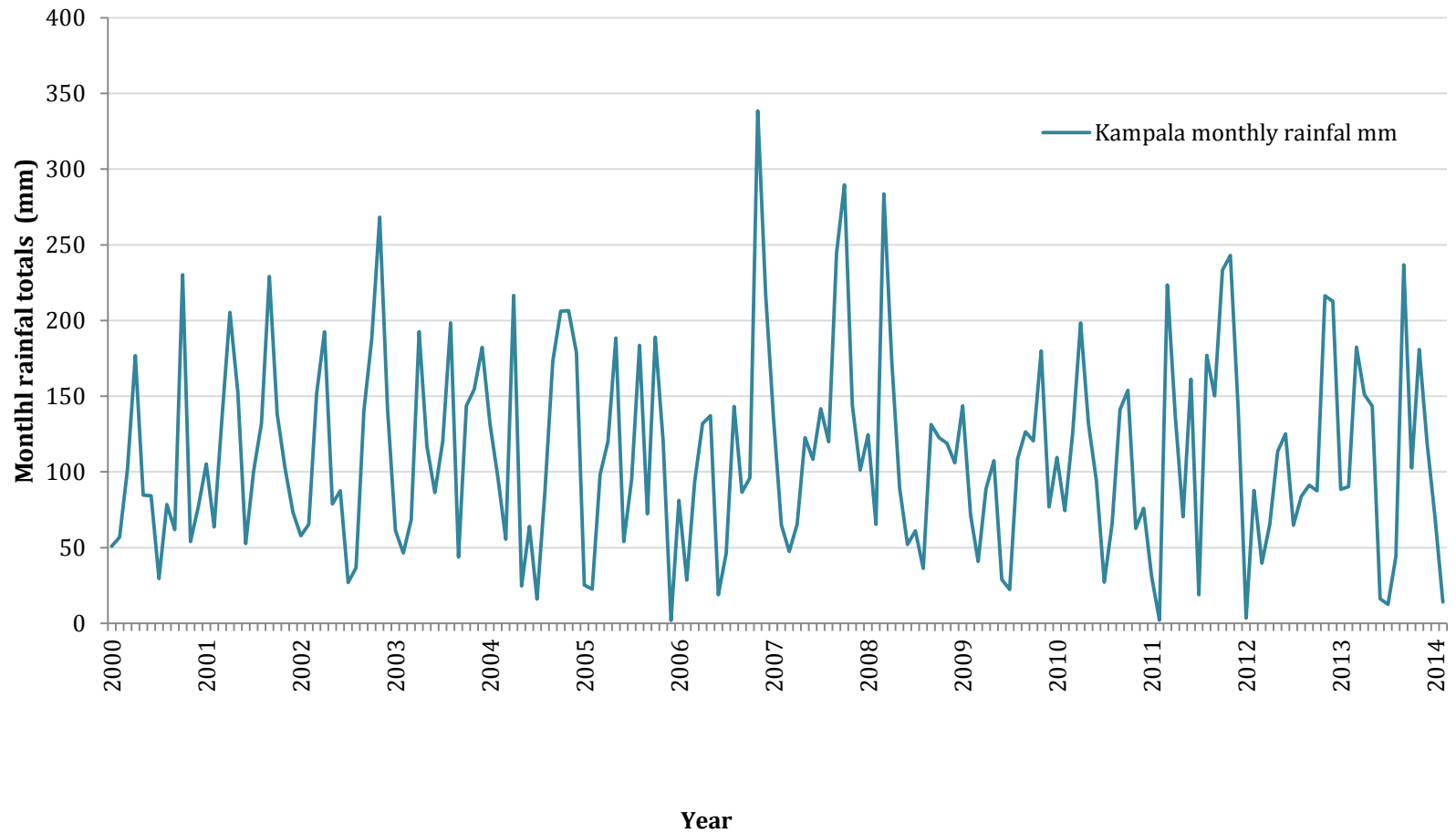
# Observed climate profiles for Uganda, Kampala

