

Promoting Green Urban Development in Africa:

enhancing the relationship between urbanization,
environmental assets and ecosystem services

Presentation Outline




Context of Case Study Cities

Quality of Environmental Assets

Drivers of Environmental and Ecosystem Vulnerability

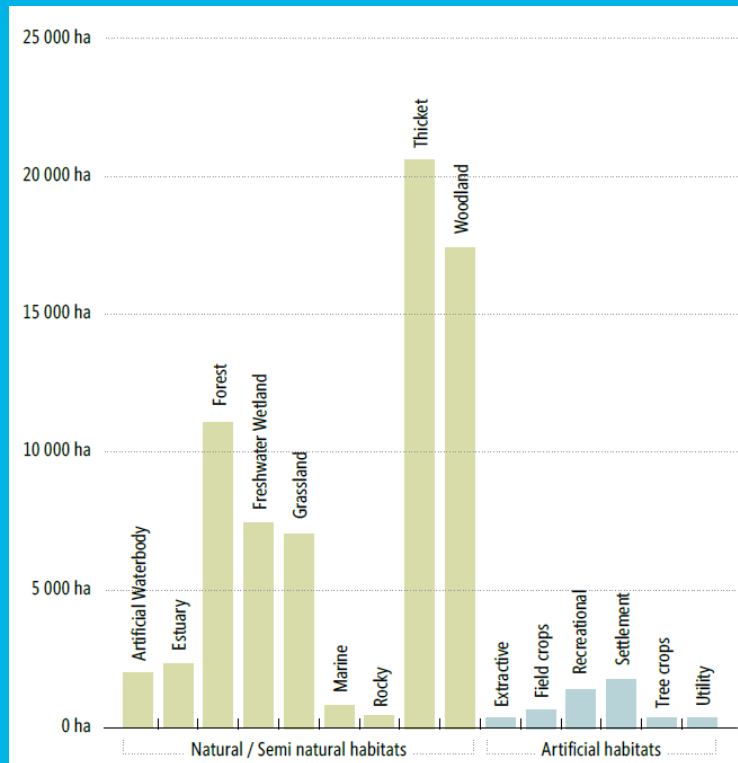
Key messages

Comparative Context of Case Study Cities

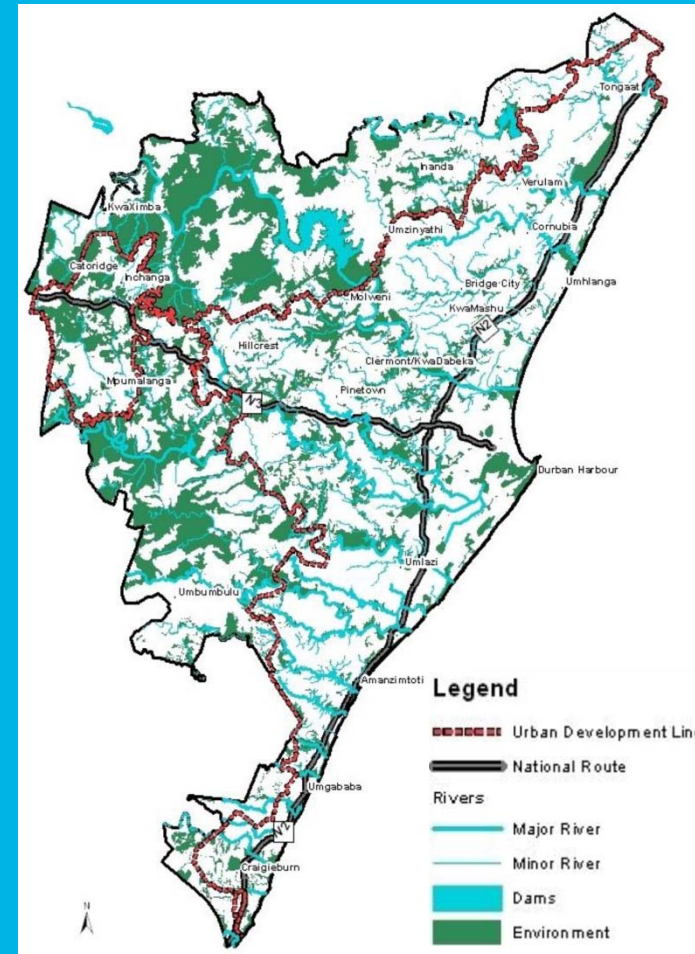
City	Population	Population Growth Rate	Land Area (km ²)	Population Density (Persons per km ²)	Characteristic	
Durban, South Africa <i>(eThekweni Municipality, 2014)</i>	3,442,361	1.13% per year (2001-2011)	2,297	1,498	Inland hills, coastal plain, coastline approx. 60km.	
Kampala, Uganda <i>(KCCA, 2012)</i>	1,516,210	Above/near 4% per year (1970-2010)	189 >10% vacant land remains	8,022	Numerous hills surrounded by wetland corridors.	
Dar es Salaam, Tanzania <i>(URT, 2012)</i>	4,364,541	Above/near 5% per year (1978-2012) Fastest growing city in East Africa	1,630	2,677	Relatively flat coastal plain with river channels	

Data Collection

Durban: considerable availability of environmental baseline data and comprehensive analysis.



Summary of D'MOSS Habitat Types and Extent
State of Biodiversity Report, 2013



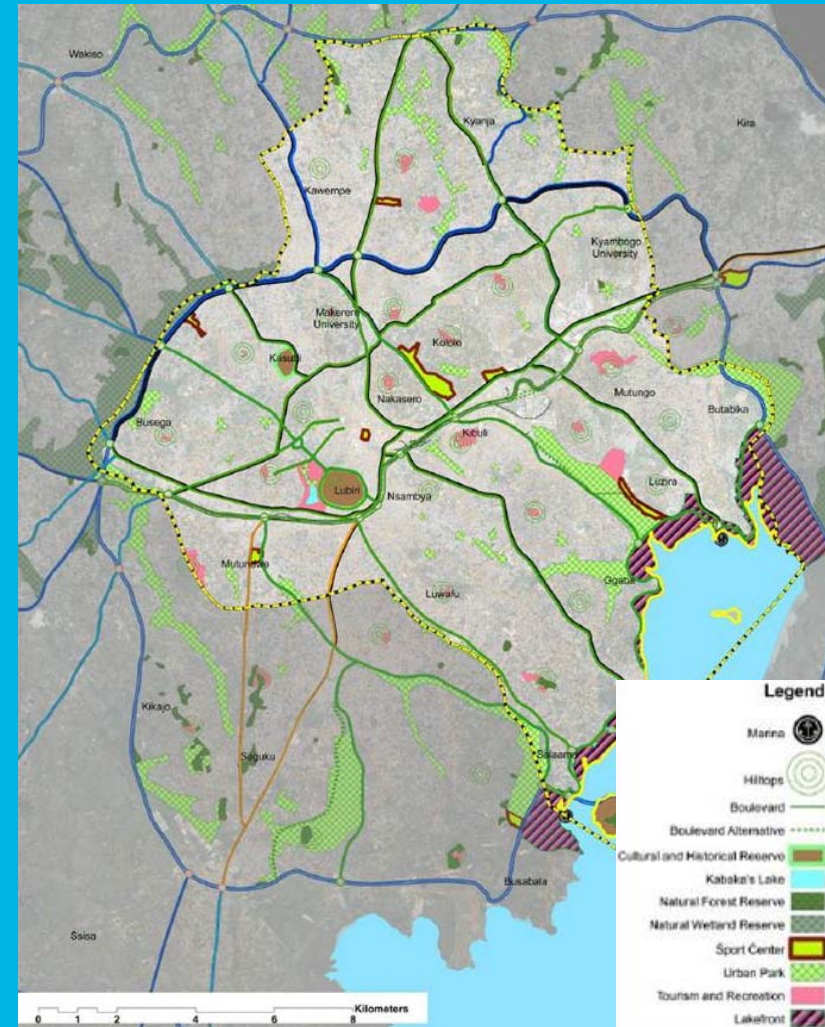
Durban Environmental Plan
eThekweni Municipality, 2013b

Data Collection

Kampala: Limited environmental baseline data and analysis.

