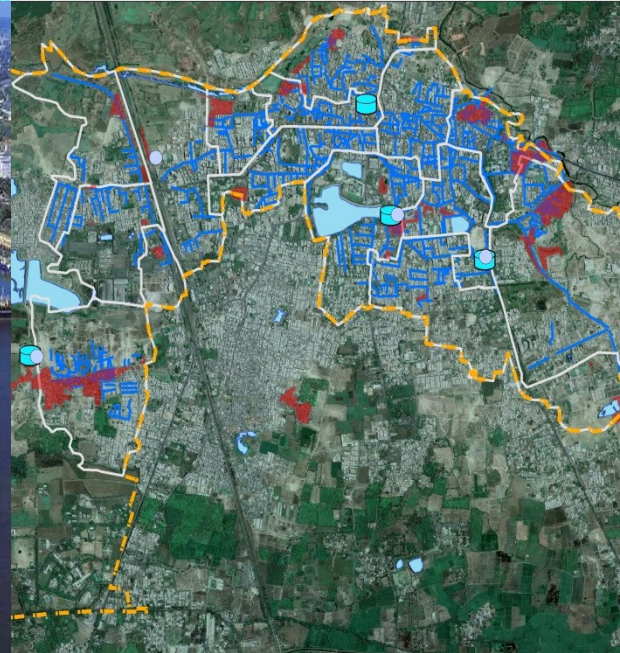


Cities, Water and Urban Planning

From challenges to emerging opportunities

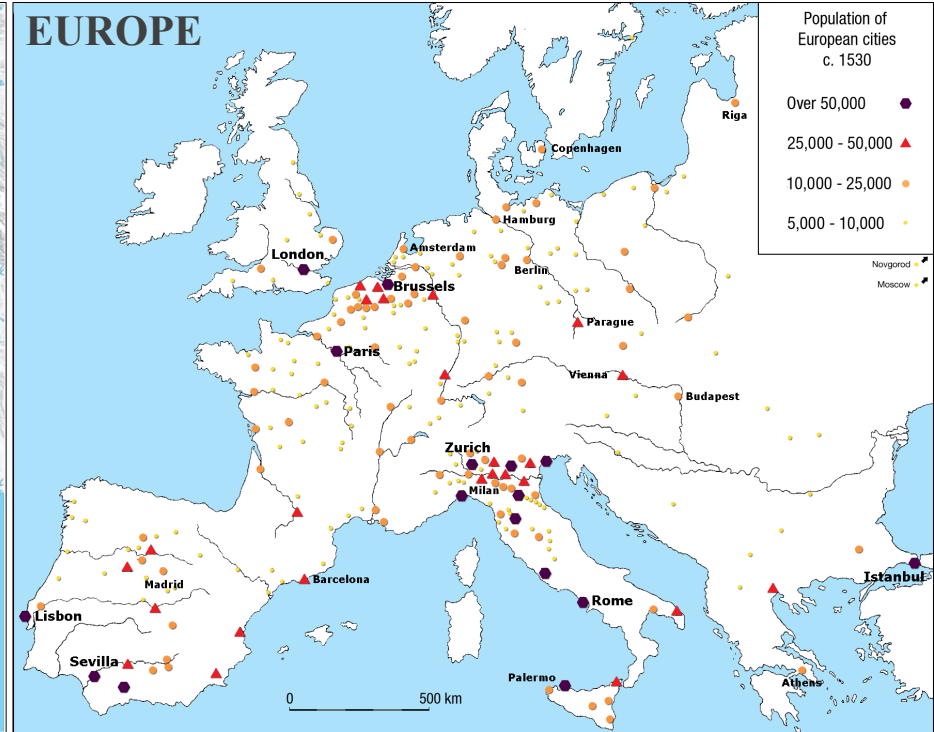
Prof. Meera Mehta, CEPT University, INDIA

50th ISCOCARP International Planning Congress, Gdynia, September 2014.



Cities and water through history

Through history most cities emerged next to sources of water...



Ancient wisdom of city planning

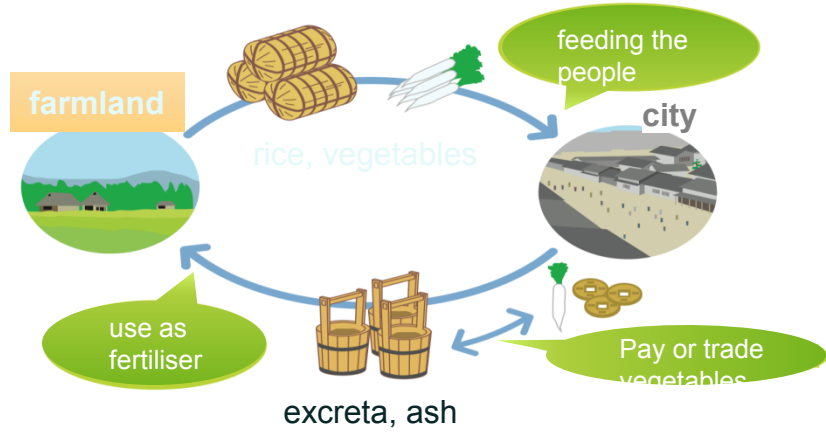
- City planning was known 2500 years ago
- These ancient cities had network of water sources
- and drainage systems with a well-developed system of urban sanitation



Mohenjo-daro : aerial view

From Edo to Rome....