	Temperature	Precipitation	Extreme weather events
<b>Uganda</b>	<ul style="list-style-type: none"><li>• Average temperatures + 0.8 - 1.5°C (1900 - 2009) i.e. warming of about 0.2°C per decade.</li></ul>	<ul style="list-style-type: none"><li>• Between 2000–2009, rainfall has been on average about 8 percent lower than rainfall between 1920 and 1969.</li></ul>	<ul style="list-style-type: none"><li>• 90% of Uganda's natural disasters are climate change related.</li><li>• Since 1990, the magnitude and frequency of droughts and floods has increased with over 5 million people directly affected.</li></ul>
<b>Kampala city</b>	<ul style="list-style-type: none"><li>• Near-surface temperatures + 1°C - 1979 and 2005</li></ul>	<ul style="list-style-type: none"><li>• No significant change in rainfall between 1951 and 2014</li></ul>	<ul style="list-style-type: none"><li>• Increased in frequency and magnitude of heavy rainfall, floods and droughts</li></ul>

# Kampala - Observed temperature



# Kampala – Monthly rainfall 2000-2014



# Projected climate - global and regional

	Temperature	Precipitation	Extreme weather events
<b>Global</b>	Average temperature on the surface will increase by 0.3 to + 4.8 ° C by the end of the 21st century	No uniform change in global water cycle Increase contrast in areas precipitation; increase in wet and dry seasons	<ul style="list-style-type: none"> <li>Continued ocean warming and acidification</li> <li>decrease the thickness of the ice</li> <li>Accelerated rise in sea level: 26-82 cm by 2100</li> </ul>
<b>Africa/ Eastern Africa</b>	<ul style="list-style-type: none"> <li>Africa's surface temperatures are likely to increase up to 2-4°C by the end of the 21st century.</li> <li>Eastern Africa has experienced a significant increase in temperature since the early 1980s.</li> </ul>	<ul style="list-style-type: none"> <li>No significant change in annual rainfall over Africa, but seasons are likely to change.</li> <li>In Eastern Africa, rainfall is likely to increase: increase in wet seasons and decrease in dry seasons</li> </ul>	<ul style="list-style-type: none"> <li>Increase in the magnitude and frequency of droughts and floods.</li> </ul>