Focused data and analysis primarily on wetlands.

Mapping limited to spatial and urban planning issues.



Diagrammatic Plan of Kampala Natural Resources and Open Spaces
KCCA, 2012

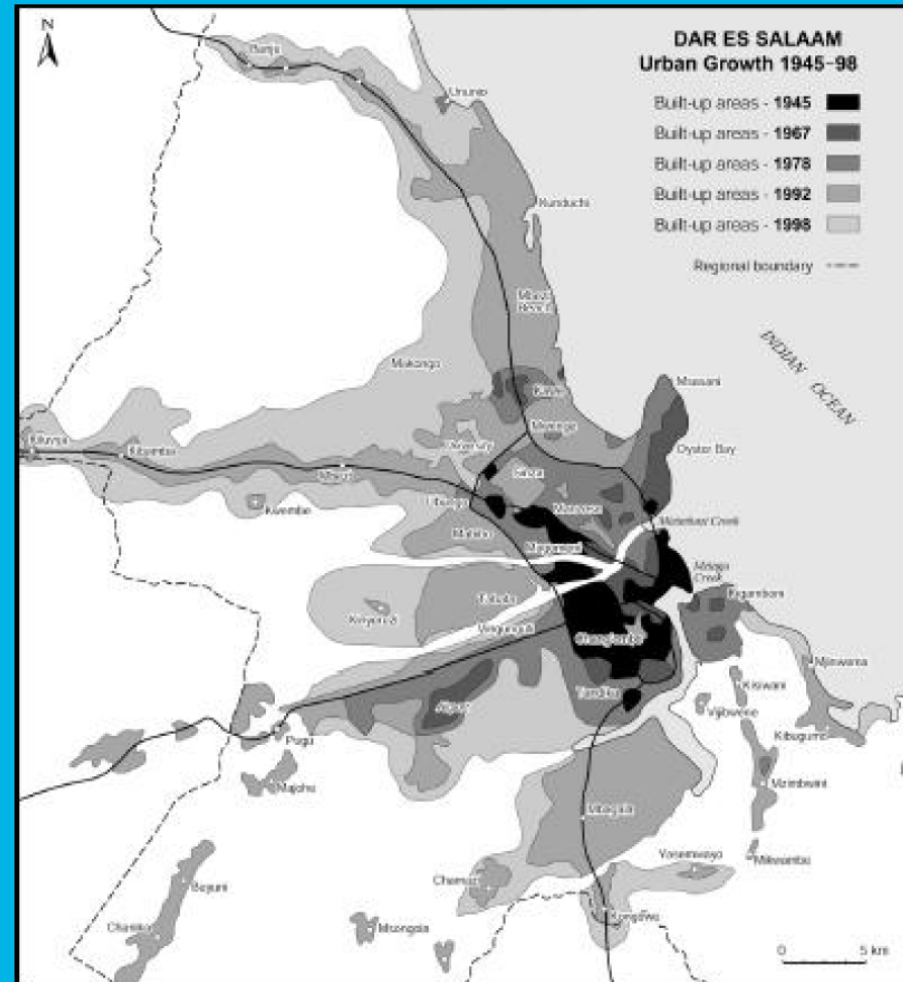
Data Collection

Dar es Salaam: Limited environmental baseline data and analysis.

Lack of a master plan (last update 1979).

Mapping limited to spatial and urban planning issues, environmental assessments and Google Earth aerial imagery.

Focused data and analysis primarily on Msimbazi River.



Pattern of Urban Growth
Dar es Salaam Draft Master Plan, 2012

Main Themes of Environmental Quality

Water quality degradation.

Progressive loss of terrestrial assets.

Increasing air quality concerns.

Climate change is exacerbating main themes.

Durban: degradation of river water quality

Increasingly polluted and degraded rivers, threatening potable water supply.

Sampling of 61 sites on 33 EMA rivers:

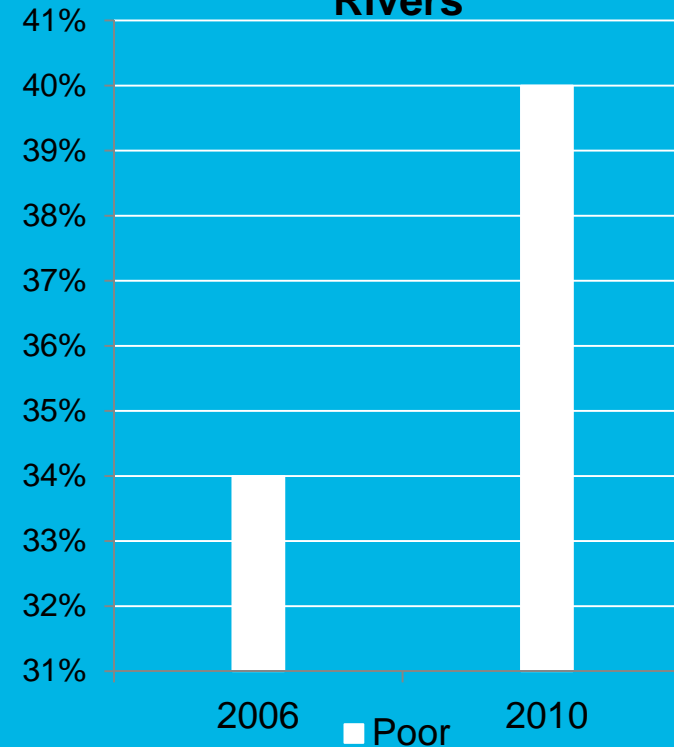
2006

- 34% degraded to rate poor condition
- 27% rated fair condition

2010

- Increased to 40% poor condition
- 3% in good to intermediate condition

“Poor” ratings of 33 EMA Rivers



Condition of 33 EMA Rivers

eThekweni Municipality IDP, 2014; Ground Truth, 2006

Kampala: degradation of wetlands

Reduced size of wetland reduces overall capacity to store and release storm water, filter sediments and pollutants from inflowing water.

