UNITED NATIONS UNIVERSITY

UNU-FLORES

Institute for Integrated Management of Material Fluxes and of Resources

TECHNISCHE UNIVERSITÄT DRESDEN

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

INTERNATIONAL KICK-OFF WORKSHOP

11-12 NOVEMBER 2013

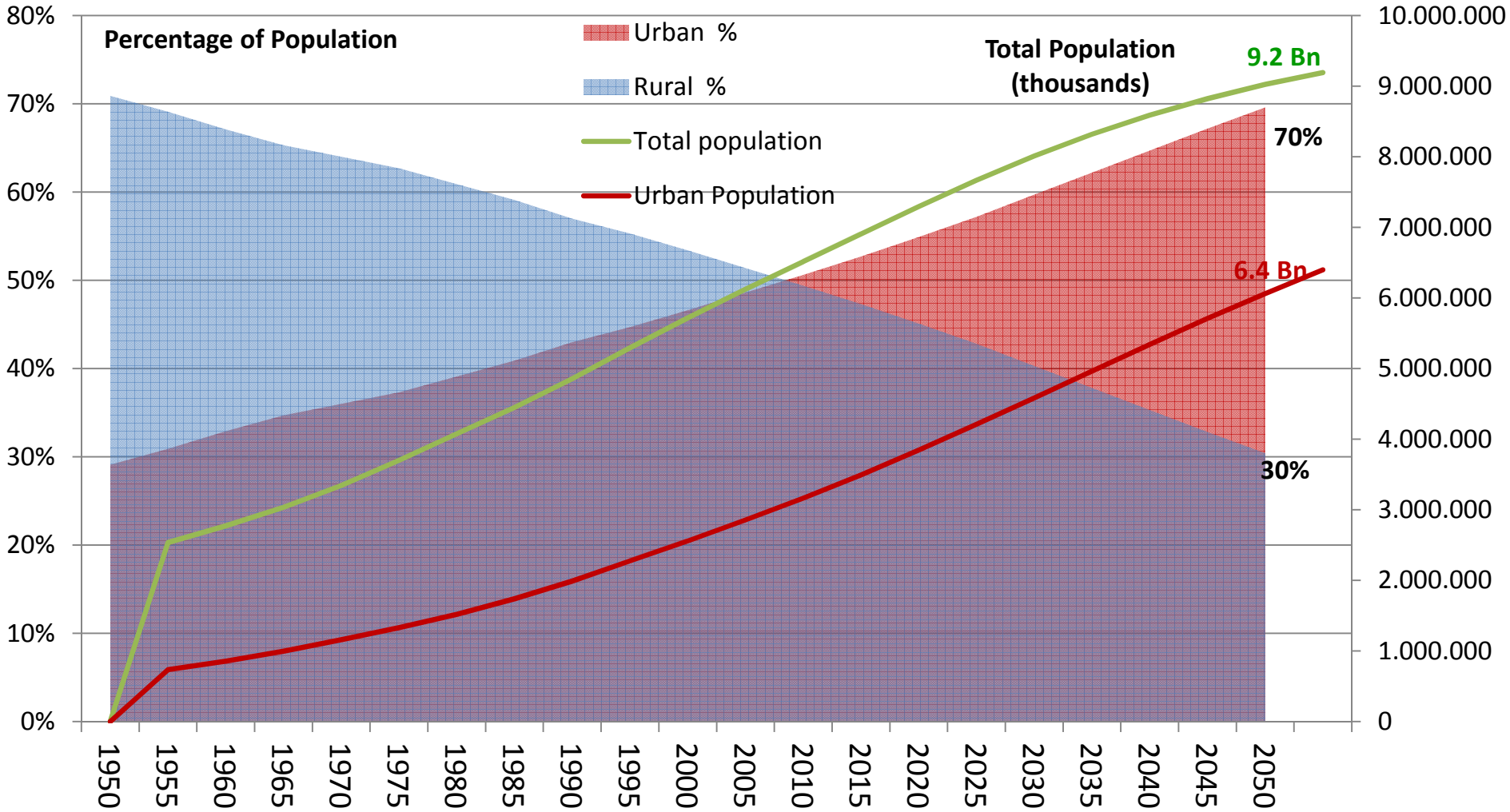
DRESDEN, GERMANY

ADVANCING A **NEXUS APPROACH**
TO THE SUSTAINABLE MANAGEMENT
OF **WATER, SOIL** AND **WASTE**

Opportunities for adopting a nexus approach to the management of environmental resources in urban areas in the post 2015 development agenda