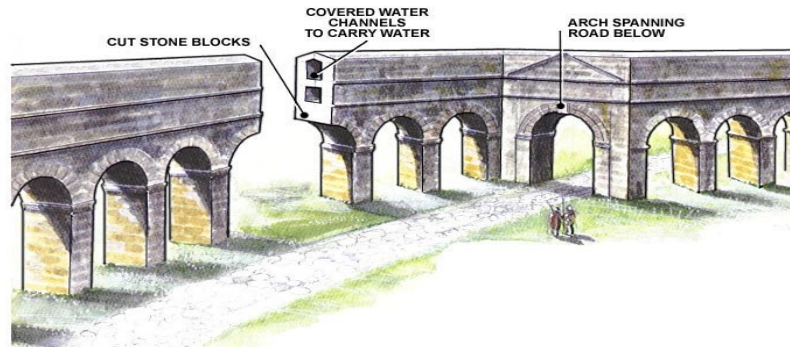
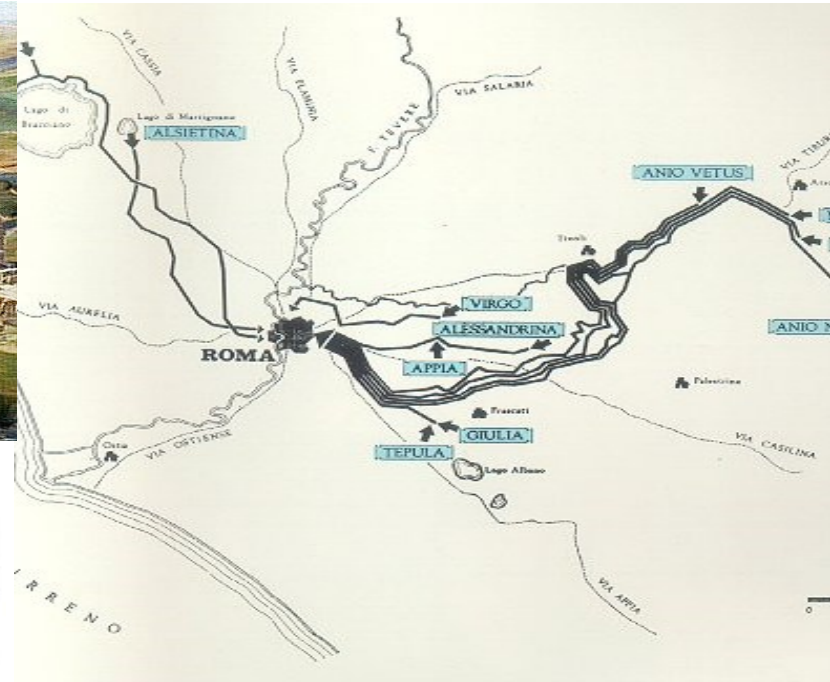
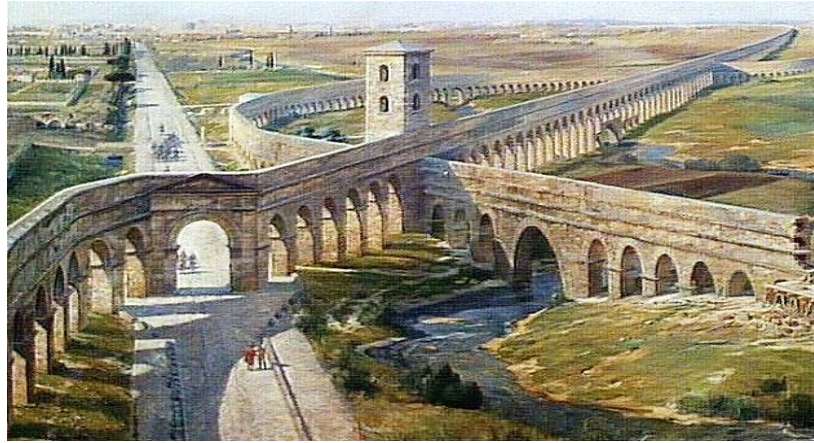
- Clean water supplied from the river and waste sold to farmers –
- circular flow concept: for nutrients and water



Source: BORDA (2010),
“Decentralized waste
water treatment:
experience sharing”,
presentation at CEPT
University – Anil
Agarwal, CSE 2001

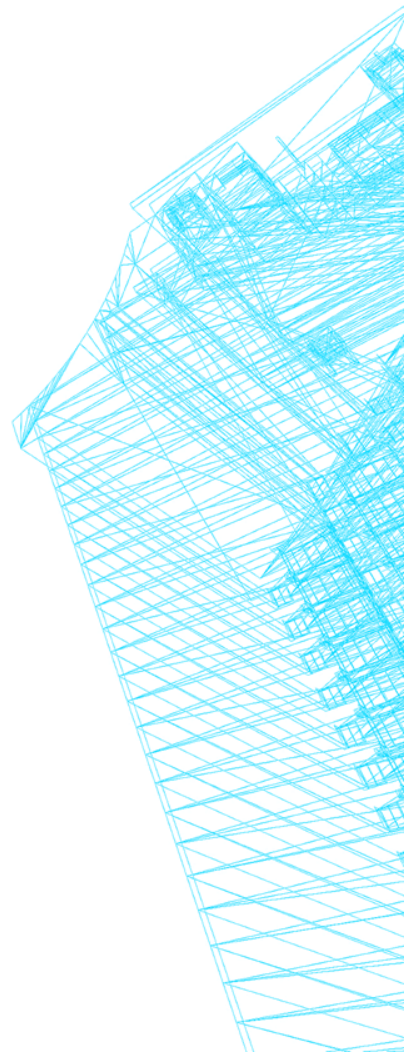
From Edo to Rome....

- Excellent aqueducts, a symbol of stupidity?
Introducing linear flow concept: clean input / use / waste output



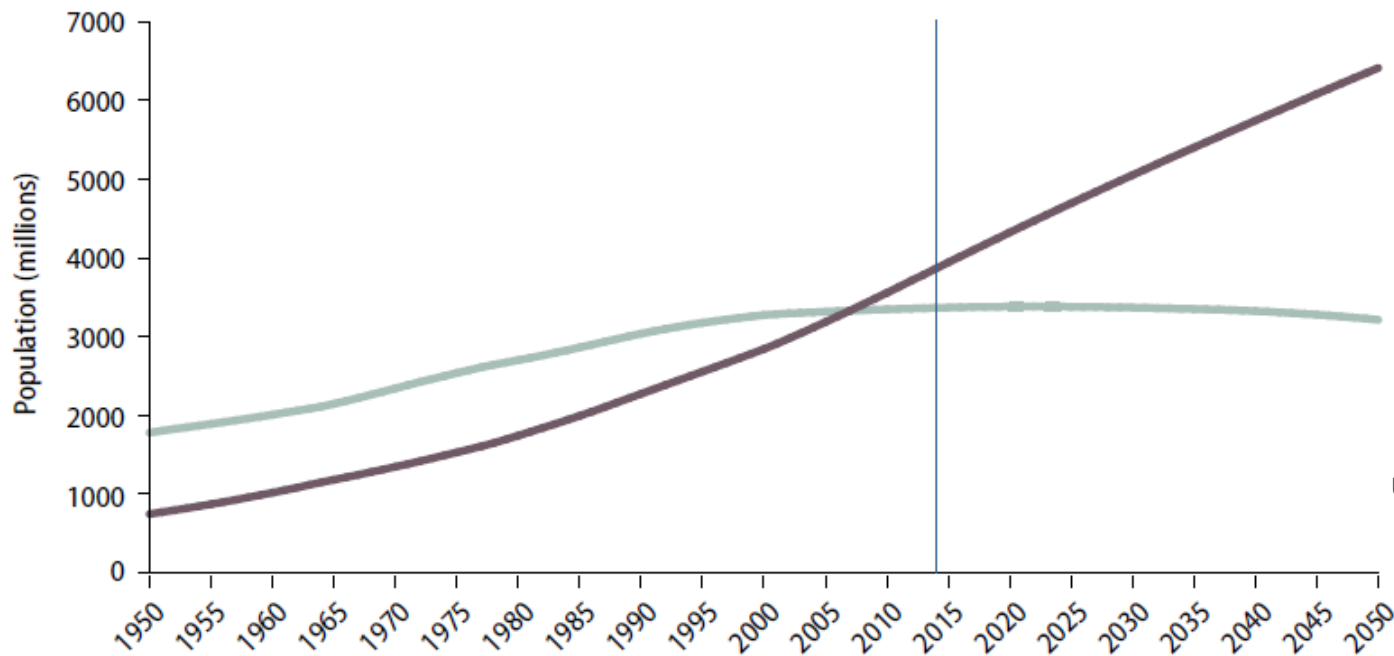
Source: BORDA (2010),
“Decentralized waste
water treatment:
experience sharing”,
presentation at CEPT
University

Challenges faced by contemporary cities



World is more urban now!!

Urban and rural population of the world, 1950–2050



Source: United Nations, Department of Economic and Social Affairs, Population Division (2014) World Urbanization Prospects: The 2014 Revision, Highlights (ST/ESA/SER.A/352).