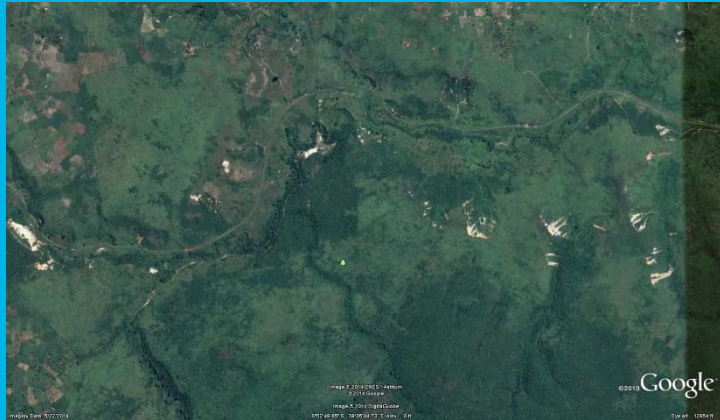
Wetland Encroachment						
Study Period	Permanent Wetlands			Seasonal Wetlands		
	Area(ha)	Change(ha)	Change(%)	Area(ha)	Change(ha)	Change(%)
1989	45	-	-	79	-	-
1995	118	73	162	183	104	132
2003	375	257	218	878	695	380
2010	658	283	75	1639	761	87

GKMA Wetland Encroachment 1989 – 2010

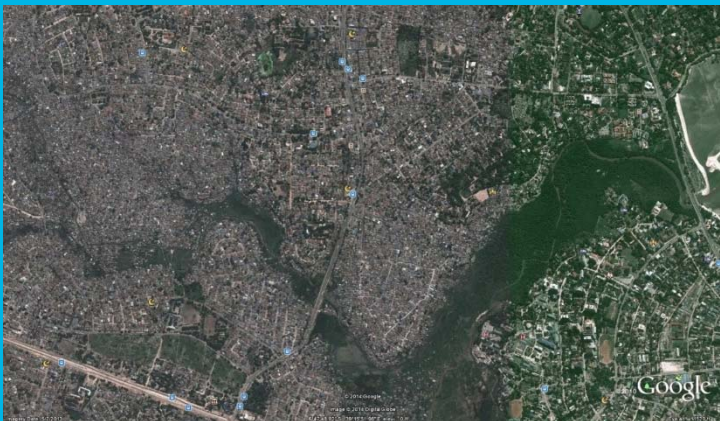
Abebe, 2013

Available analysis of encroachment combined with population growth figures suggests the remaining area of functioning wetlands is even more grim.

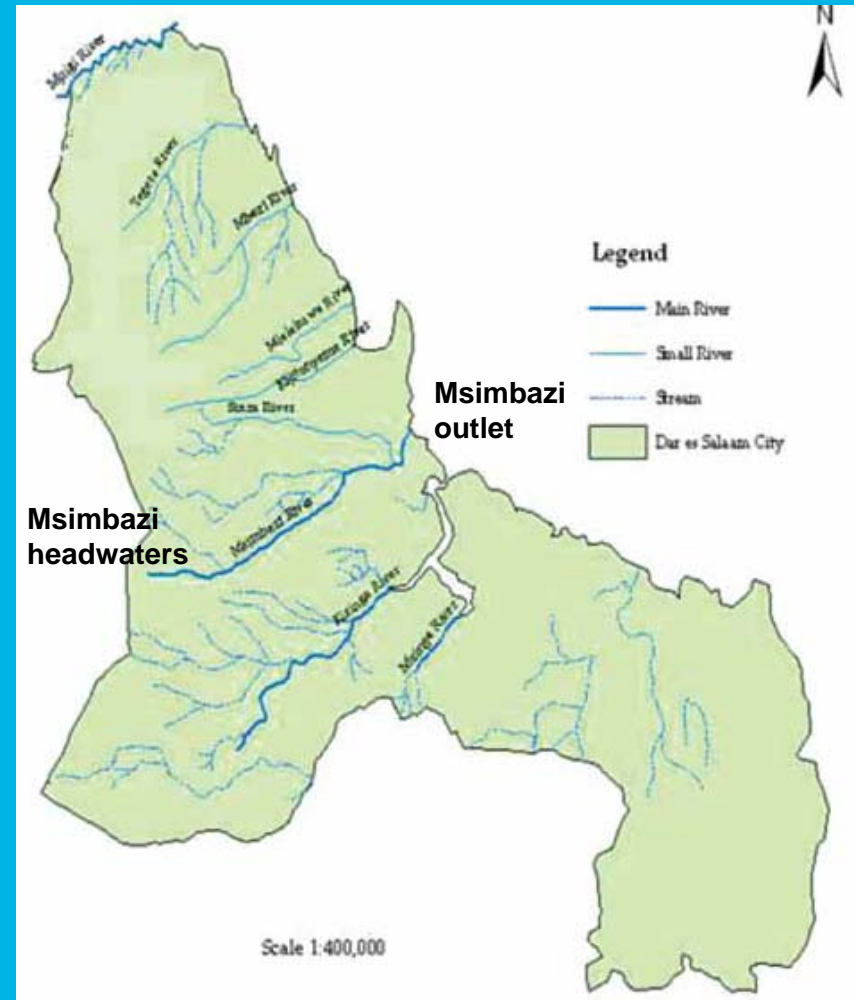
Dar es Salaam: degradation of rivers and catchments



Msimbazi River Headwaters in Pugu Forest Reserve



Msimbazi River Outlet at Indian Ocean



Rivers and Stream in Dar es Salaam City
JICA, 2008

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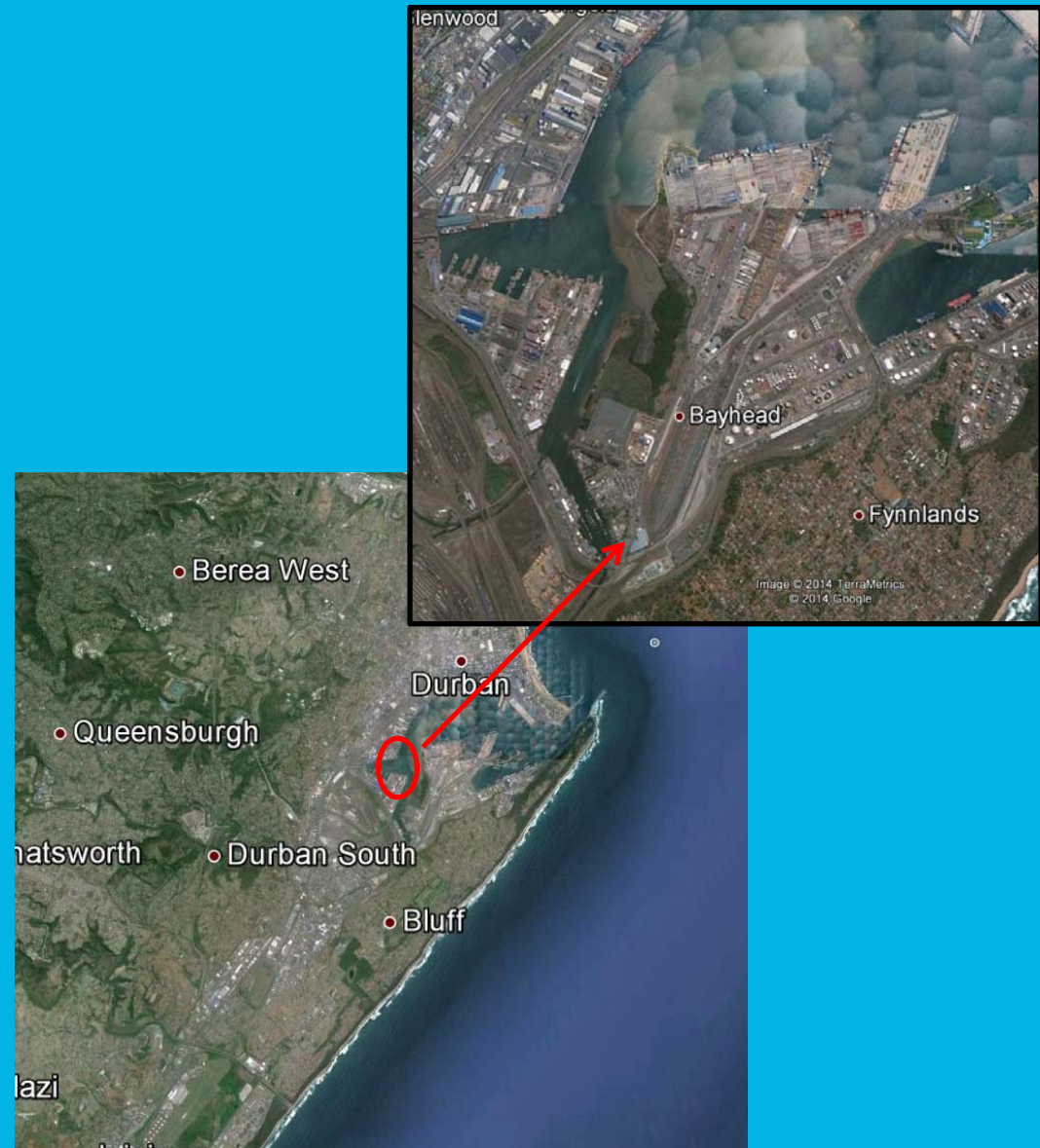
Climate change is exacerbating main themes.