Dr Graham Alabaster
UN-HABITAT
alabaster.unhabitat@unog.ch

Population and urbanisation



Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2006 Revision and World Urbanization Prospects: The 2007 Revision,

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

A Changing Urban World

- **Global population growth:** fastest in the fifty least-developed nations. By 2050, it has been estimated that 86% of the world population (almost eight billion people) in the less developed regions
- **Age structure: b**y 2050, approximately two billion people will be aged 60 or over
- **Urbanization:** 60% of the world population will live in urban areas within the next 25 years.
- The main growth will not be in big Cities but in secondary urban settlements (> 500,000 – 1m)
- Currently 62% of the worlds urban population live in slums (72% Africa, 46% Asia, 30% LAC)

The Slum Challenge

- Unprecedented slum growth: **18 million** new slum dwellers per year during 1990-2001
- Projected growth: **27 million** people a year (2005/20)
- Slum growth = **38%** of the world's urban growth

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Secondary Towns and the Urban Sprawl

Often, the spatial expansion of cities is faster than population growth, which translates into a reduction of density.

As a consequence, secondary urban centers show the highest per capita cost, which reflect the need to apply urban solutions while having densities still not high enough to benefit from significant economies of scale in the delivery of services.

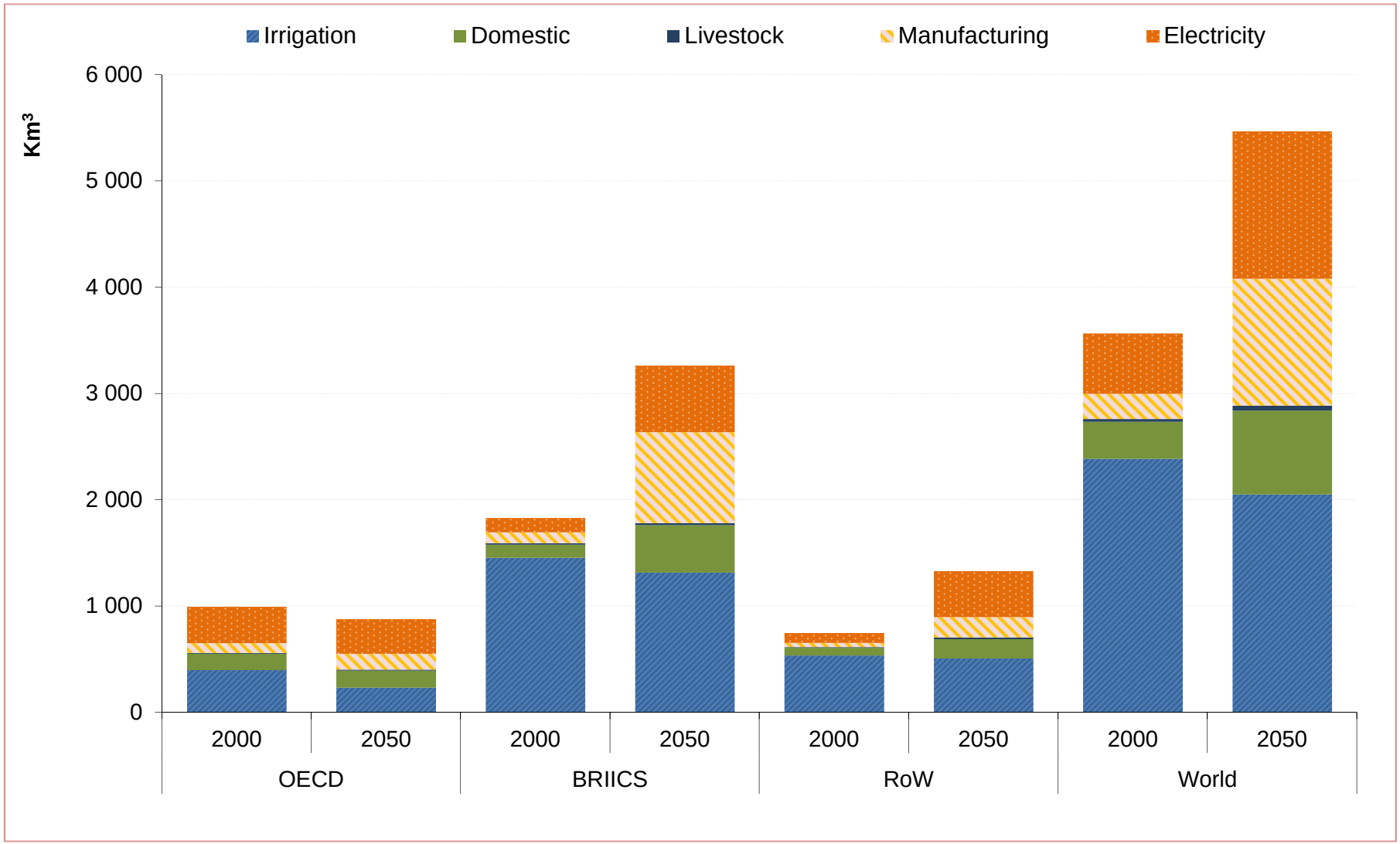
As a result, the already high costs for infrastructure in urban Africa will increase with further sprawl, further hindering the affordability of basic services.