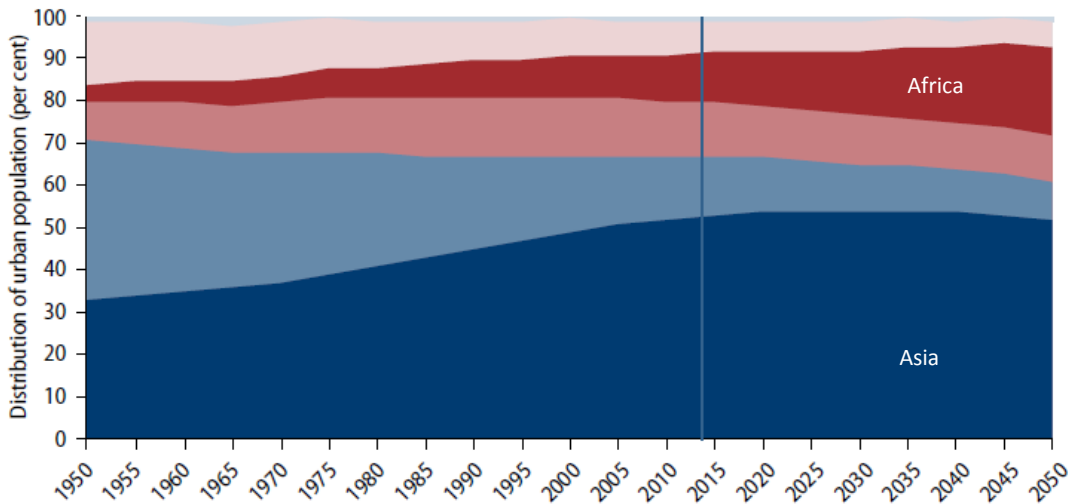


World
Urbanization
Prospects

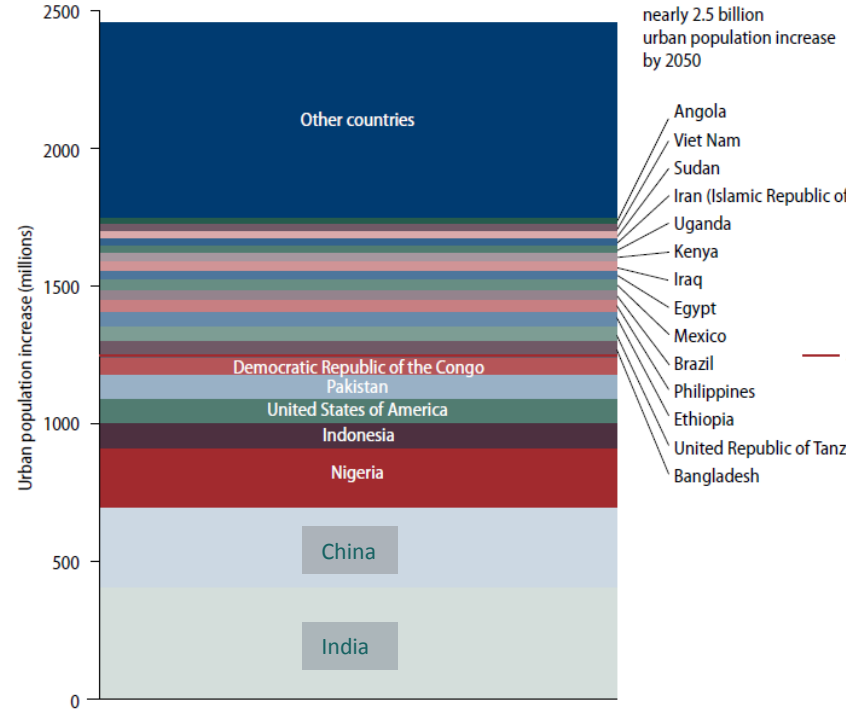


[highlights]

Asia, Africa will have a greater share of urban population over the next 30 years



Contribution to the increase in urban population by country, 2014 to 2050



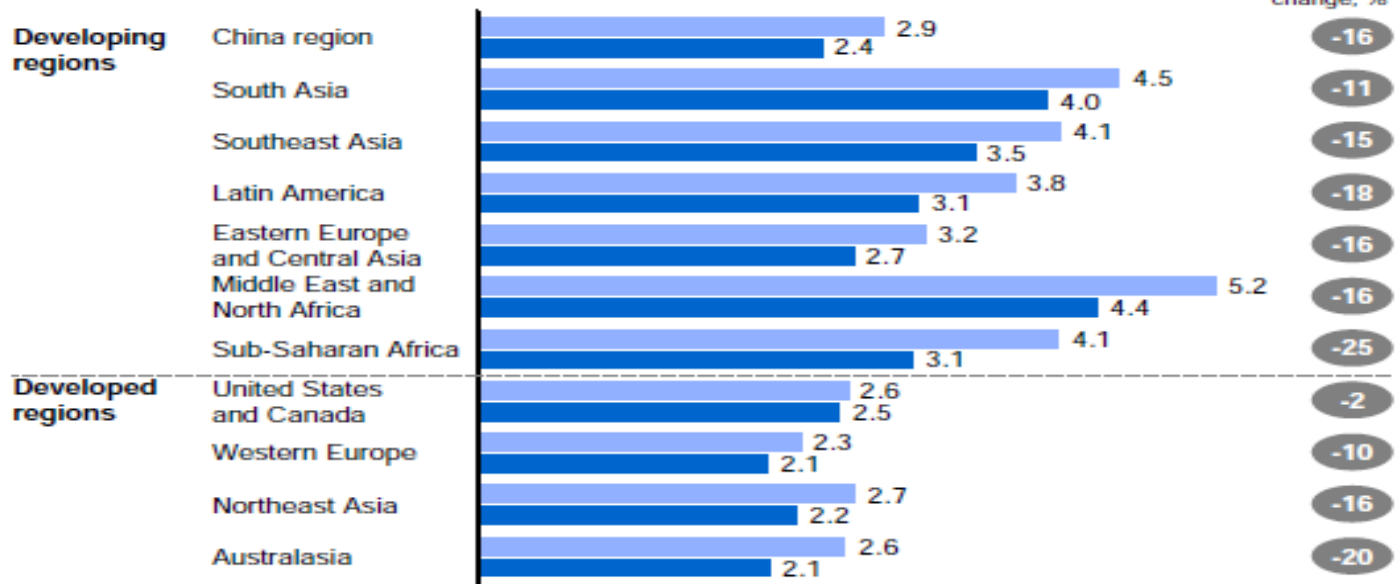
Declining household size

More demand for infrastructure and services

Exhibit 16

The size of households is declining and converging globally;
MENA and Sub-Saharan Africa have the largest absolute declines