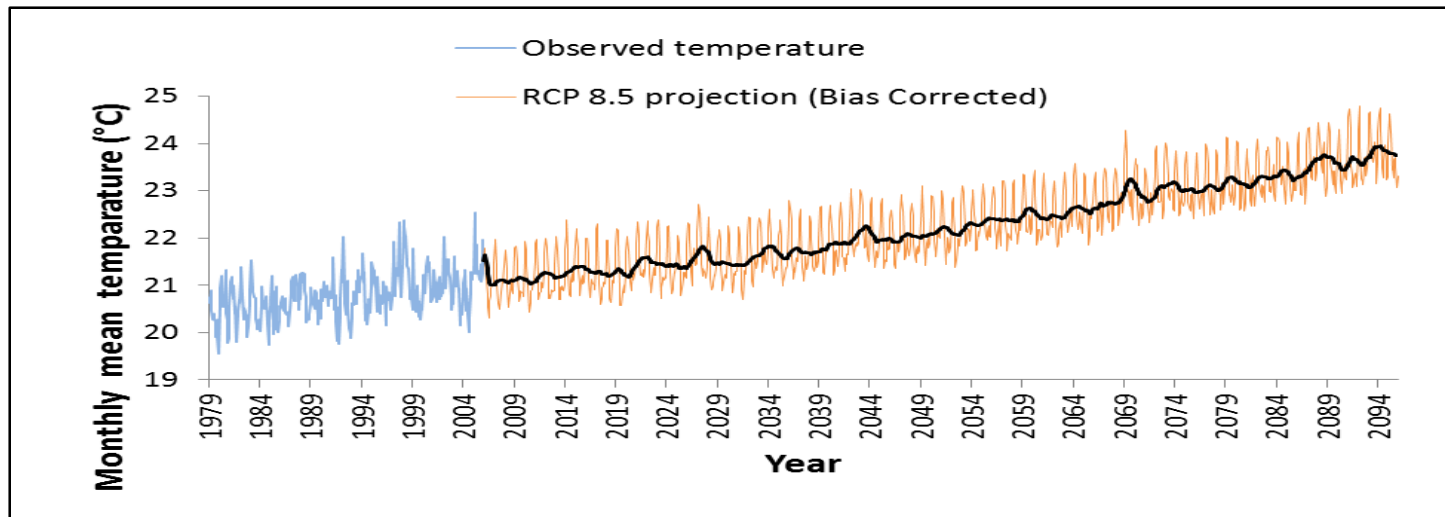
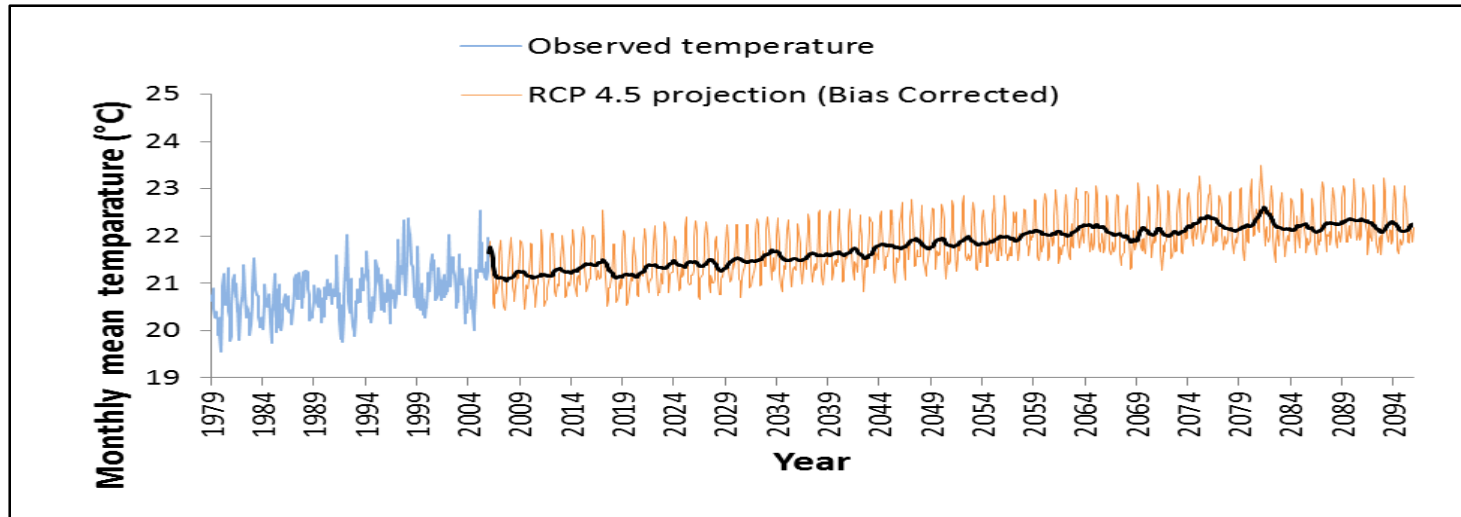
# Projected climate – Uganda, Kampala

	Temperature	Precipitation	Extreme weather events
<b>Uganda</b>	<ul style="list-style-type: none"><li>• Average temperatures +2°C to +5°C by the end of the 21st century</li></ul>	<ul style="list-style-type: none"><li>• 10mm to -20mm (mostly in the northern half) to -30mm per month (mostly in the south). Over -100mm per month over lake Victoria.</li></ul>	<ul style="list-style-type: none"><li>• The magnitude and frequency of droughts and floods will increased.</li></ul>
<b>Kampala city</b>	<ul style="list-style-type: none"><li>• Near-surface temperatures + 1.5 - 3°C by the end of the 21st century</li></ul>	<ul style="list-style-type: none"><li>• A decrease of approximately 20mm</li></ul>	<ul style="list-style-type: none"><li>• Increased in frequency and magnitude of heavy rainfall and floods, droughts</li></ul>