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Urbanization: resource demand and waste production

- Resource demands and waste products are concentrated in cities
- Cities account for 75% of all greenhouse gas emissions
- Cities are often spatially disconnected from their resource base meaning increased transport needs including water and waste products
- Nexus approaches in urban areas need attention to integrated planning approaches
  - Infrastructure for water, energy, wastes
  - Building synergies with the rural hinterland for agricultural products and recycling waste products

World water demand projected to grow by 55% by 2050

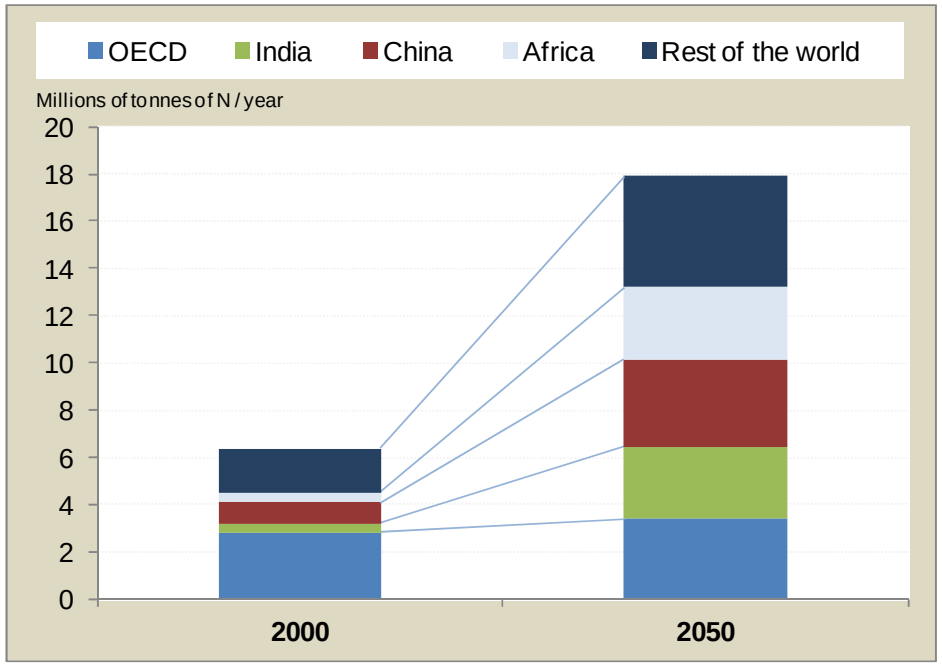


Source: OECD Environmental Outlook Baseline; output from ENV-Linkages.