Household size in the City 600, 2007 and 2025¹



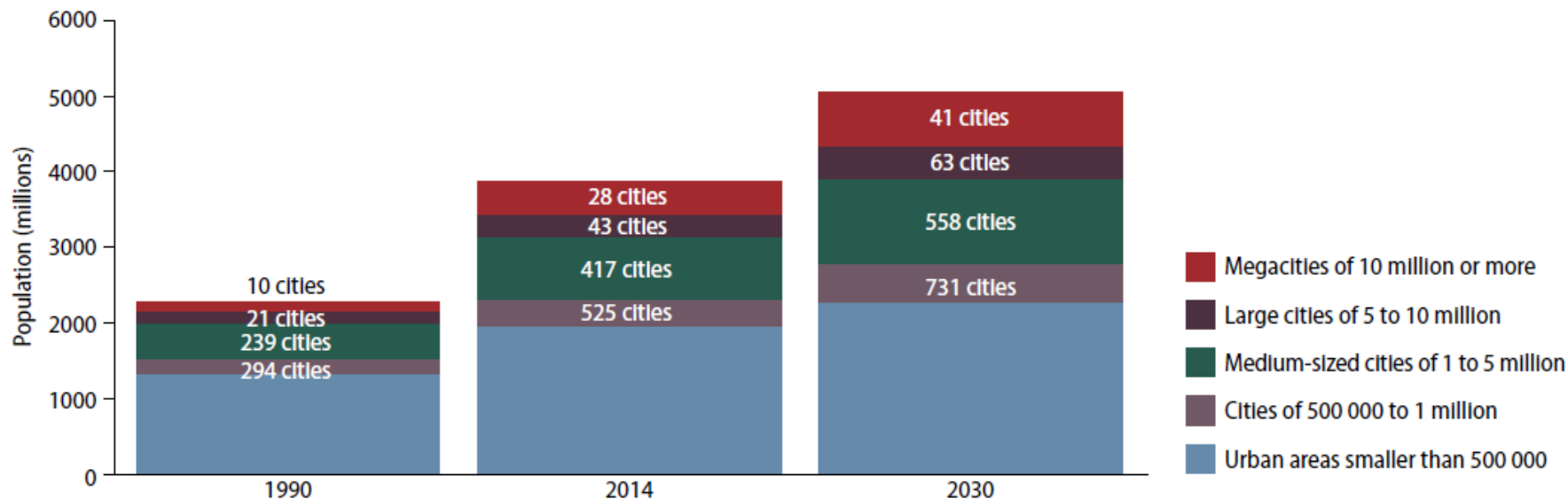
¹ Household size calculated by taking the simple average of the household size of all cities within a region.
NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute Cityscope 1.0

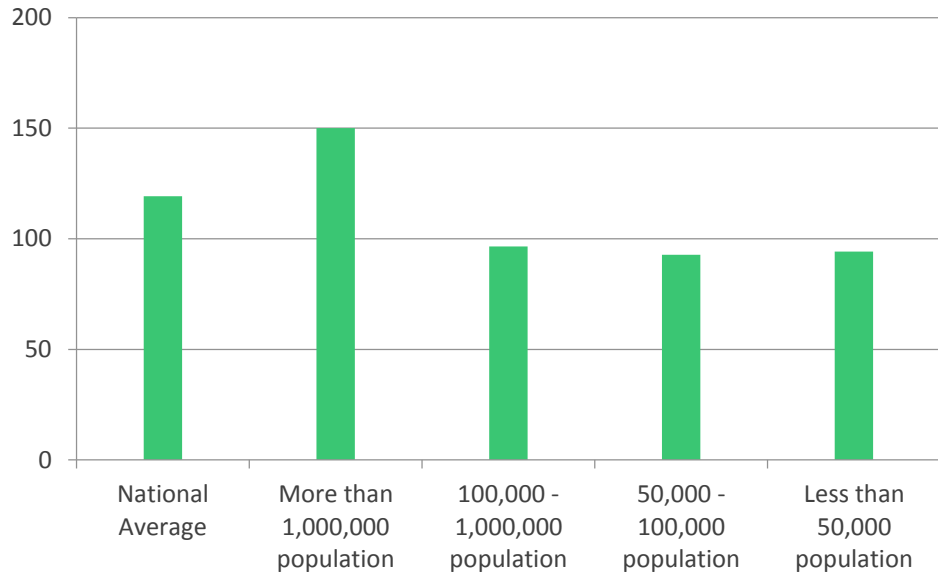
Megacities or small towns?

Figure 8.

Global urban population growth is propelled by the growth of cities of all sizes



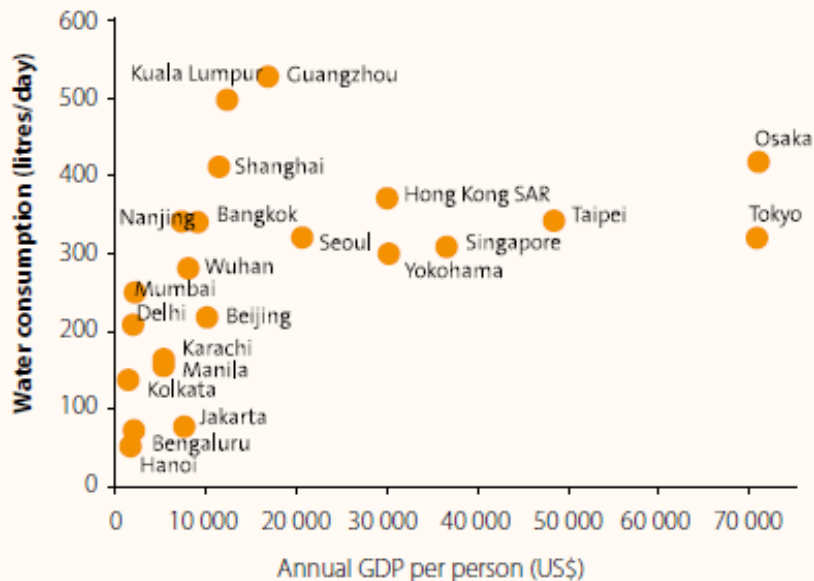
Larger cities also have larger per capita water demand



Information from across about 1500 cities in India for 2012 suggests that beyond 1 million per capita supply of water almost doubles

Rising incomes leads to increased water consumption

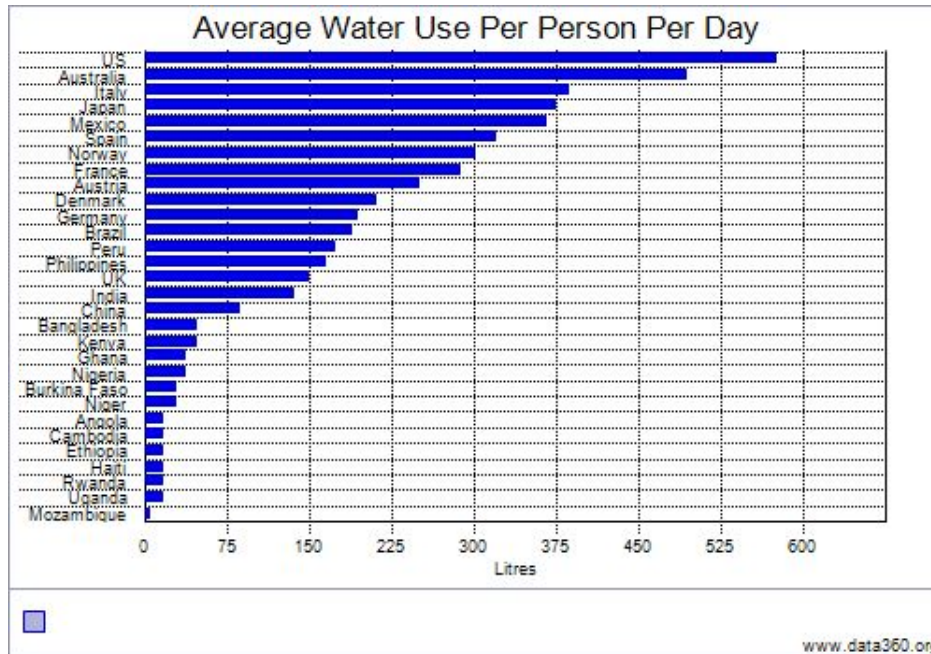
Water consumption and per capita income in selected Asian cities



Note: Years differ from city to city from 2005 to 2009. Annual Gross Domestic Product (GDP) per person in US\$ is based on current prices at the time.