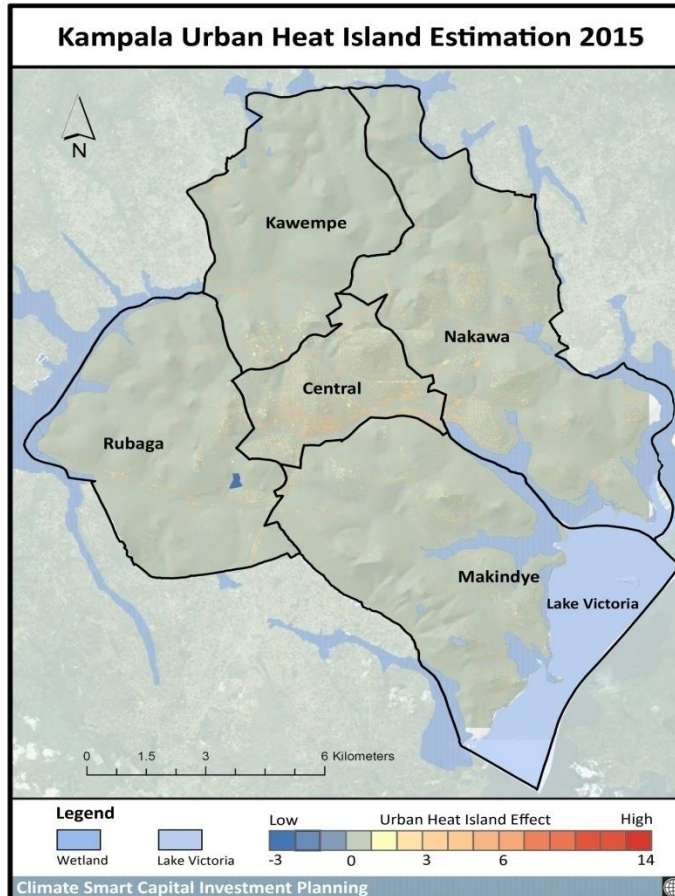
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# Kampala - Projected temperature increase