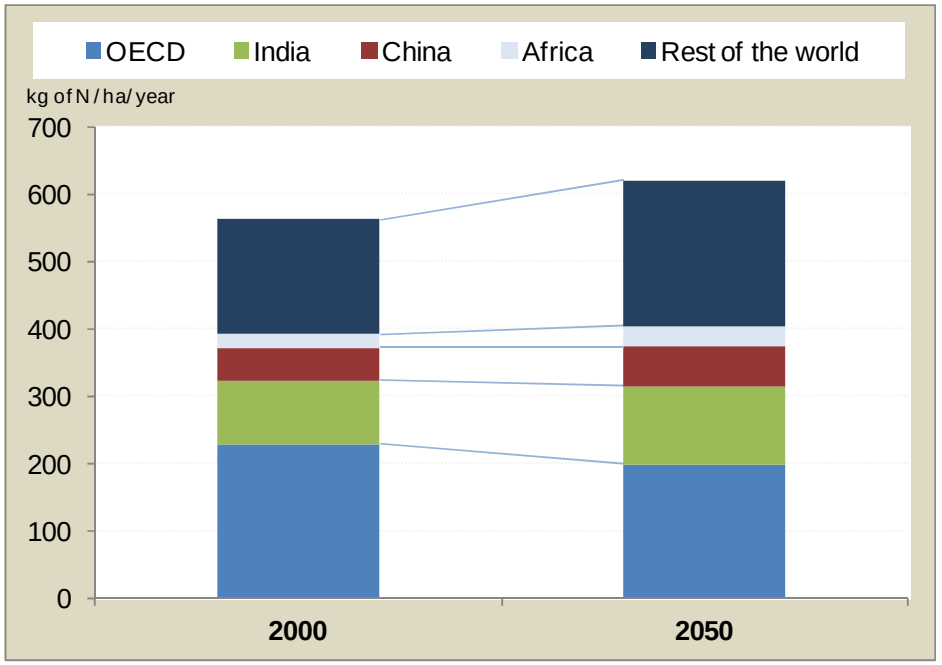
ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Wastewater and water quality an increasing concern