Durban: Loss of Land, Soil, & Vegetation

Mangroves – Approx. 437 ha. of original forest area

Areas of decline:

- Majority of loss at Durban Bay - from 250 ha (1950) to 15 ha (2011).
- Beachwood at mouth of uMngeni River reduced to 44 ha.
- Isipingo River reduced to 12.5 ha.

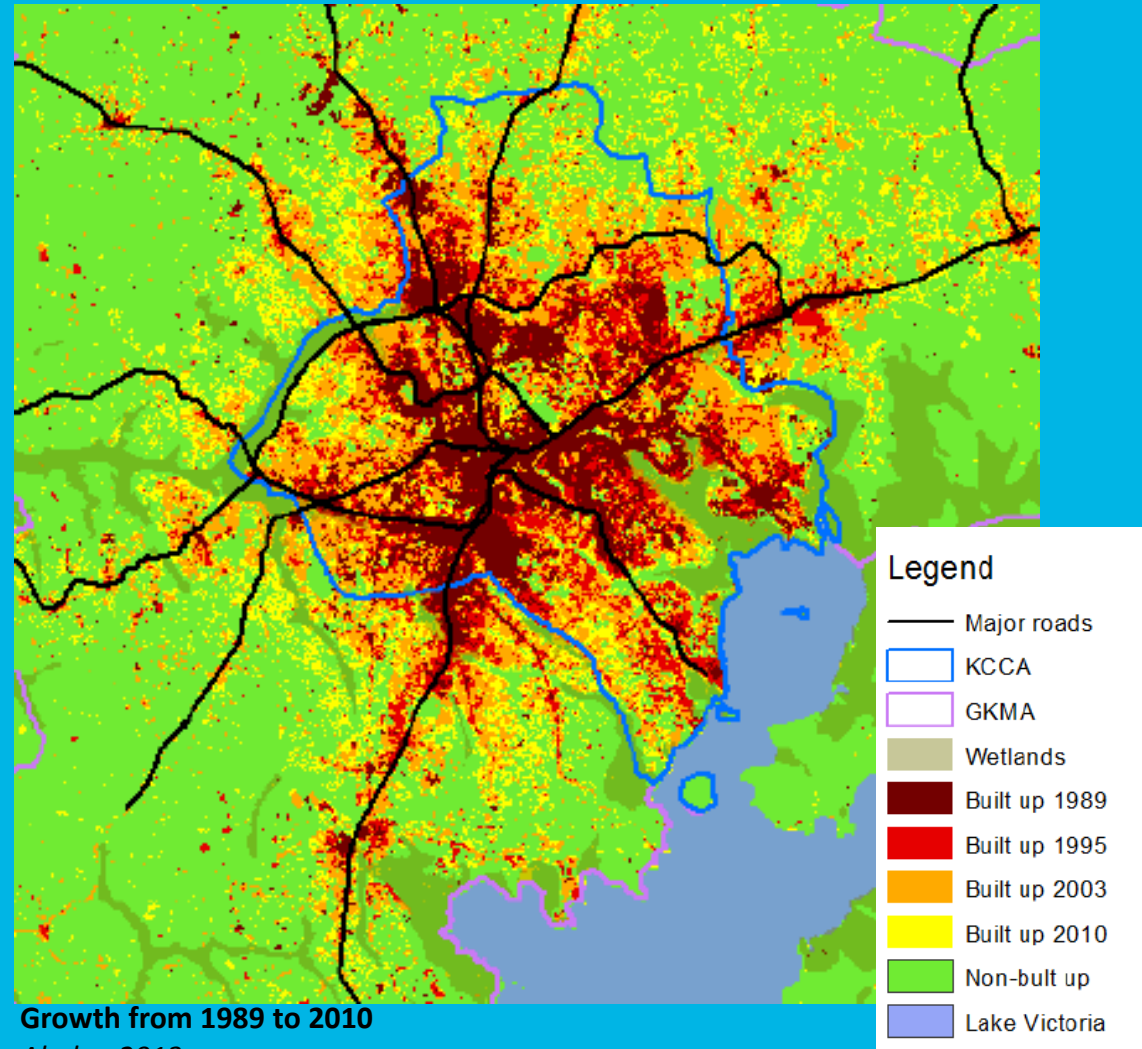


Loss of Mangroves at Durban Port

Kampala: Loss of terrestrial assets with conversion of Land

From 1989 to 2010, corresponding with explosive population growth, developed land area increased from 27% to 78%.

Loss of soil and vegetation coverage, leading to erosion, sedimentation, clogging urban drainage and degrading the natural drainage systems.



Growth from 1989 to 2010

Abebe, 2013

Dar es Salaam: Loss of Forest Land

Approx. 72 sq km of forest reserves remain.

2010 study – more than 30% decline of Pugu and Kazimzumbwi forests over 30 years.

Degradation driven by:

- Provision of vital goods - medicinal plants, fuel wood, building materials and food
- Close proximity to the city provides major markets for forest products.
- Expansion of settlement into peri-urban areas drives degradation.
- Little enforcement of forest law and limited restrictions on access to forest products.

Deforestation within catchment area has great impact on water quality and quantity downstream.



Natural Areas to be Protected
Dar es Salaam Draft Master Plan, 2012



Former Forest Degraded to Bush and Grassland
CCIAM, 2010

Dar es Salaam: Loss of Forest from Use of Charcoal

2012 - 94% of households relied on firewood and charcoal as primary fuel: it is cheaper and easily available.

Household Budget Survey, 2012

2009 – used 200,000-300,000 bags (avg. 50 kgs) of charcoal per month.

TZ biodiversity, 2009

Major source of energy for hotels, bars and small-scale food vendors.