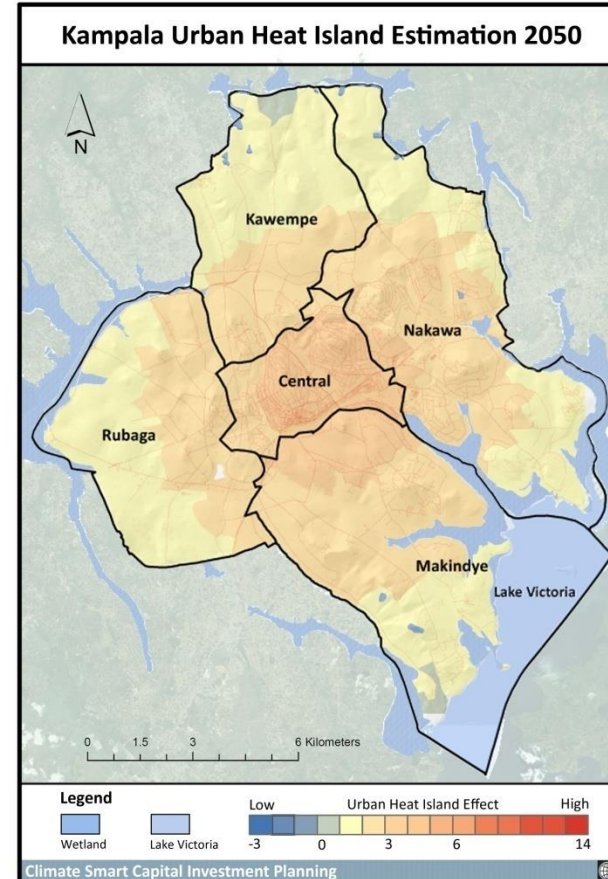


# Kampala urban heat island effect



## Urban Heat Island

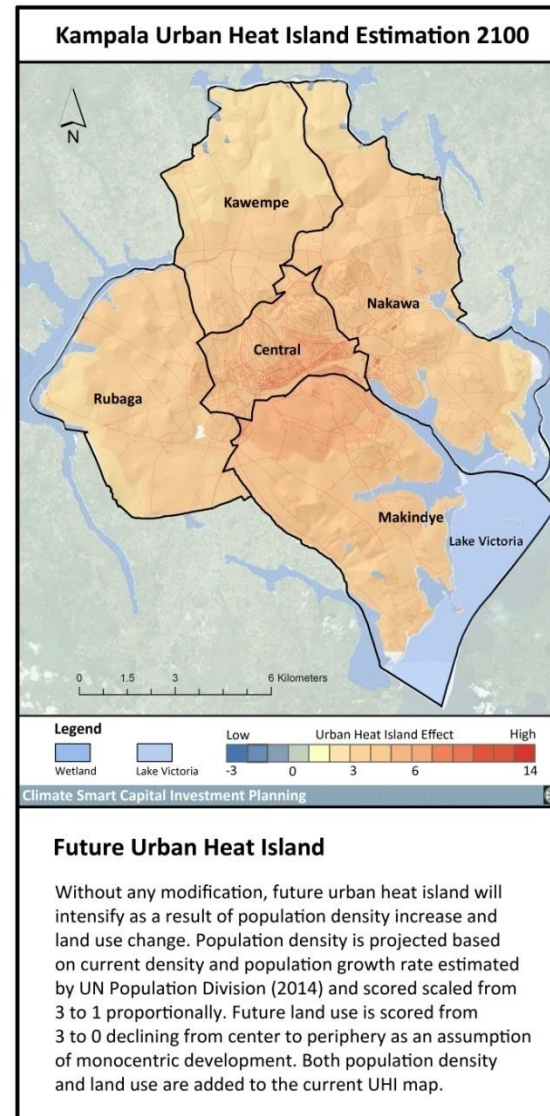
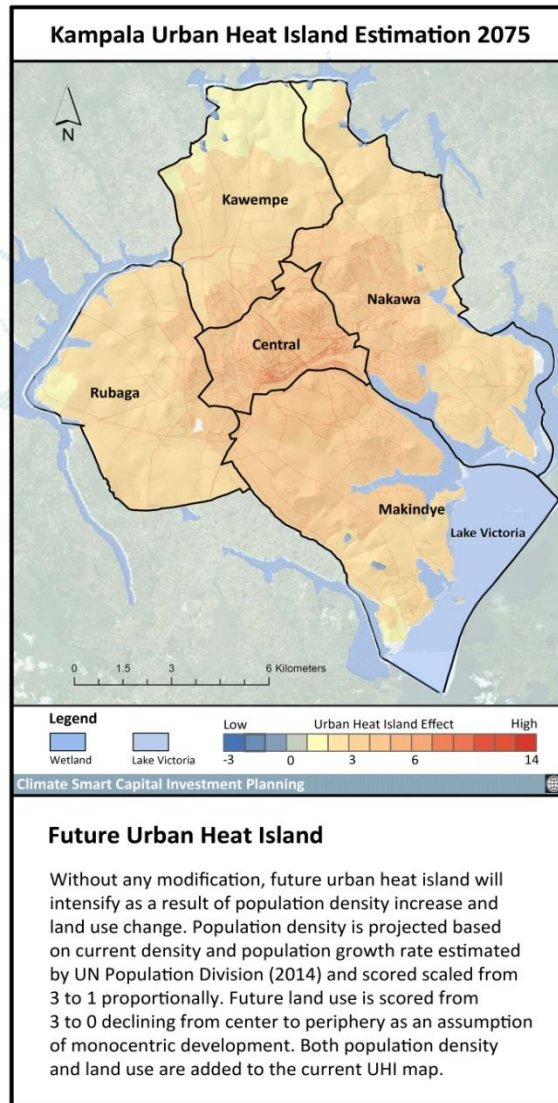
An urban heat island is a city or metropolitan area that is significantly warmer than its surrounding rural areas due to human activity. Urban elements that contribute to increase heat (e.g. roads, buildings, etc) are scored in positive numbers. Landscape features that moderate urban heat are scored in negative numbers (e.g. trees, green space and water). As Kampala grows and continues to develop, the urban heat island will intensify.