Source: UN Water (2014), "United Nations World water Development Report 2014", UNESCO, WWAP, p. 63.

Rising incomes in urban areas also suggest rising demand for water supply

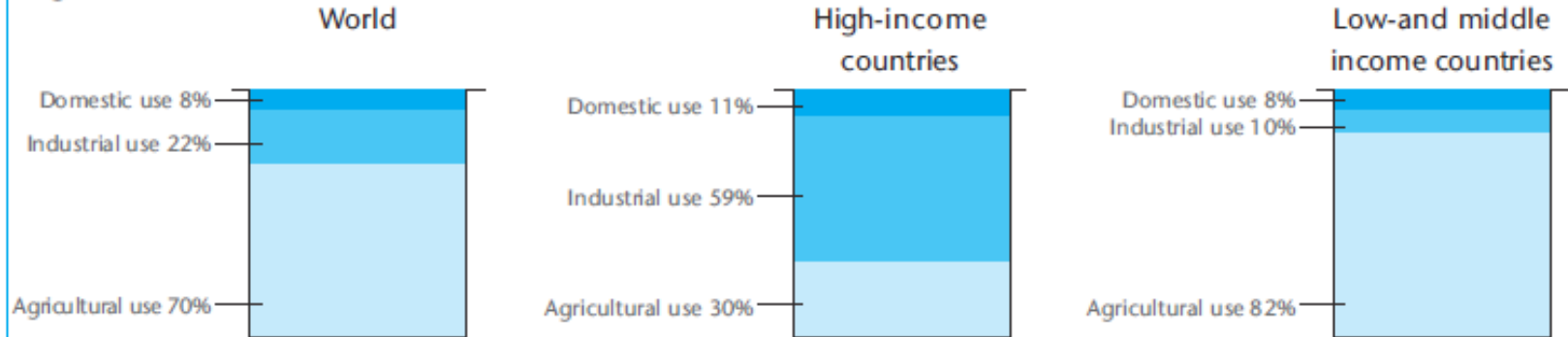


Source: http://www.data360.org/dsg.aspx?Data_Set_Group_Id=757, downloaded on Aug 18 2014

Higher income also means increased demand for water by industries

Competing water uses for main income groups of countries⁶

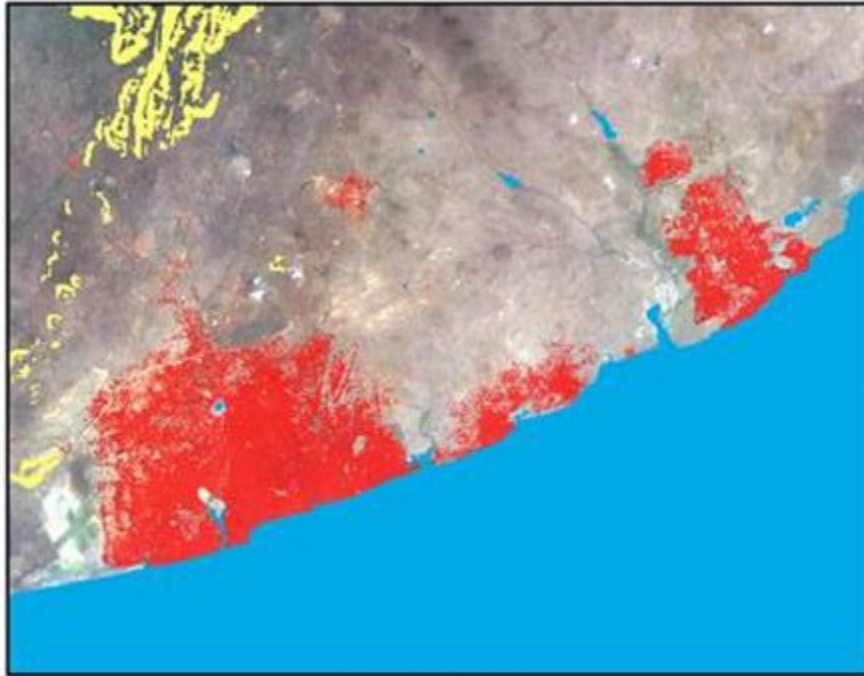
Industrial use of water increases with country income, going from 10% for low- and middle- income countries to 59% for high-income countries.



Ref. 6: "Water for People, Water for Life" United Nations World Water Development Report, UNESCO, 2003
www.unesdoc.unesco.org

Spatial growth three times population growth

Accra, Ghana



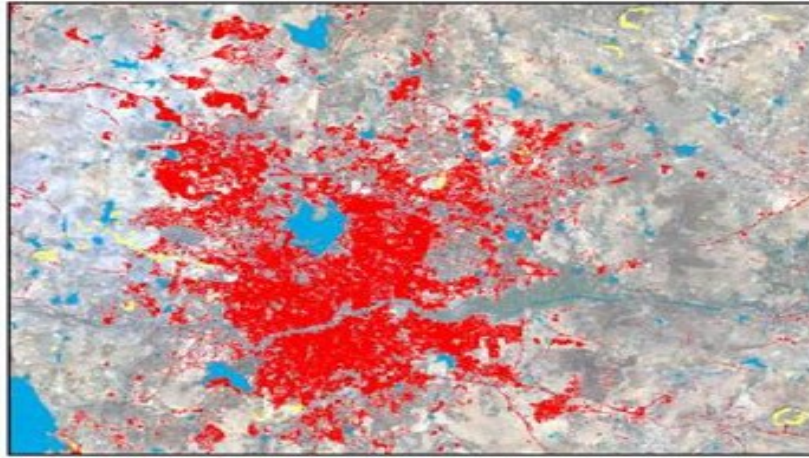
T₁: 6-Mar-85



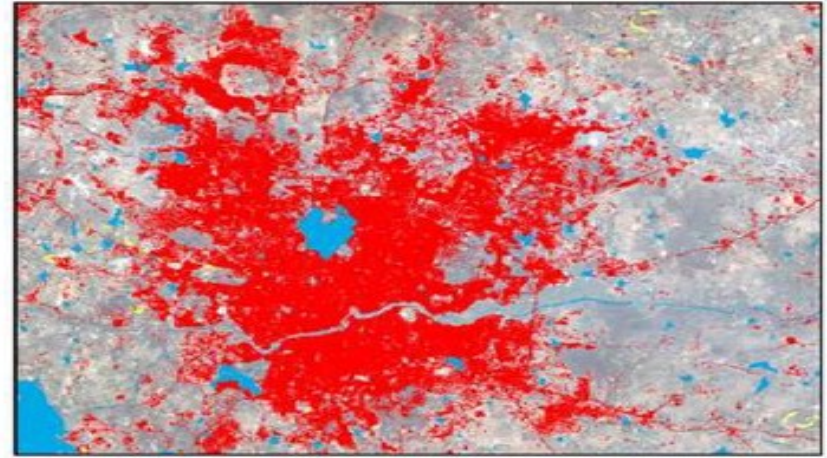
T₂: 4-Feb-00

With expanding cities, infrastructure costs rise

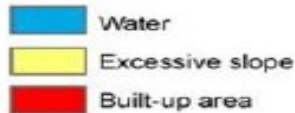
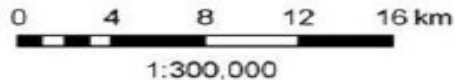
Hyderabad, India