WB DSM, 2011

Type of Fuel	Percentage Preference		
	1991/92	2000/01	2007
Charcoal	51	69	78
Kerosene	28	25	13
Electricity	15	4	5
Firewood	1	1	4

Household Fuel Preferences

Malimbwi and Zahabu, 2008



Charcoal Making in the Forest

CCIAM, 2010

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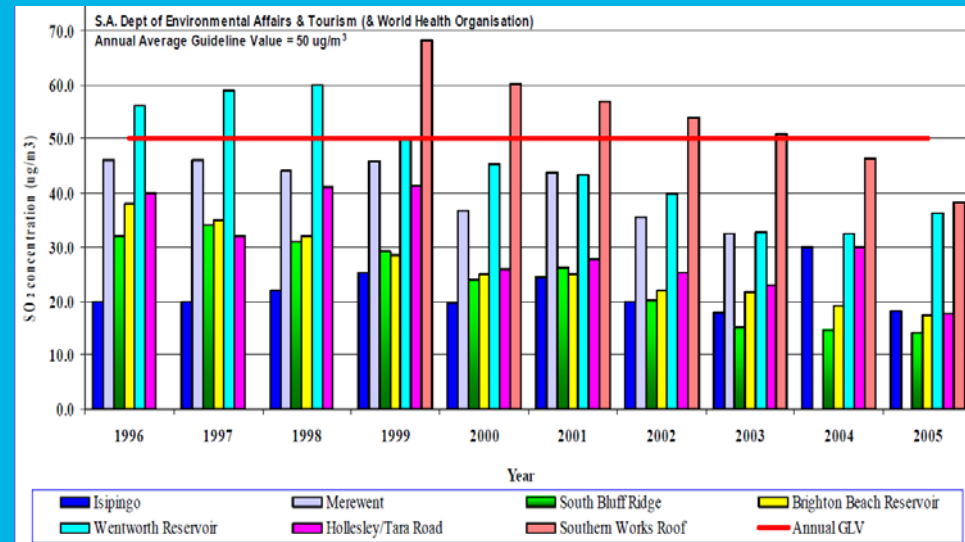
Durban: Industrial-based Emissions

Historically high level of SO₂ due to industry and transportation related to Port industry.

Recent interventions – such as end of pipe scrubbers - are reducing levels.

City has implemented air regulations that has lowered the concentration of major air pollutants to below international thresholds.

Transportation is growing source of air pollution.



10 Year Annual Average SO₂ Trend in South Durban

eThekweni Health et al, 2007

Kampala: Increase in Vehicle Use

Little air quality data available. First GHG inventory in 2012.

Structural shift in the composition of vehicle stock.

70% of imported vehicles are in Kampala.

Significant increase in motorcycles (boda-boda).

% Change in vehicle use from 2002 to 2012	
Light Transit	5.7%
Mini Buses	12.6%
Buses	5.4%
Trucks	9.2%
Motorcycles	15.7%

Increase in Vehicle Use 2002-2012
UBOS, 2012

Vehicle Type	2009	2010	2011	2012	2013	Total
Tractor Head/Trailer	607	627	827	1,268	1,157	4,486
Mini Bus	2,950	3,260	2,164	2,033	3,533	13,940
Saloon	22,133	31,879	24,897	28,179	29,397	136,485
Lorries	8,293	9,453	7,536	7,751	8,254	41,287
Total Vehicles	33,983	45,219	35,424	39,424	42,341	196,198
Motorcycles	63,734	69,717	101,736	69,368	85,183	389,738
						585,936

Newly Imported Vehicles in Uganda, 2009-2013

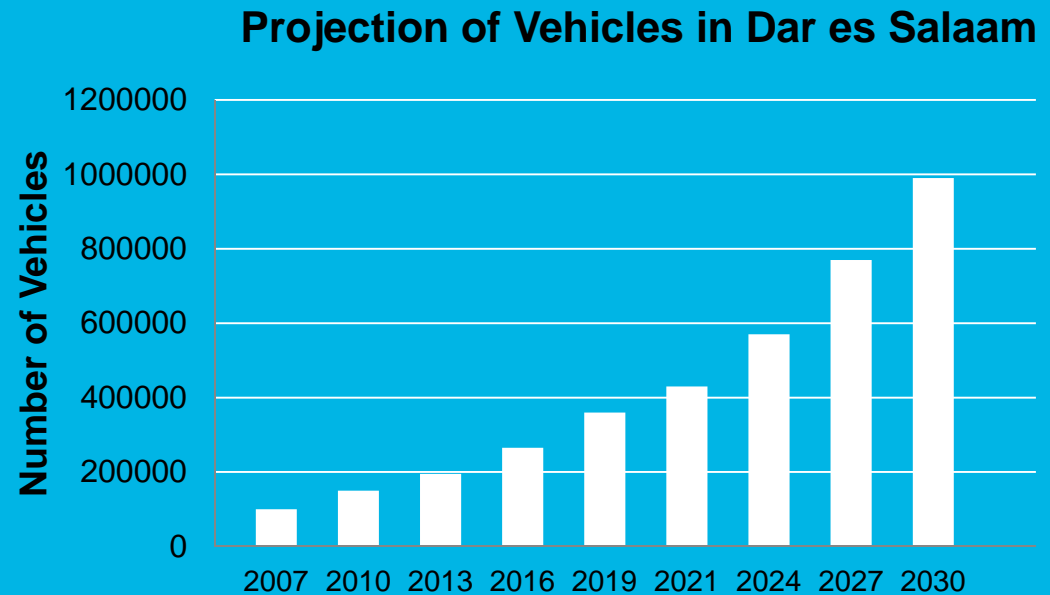
Ministry of Works and Transport, 2014

Dar es Salaam: Increase in Vehicle Use

Little air quality data available.

Majority of the population travels by bicycle and by walking, trend is shifting to motor vehicles.

Increase in motor vehicles use:
24,600 in 1979
605,000 to 705,000 in 2011.