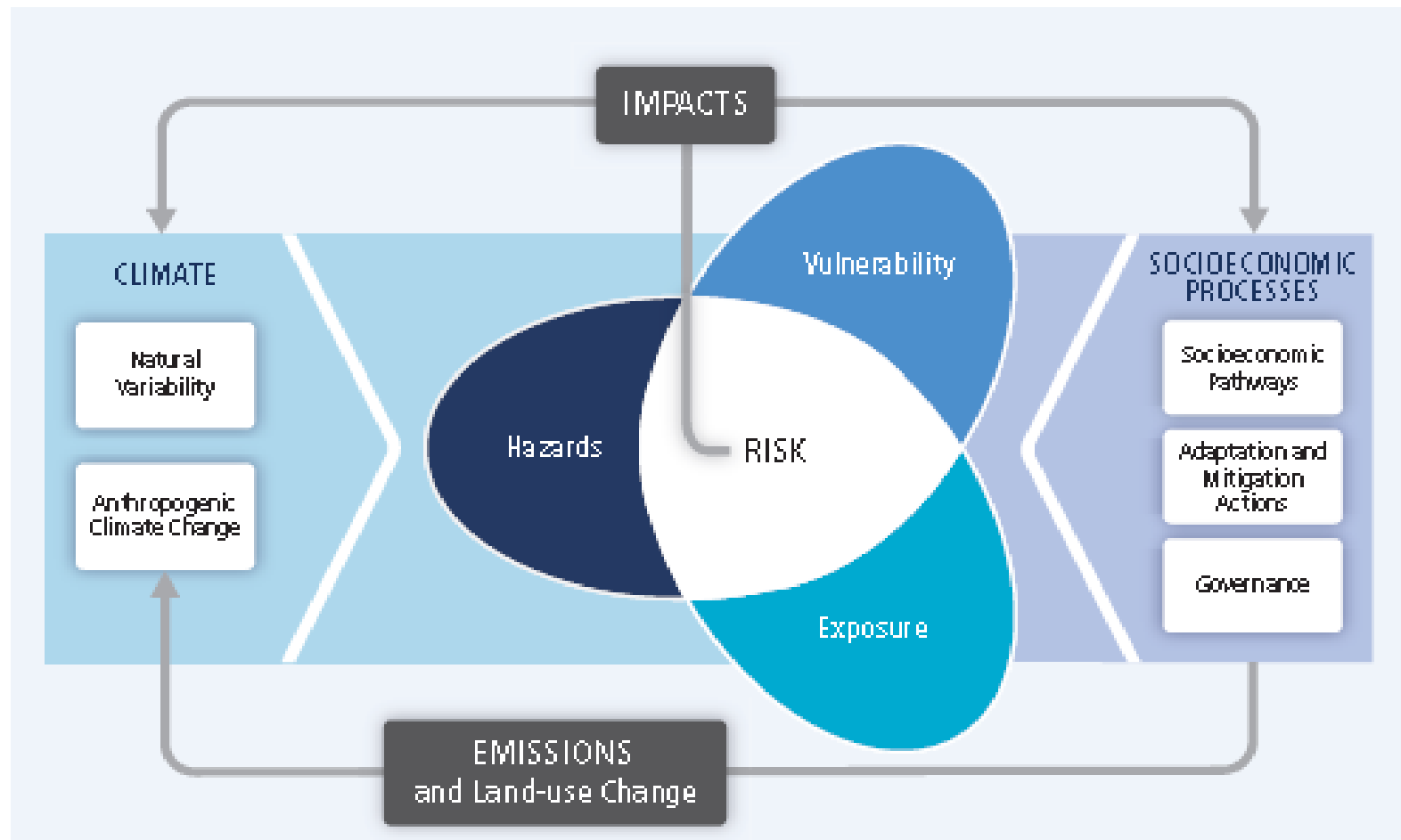
## Future Urban Heat Island

Without any modification, future urban heat island will intensify as a result of population density increase and land use change. Population density is projected based on current density and population growth rate estimated by UN Population Division (2014) and scored scaled from 3 to 1 proportionally. Future land use is scored from 3 to 0 declining from center to periphery as an assumption of monocentric development. Both population density and land use are added to the current UHI map.