T₁: 21-Nov-89



T₂: 29-Oct-01

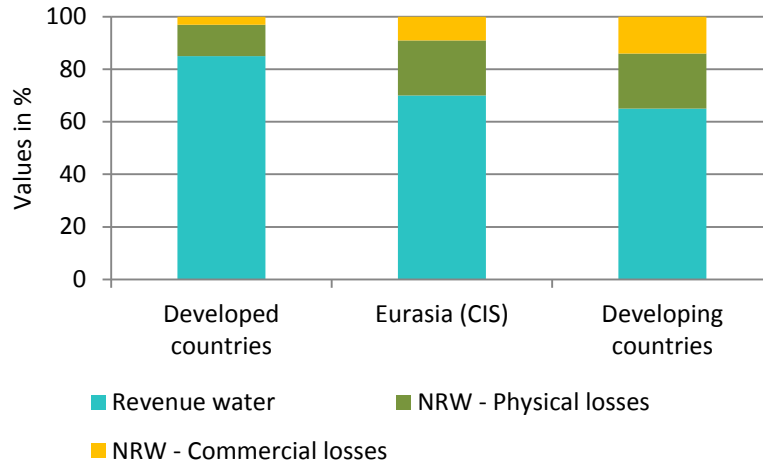


Measure	T ₁	T ₂	Annual
			% Change
Population	4,887,789	5,707,677	1.31%
Built-Up Area (sq km)	166.96	301.89	5.09%
Average Density (persons / sq km)	29,275.98	18,906.43	-3.60%
Built-Up Area per Person (sq m)	34.16	52.89	3.73%
Average Slope of Built-Up Area (%)	2.82	3.12	0.84%
Maximum Slope of Built-Up Area (%)	14.43	17.16	1.46%
The Buildable Perimeter (%)	0.94	0.93	-0.04%
The Contiguity Index	0.75	0.88	1.36%
The Compactness Index	0.37	0.38	0.22%
Per Capita Gross Domestic Product	\$1,541.53	\$2,343.04	3.57%

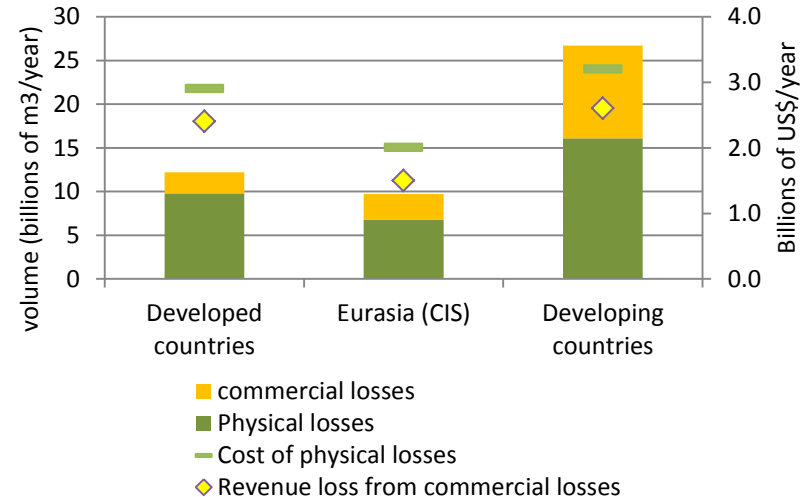
Water losses

- Every year around **32 billion cubic meter of treated water is physically leaked from water supply systems** while 16 billion cubic meter are delivered to consumers for zero revenue
- More than US\$ 14 billion is lost every year by water utilities around the world – and more than a third of that by water utilities in developing countries

Estimates of NRW (%)



Estimates of NRW (water quantity)



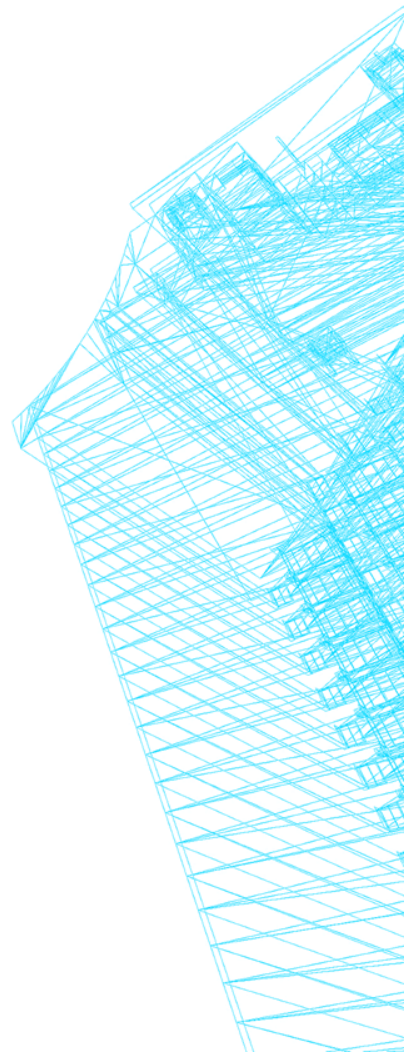
NON WATER DAYS...



THE 'WATER DAY'



A new approach Water Sensitive Urban Design and Planning



Many types of water in our cities

WATER DEFINES OUR PLACES

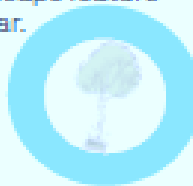
VITALITY: The support and sustenance for a growing population.

IDENTITY: The river, pond, lake or coastline that has become central to the identity of our cities and towns.

ACTIVITY: A provider of recreation and well-being for all.

HEALTH: The supporter of essential ecosystems and food supplies.

LANDSCAPE: A desirable landscape feature that communities love to be near.