Nitrogen effluents from wastewater



Nitrogen surpluses from agriculture



Source: *OECD Environmental Outlook to 2050*; output from IMAGE

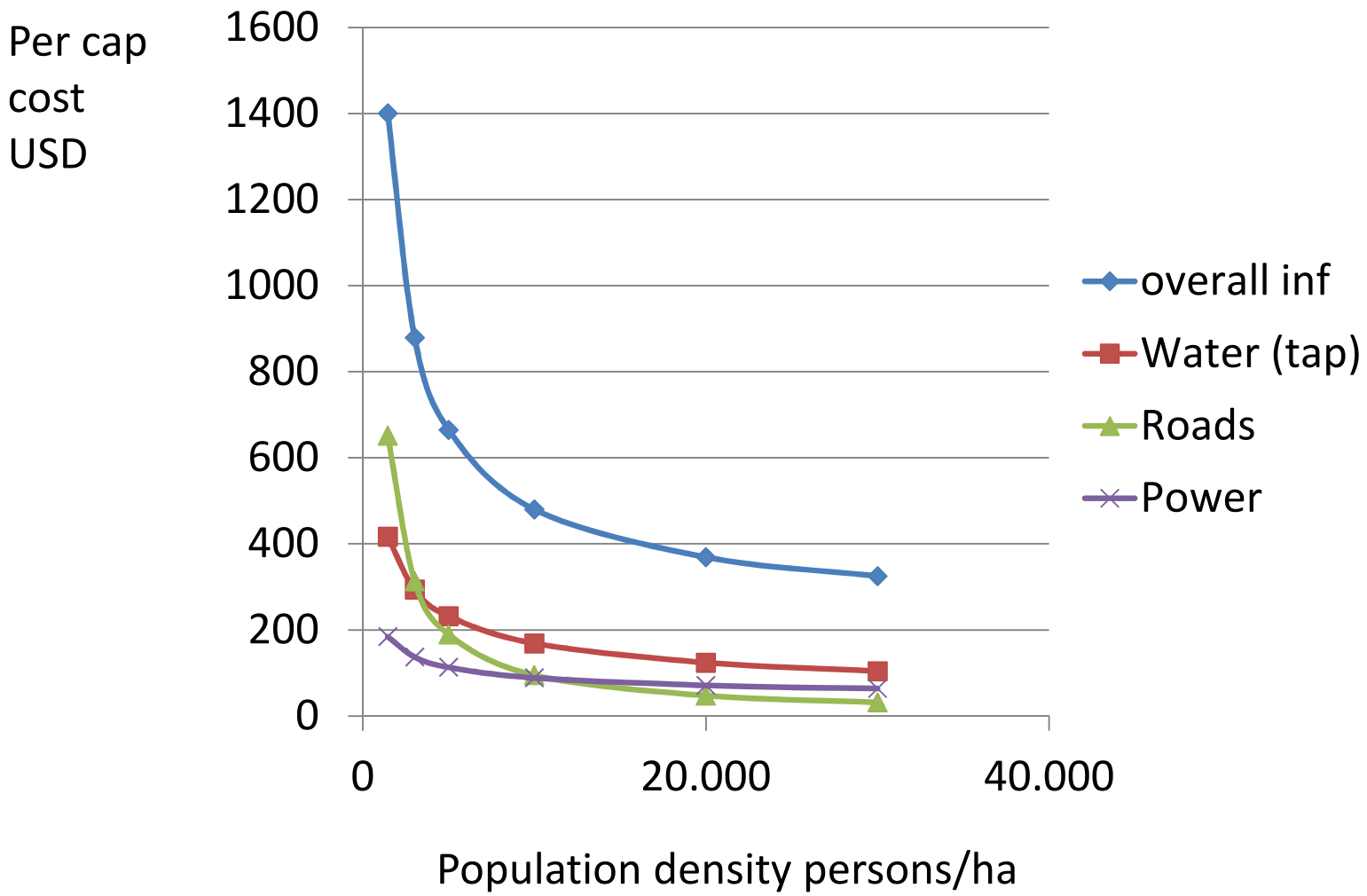
ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

A Great Opportunity: Economies of density

The cost of infrastructure network expansion is highly sensitive to population density. For the exact same infrastructure, in both urban and rural spaces, the capital cost declines with density. At the highest density, the cost of a bundle of high-quality services is $325 per capita; for medium- density cities, it is $665; for the rural hinterland $2,837; and for isolated areas $4,879.

Population density affects also the availability to pay for such infrastructure.
In rural areas the cost of a high quality infrastructure bundle is 10 to 20 times the annual household budgets so unaffordable. This ratio falls steeply in urban areas, where the cost of the bundle is one to three times the annual household budget.
(*Africa's Infrastructure: a time for transformation, African Development Bank Group)