Projection of Vehicles in Dar
UNEP, 2011

Common Drivers of Environmental Degradation




Informal Settlements

Effluents

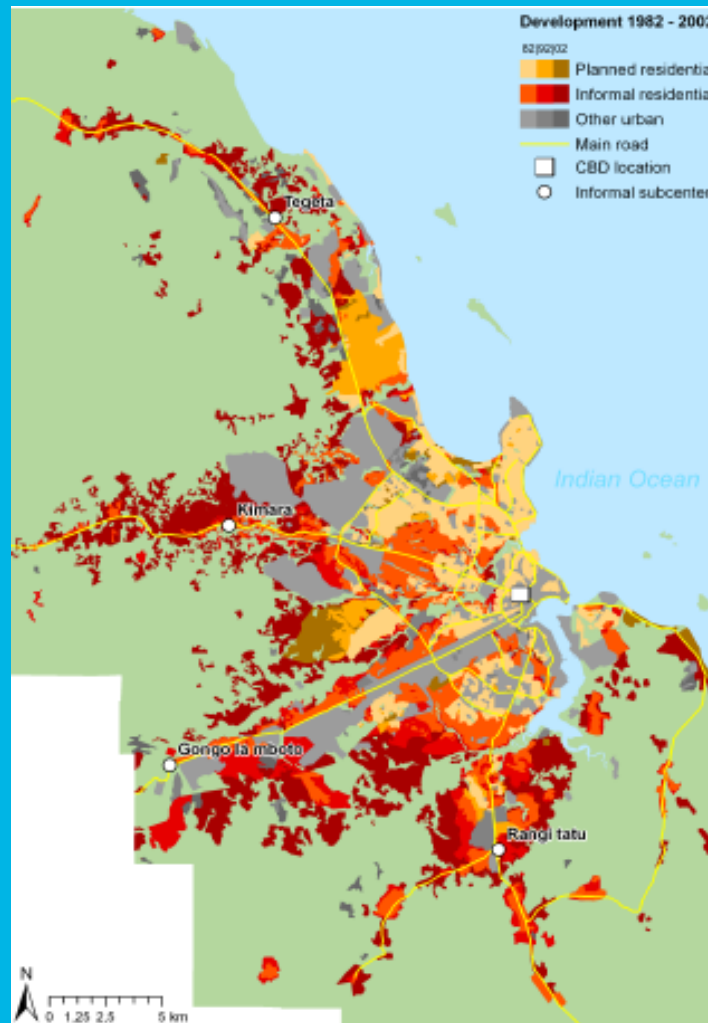
Solid Waste

Impacts of Climate Change

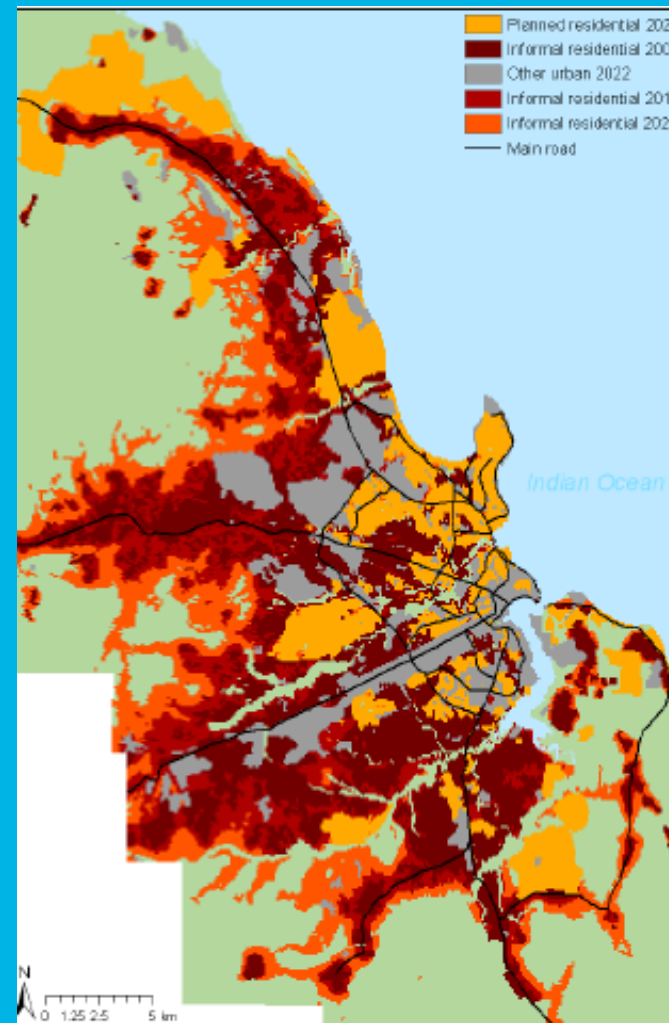
Informal Settlements

City	Percent	Number	Characteristic	
Durban, South Africa <i>(eThekweni Municipality, 2014)</i>	27.2% of households	262,000 households	Unique legacy of post-apartheid segregation, areas within unregulated tribal land	
Kampala, Uganda <i>(KCCA, 2012)</i>	40% of population		Low lying areas, along the wetlands	
Dar es Salaam, Tanzania <i>(URT, 2012)</i>	75% of development	100+ settlements	Outward expansion along river corridors and infill areas	

Projected Growth of Informal Settlements



Development 1982-2002
Hill and Linder, 2010



Planned and Informal Residential 2012-2022
Hill and Linder, 2010

Common Drivers of Environmental Degradation

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Solid Waste

Impacts of Climate Change

Effluents due to Lack of Sanitation Services

City	Population	Amount of Population Serviced by Piped Sewerage
Durban	3,442,361 <i>eThekweni Municipality, 2014</i>	54.6% of households <i>IDP, 2014</i>
Kampala	1,516,210 <i>KCCA, 2012</i>	10% of population <i>KCCA, 2012</i>
Dar es Salaam	4,364,541 <i>URT, 2013</i>	Approx. 10-14% of population <i>URT, 2014b</i>

Durban: Lack of Sanitation in Informal Settlements

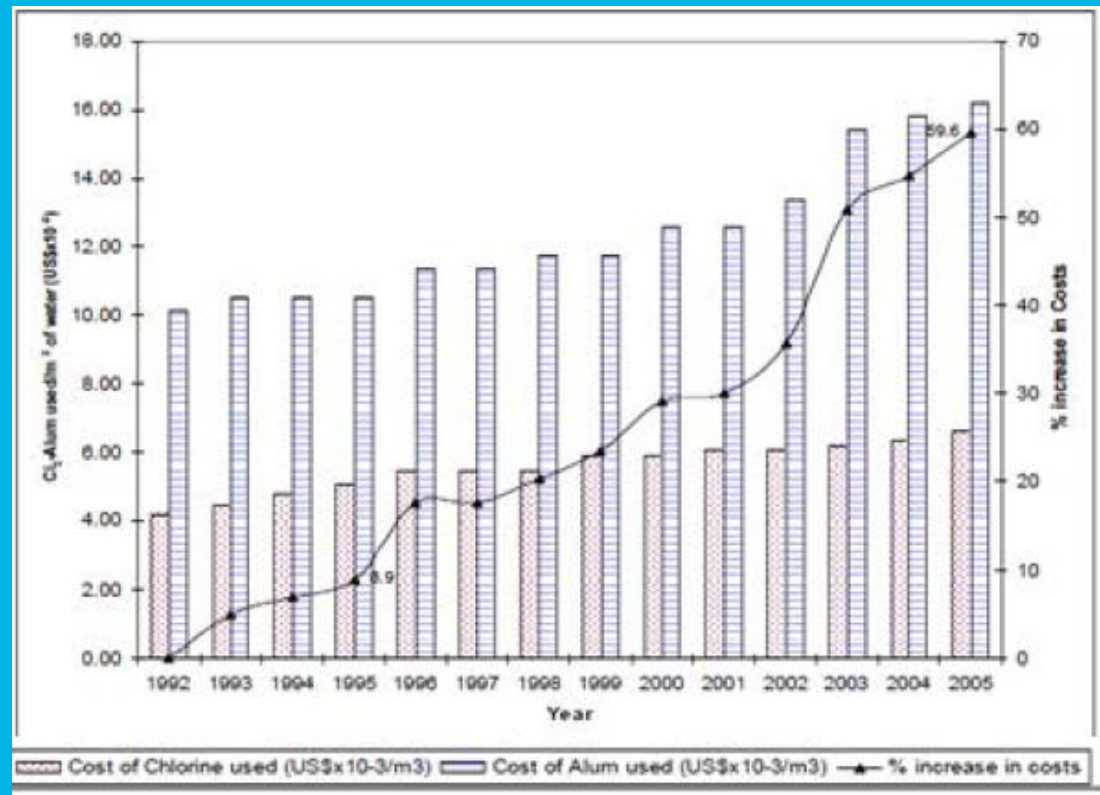
Lack of sanitation in informal settlements (72% pop un-serviced in informal settlements) drives increasing eutrophication of rivers and estuaries.