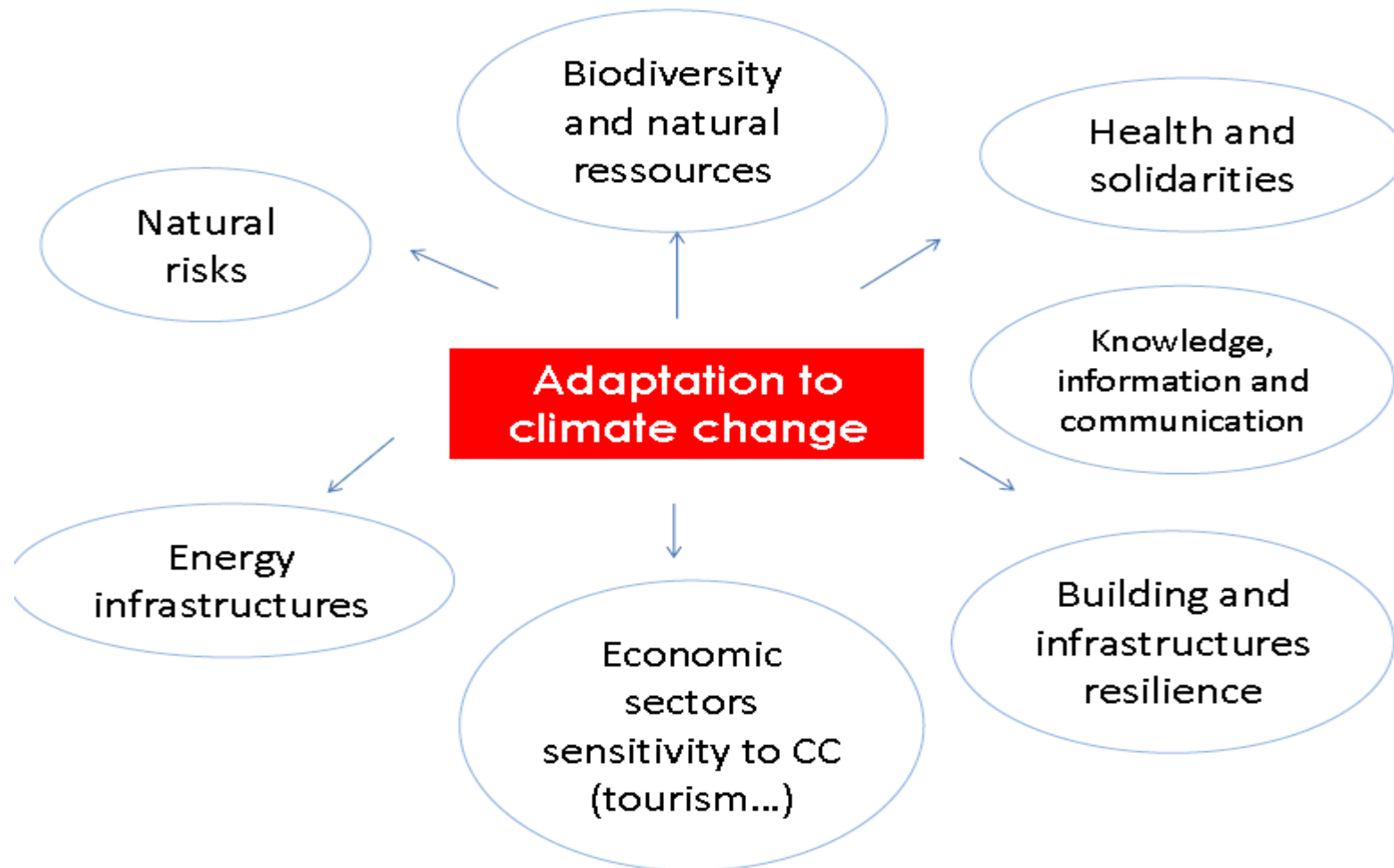
# Kampala urban heat island effect



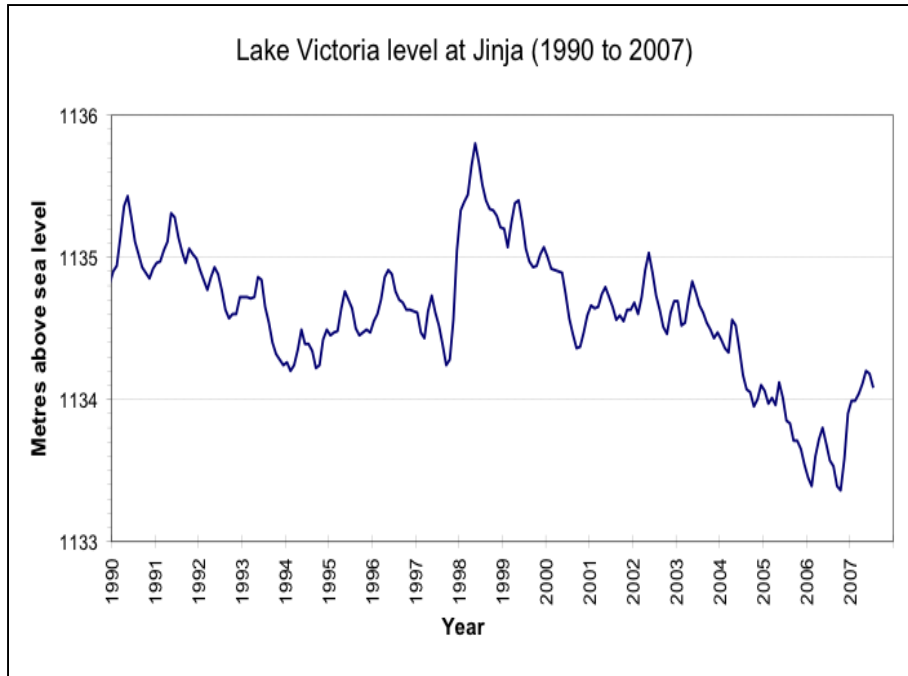
# Climate change impacts, vulnerability and socio-economic development