Per capita cost of Infrastructure vs. population density



ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

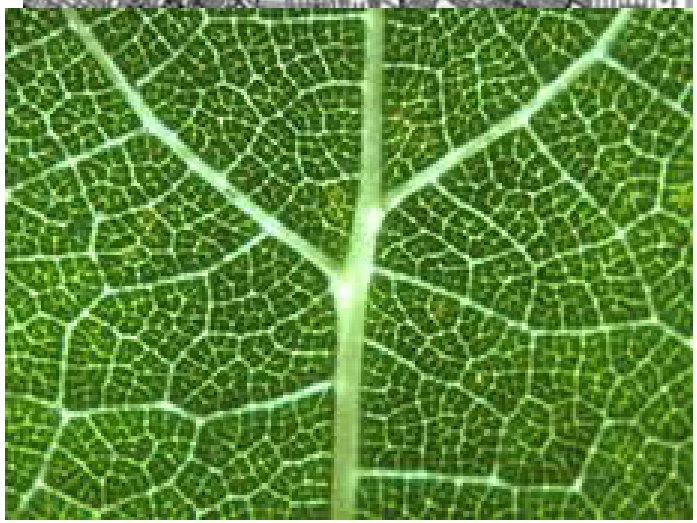
The Role of Urban Planning

The expansion of basic services and infrastructure should be coordinated and considered as an essential component of the urban planning.

Could bundling infrastructure services substantially increase the return of infrastructure investments ?

Since water and sanitation on average account for a significant proportion of the investment related to services (including among others roads, electricity, ICT, etc.), it makes good sense to start with planning infrastructure set-up and extensions.

Divided Institutional responsibility kills any opportunity for planning of infrastructure services in an integrated way



ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Priority areas for action

- Water demand management
- Following the solid waste management hierachy
- Maximising energy conservation
- Maximising water/waste livelihood linkages (green economy)
- Effective land use planning to minimise transportation costs, site as close as possible sources and sinks of waste/wastewater

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Means of implementation

- O&M is the main impediment to improved urban systems, focus on fast track capacity-building to improve cost recovery (at least to the level where O&M costs are covered
- Develop local management strategies, health/environement/planning
- Invoke civil society through multi-stakeholder dialogues

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Bio-latrines for better sanitation

UN-Habitat advocates the use of biogas technologies for public latrines in high density urban areas like slums and public places (schools, prisons, markets etc.) to provide decent sanitation and modern energy for cooking.

In less than 2 years, 20 bio-latrines have been built in Nairobi alone

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Kisii: Micro-hydropower for a water pumping station

- Despite being connected to the Municipal water supply network, some residents of Kisii town have not received water for the last 15 years;
- The town's water supply and distribution system is inadequate and unable to address the demand;
- The town experiences frequent breakdowns of water pumps and intermittent power supply;
- The electricity bills account for almost 70 % of the revenue collected from the users.
- **UN-Habitat has conducted a feasibility study for a micro-hydropower plant to generate electricity for the water pumping station.**
- **The result revealed that the power plant could generate on average 150 Kw, equal to 80% of electricity needed to operate the water pumping station.**
- **The payback of the investment is 5 years.**