OUR PLACES CONTAIN MANY TYPES OF WATER

Drinking
Water
Greywater
Irrigation

Surface water runoff
Wastewater
Water

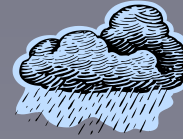
Environment
Rainwater

Flood
Water

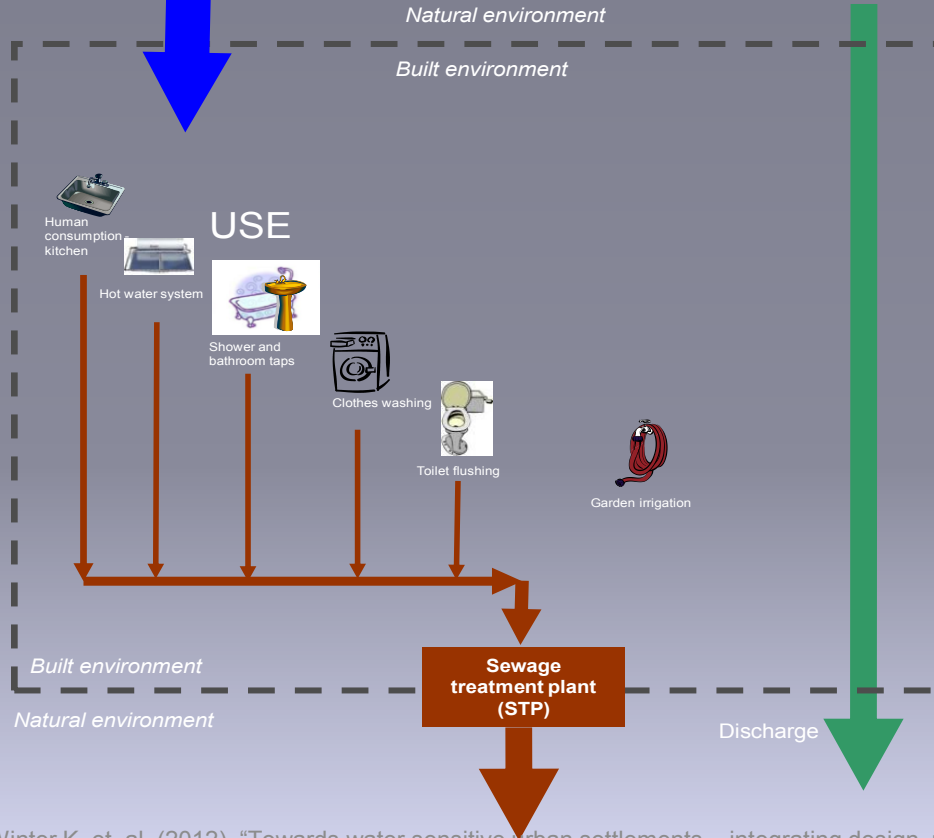
Potable water supply and treatment plant



Water treatment plant

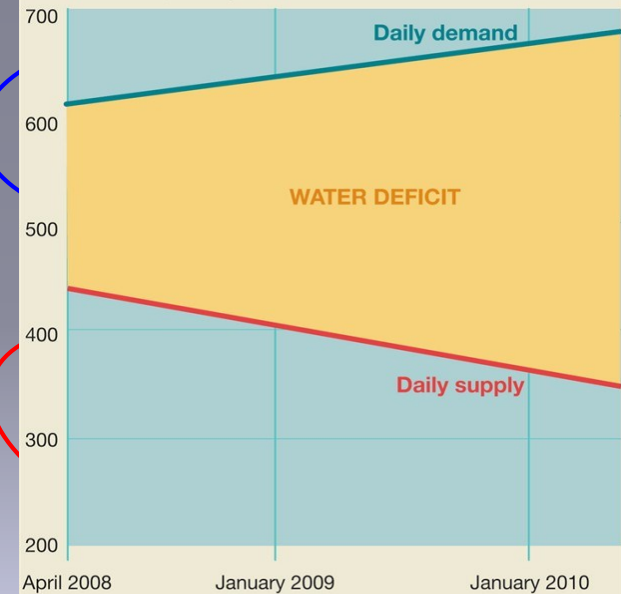


Conventional approach

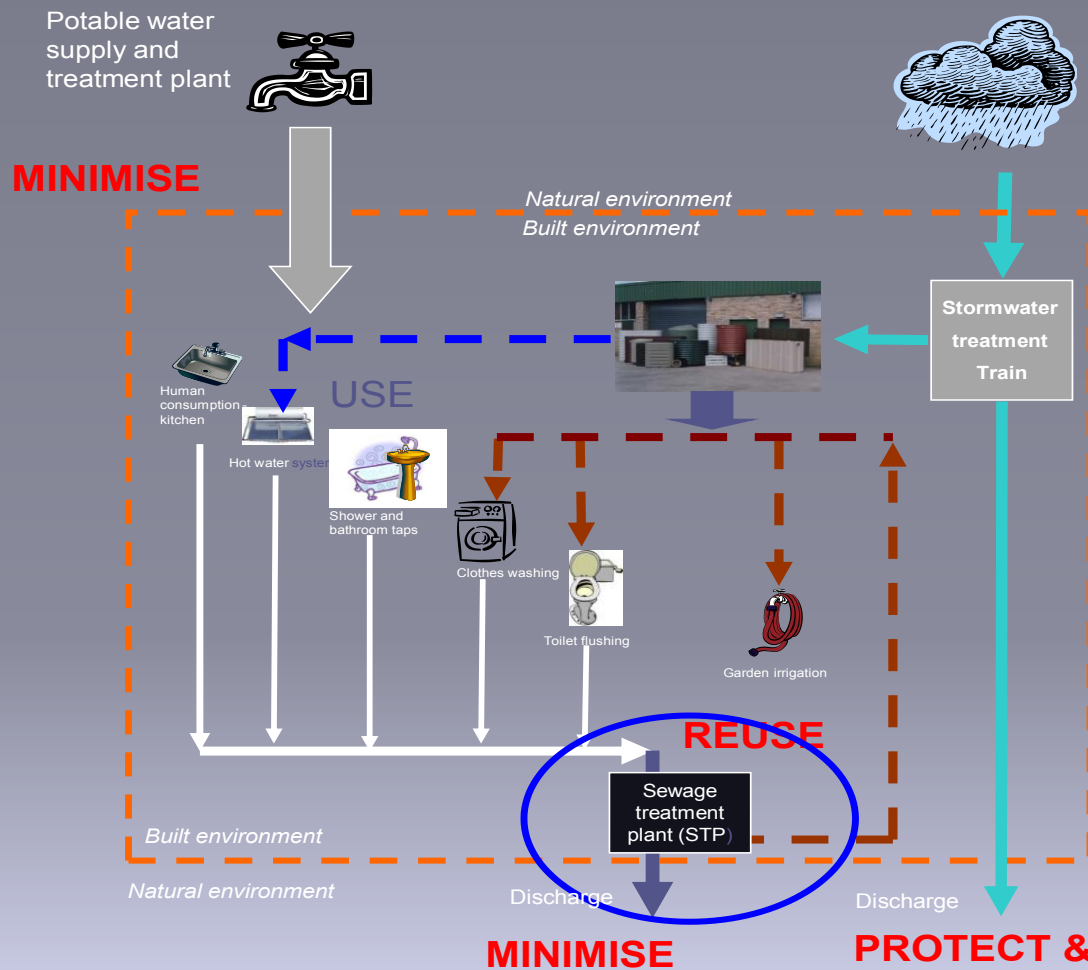


Water supply and demand in Nairobi

Cubic metres per day



Source: NCWSC, 2010.