Access to Sanitation Facilities	2001	2011	% Change b/t 2001- 11
Higher level of access (Flush toilet connected to sewerage system)	10%	15%	50%
Basic access (Flush toilet with septic tank/pit latrine with VIP)	16%	12%	-25%
No access	75%	72%	-4%

Access to Sanitation Facilities: eThekweni Households in Informal Settlements
The Housing Development Agency, 2012, 2013

Kampala: Cost of Inadequate Sanitation

Lack of sanitation services (10% pop serviced), compounded by lack of drainage, steadily increased treatment costs for city water supply at Gaba Drinking Water Intake Facility.



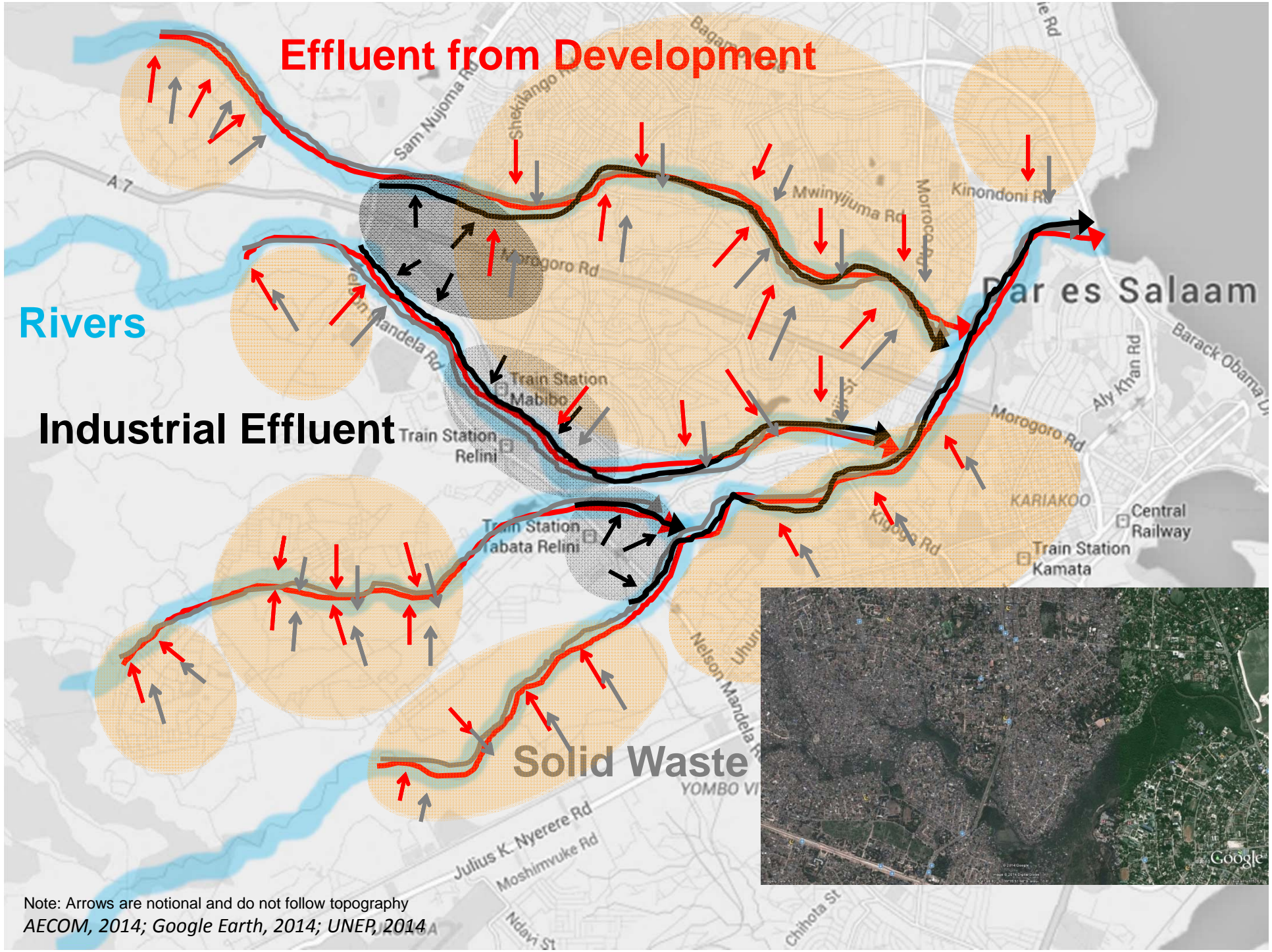
Increased Costs of Water Treatment Chemicals in Gaba Water Treatment
Mwanuzi et al., 2005

Effluent from Development

Rivers

Industrial Effluent

Solid Waste



Note: Arrows are notional and do not follow topography
AECOM, 2014; Google Earth, 2014; UNEP, 2014

Common Drivers of Environmental Degradation

Informal Settlements

Effluents

Solid Waste

Impacts of Climate Change

Solid Waste

City	Approximate Rate of Uncollected Solid Waste
Durban <i>SAWIC, 2012</i>	11% (approx. 75% in informal areas)
Kampala <i>Madinah et al., 2014</i>	35%
Dar es Salaam <i>Ilala Municipal Council; URT, 2014a</i>	60-63%

Comparison of Rates of Uncollected Solid Waste

Common Drivers of Environmental Degradation

Informal Settlements

Effluents

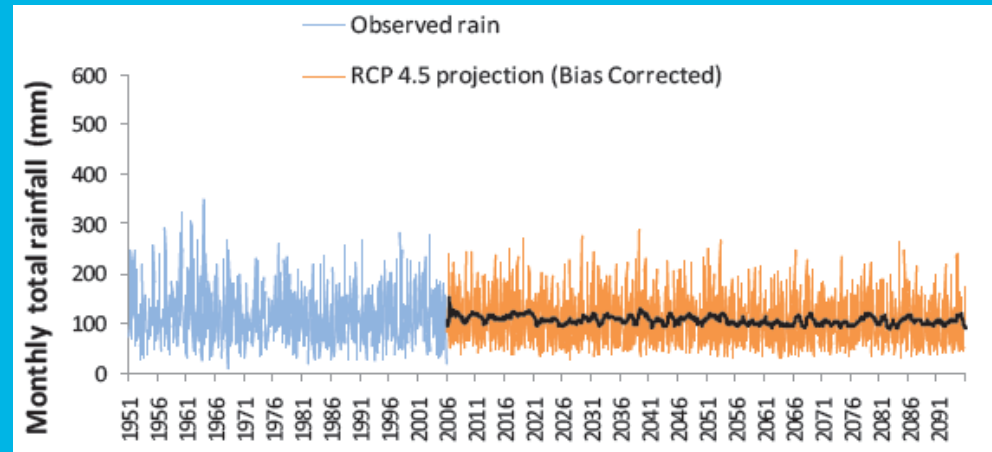
Solid Waste

Impacts of Climate Change

Projected Climate Change: Decline in Precipitation

Kampala overall decrease in precipitation, 20 mm decrease by 2095, Extended wet season from September into February