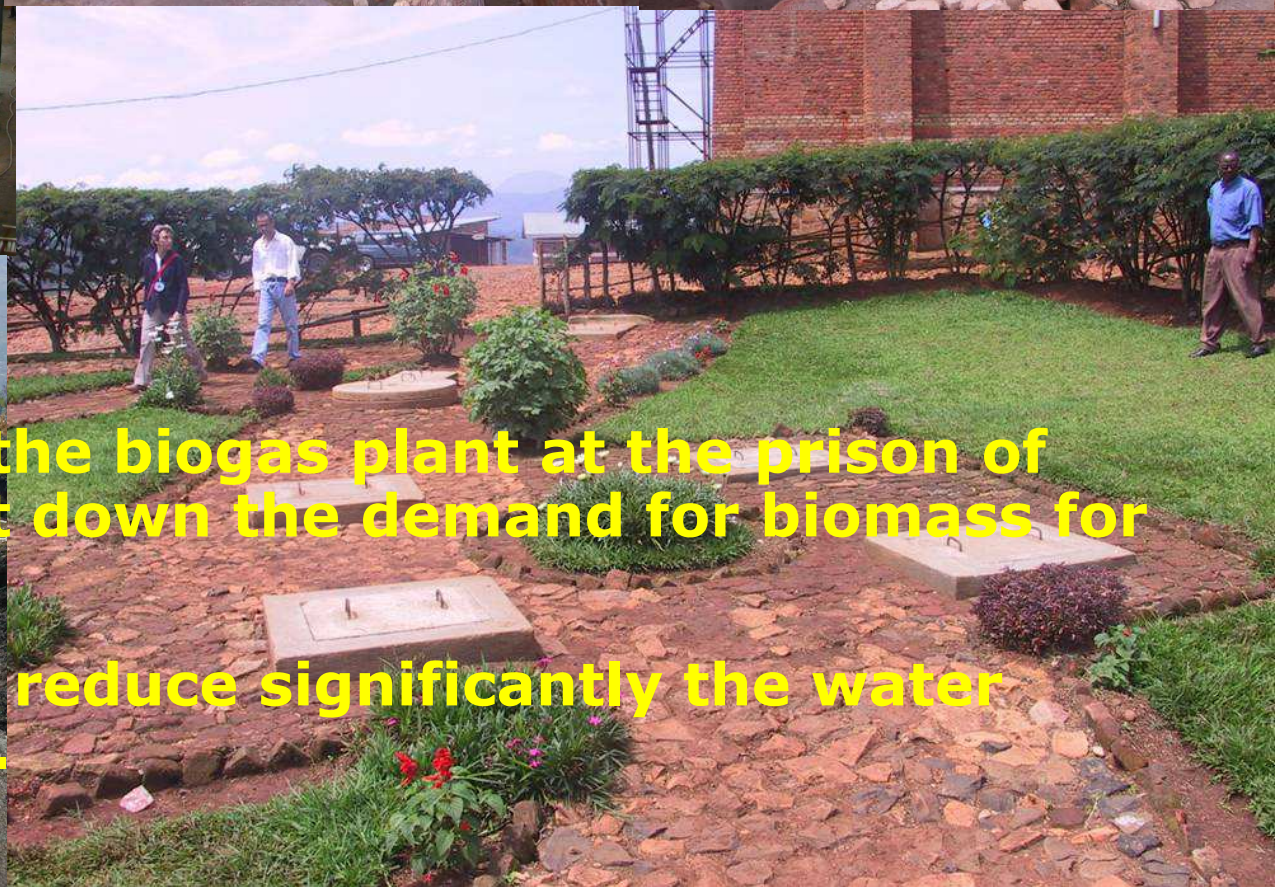
ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Homabay: Waste to Energy

- There is chronic water shortages in the town due to the high cost of energy;
- There is an elaborate water rationing time table;
- High levels of water losses (up to 65 percent) from heavy leakages;
- The town's water utility spends up to 75 % of the revenue collected on electricity bills.
- The low revenue base does not allow the utility company to adequately finance operations and maintenance activities.
- The sewage system requires electrical pumping that is costly to run and maintain.
- **UN-Habitat has conducted a feasibility study on the use of municipal organic waste to produce biogas and generate electricity to power the water pumping station.**
- **UNIDO has installed a biogas plant at the city slaughter house to generate energy.**

ADVANCING A **NEXUS APPROACH** TO THE SUSTAINABLE MANAGEMENT OF **WATER, SOIL** AND **WASTE**

Kigali prison: Waste to Energy



- A The construction of the biogas plant at the prison of Kigali, Rwanda has cut down the demand for biomass for cooking by 70 %.
- The use of biogas also reduce significantly the water demand for sanitation.

Energy Efficiency and Energy Audits of Water Utilities

- Energy efficient technologies could reduce significantly the cost of water supply.
- Frequent and regular energy audits could improve the efficiency of water pumps.
- In 2009, UN-Habitat conducted energy audits in different water utilities in Kenya, Nigeria and Ghana.
- In Accra, a good housekeeping and replacement of old water pumps were able to increase the quantity of water supply and the reduction of the energy needed by 30%.

Conclusions

- Service provision and density is key to driving down the per capita cost of services enabling the nexus approach to be operationalised
- Focus on O and M as a means to improve efficiency of resource use and waste production, focus on energy efficiency for example energy costs, represents more than 50 % of the cost of water supply. It could go up to 80 % if energy is imported or has to travel long distance to the water pumping station.
- Examine how local communities can be engaged in Nexus approaches
- Develop urban planning approaches in rapidly urbanizing secondary towns