# Dimensions of vulnerability and adaptation



# Energy and water vulnerabilities



- Dependence on energy that is produced outside the city
  - KCCA has no control on the price of the energy, reliability and performance.
- Impacts of climate change impacts affect the energy supply chain;
  - water level and energy generation,
  - Effects of storms and floods on energy supply,
  - disruption in supply of oil (transport), breakdown of the electricity distribution network
- Dependence on Lake Victoria for water supply
  - Water scarcity, pollution and related impacts

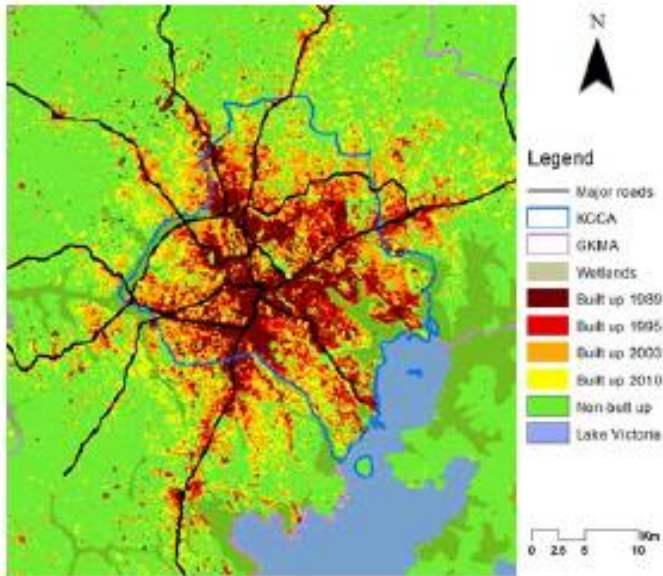


# Mobility and transport



- Kampala city has spread without adequate controls;
  - public transport to the extended areas is inadequate,
  - necessitating almost exclusive reliance on motor vehicles.
- The main transport challenges in Kampala city are accessibility and connectivity
  - Travel time, costs, maintenance and high GHG emissions.
- The city's transport is considerably exposed and affected by flooding
  - the roads, bridges and rail.
- The disruption of transport has critical economic and social consequences.

# Spatial Developments in Greater Kampala



**Expansion of settlements**



**Hillside developments**



**Encroachment on wetlands**



# Housing and health

- Hillside housing development an wetland encroachment – flooding
- The poor and marginalized in slums or informal settlements are most exposed to disaster risk.
- Water borne diseases during floods – cholera, dysentery, typhoid, diarrhea  
Spread of diseases, malaria

# Economic activities

- Agriculture – crop failures in the hinterland – food shortages and rising food prices; declining urban agriculture due to land shortage
- Industry – supply of raw materials: meat, fish, milk, coffee, cotton, grain milling etc are affected by climate change
- Floods and storms affect transport – this affects trade and industry
- Floods affect commercial activities, retail, wholesale, small scale
- Impacts on tourism and on Kampala attractiveness as a business and holiday destination
- There is a huge potential to develop the resilience of the economic sector but also to develop the green economy potential (and the related green jobs)
  - renewable energies, eco-mobility and public transport, green tourism, urban agriculture and urban nature, wastewater treatment, eco-materials and eco-construction...