Limited data available, currently under development

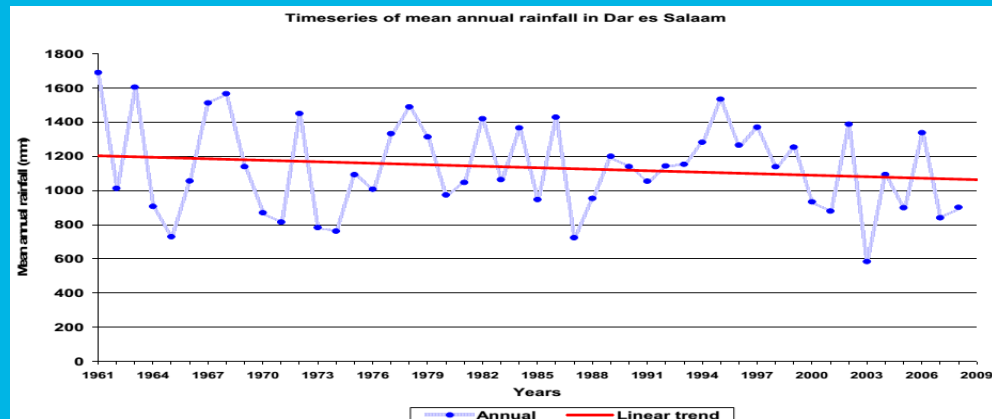


Kampala: Observed and Future Rainfall

Baastel, 2014

Dar es Salaam General reduction in annual rainfall over 5 decades.

Expecting both droughts and floods of increasing magnitude and frequency.



Dar es Salaam: Decline of Mean Annual Rainfall over the past 5 decades

TMA, 2010

Summary of Key Findings

Urban Planning

Durban: urban planning structure in place but weakened by limited control over municipality lands.

Kampala: the city has a lack of an effective physical development plan to guide growth and development, which has proceeded with little awareness or sensitivity of the overall impacts on ecosystems. Recently developed planning documents remain high level, need data and detailing.

Dar es Salaam: The city has not updated the master plan since 1979. More than 80% of the city lacks formal planning and public services.

Kampala and Dar es Salaam lack planning mechanism to identify and prioritize critical natural assets. There is no planning structure to evaluate and balance the impacts of development, to preserve assets or to mitigate the loss.

Informal Settlements

The continued growth of informal settlement is inevitable.

Each city is an important economic engine that will grow and attract new residents, many that cannot afford housing and without means to participate in the formal economy. This is particularly acute in Dar es Salaam.

Informal settlement is currently the single biggest driver of ecosystem loss; it will only worsen.

To arrest environmental degradation, each city needs plans that designate areas for informal settlement and describe mechanisms for providing basic services.

Environmental Regulation

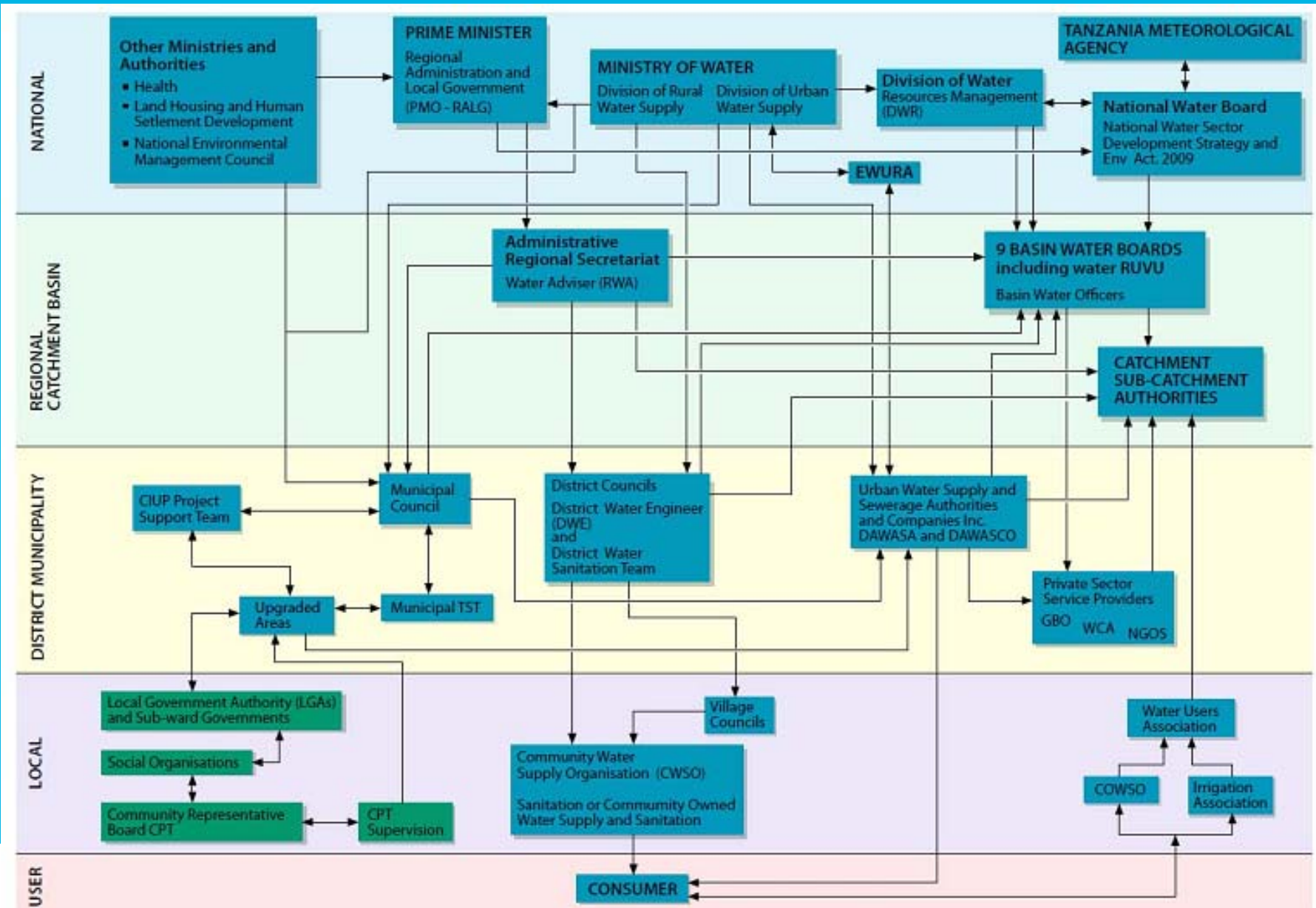
Durban The city is a leader in Africa on numerous environmental programs to address environmental degradation but it is limited by the lack of authority over much of the municipal land area

Kampala There is little implementation of existing wetland policy and regulations due to political, social, and economic implications of restricting land use. The enforcement capacity of institutions charged with environmental management is limited.

Dar es Salaam There are numerous institutions dealing with aspects of environmental issues of local nature, each with own legal framework and decision-making process.



City of Dar es Salaam Water Stakeholder Map



Institutional Challenge is a common problem

Durban Institutionally, the most difficult issue to address is EMA's lack of authority to direct development and conservation in the Tribal Lands. This drives the political and regulatory context; there is little will or leadership to address post-apartheid legacies. Urban and strategic planning lacks alignment and integration.

Kampala The city government is relatively new. It lacks experience, capacity and resources as it establishes a city government.

Dar es Salaam Institutional fragmentation problems are particularly bad in Dar es Salaam due to the weak city government and division of authority among three districts. Any effective interventions to protect remaining environmental assets will require serious action to address the institutional weaknesses that prevent effective response.

Kampala and Dar es Salaam are particularly challenged by limited financial resources to invest in grey infrastructure that is required to offset the degradation of the green environmental asset base.