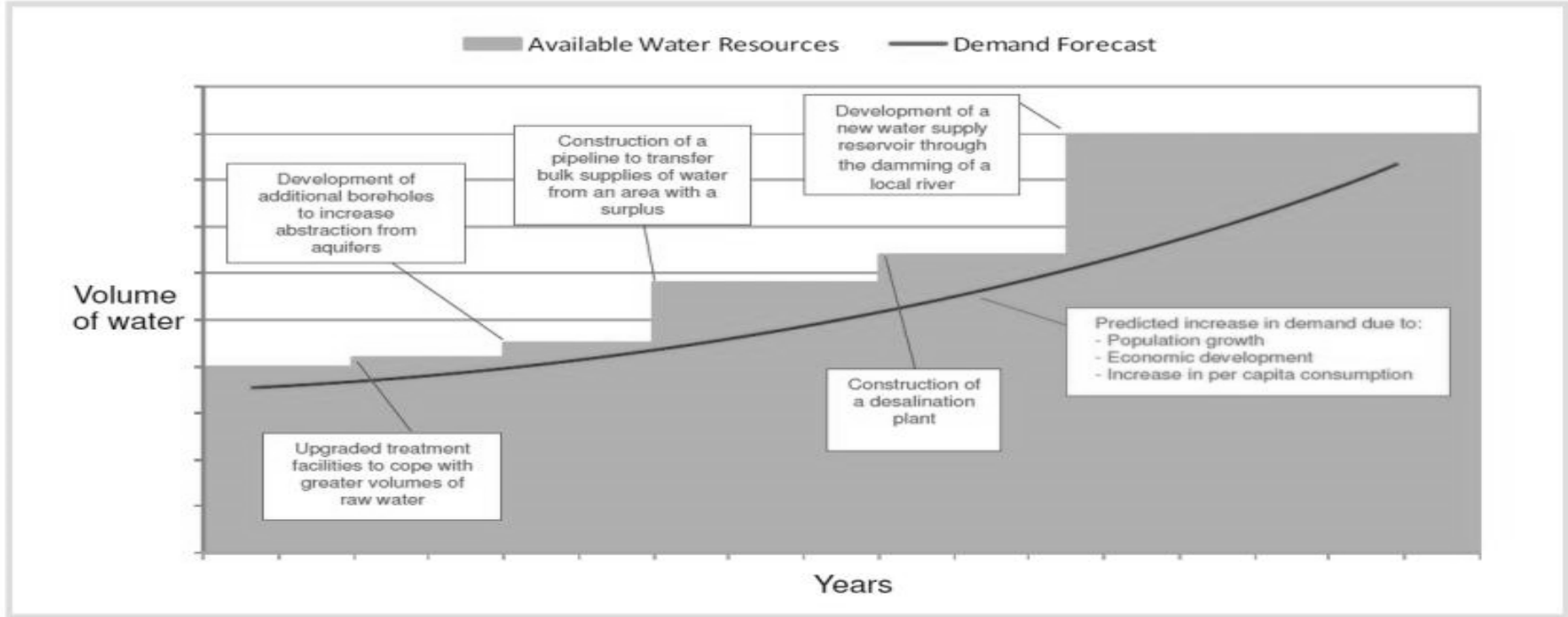


Water sensitive Urban design approach

All water is an opportunity
Not a threat

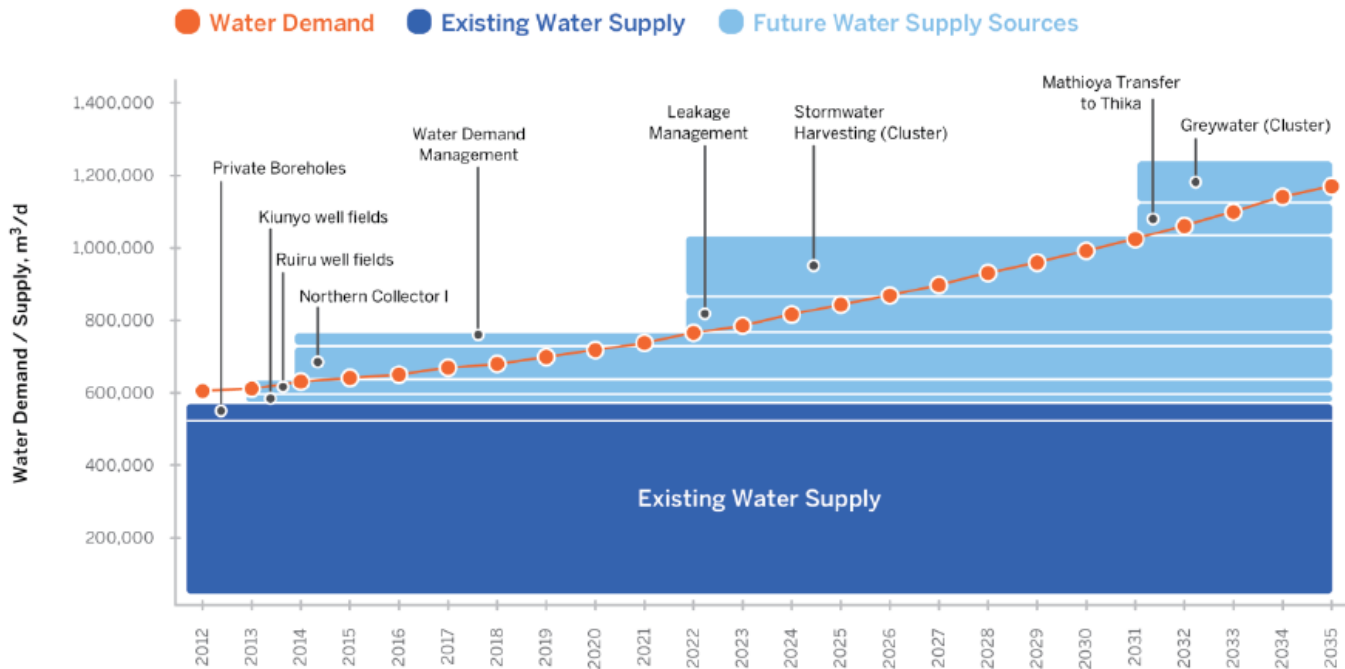


Supply-demand graph for a conventional approach to water supply services



WSUD for Nairobi water supply plan by 2035

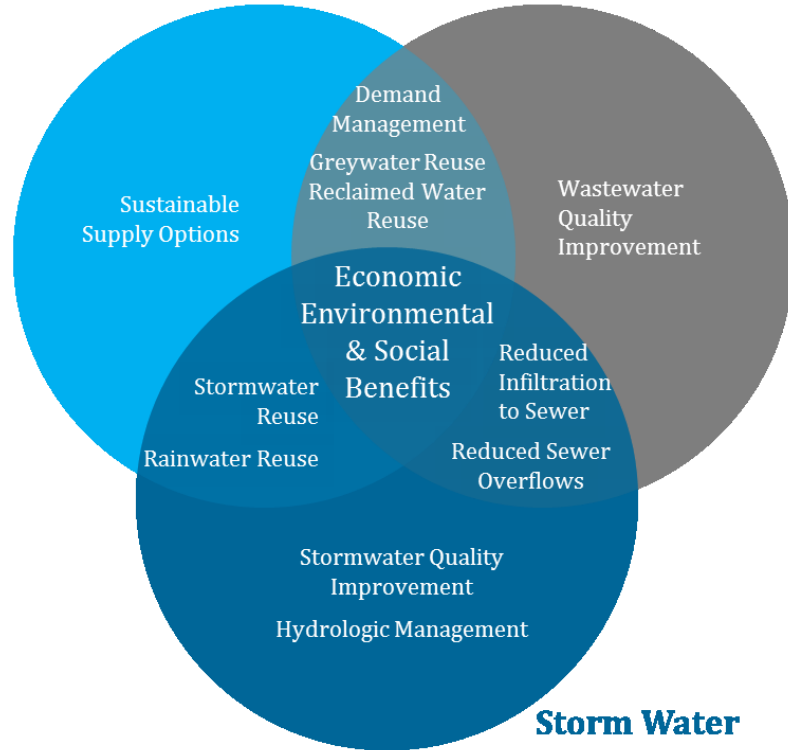
Figure 3. Proposed staged development of alternative water sources in Nairobi 2010 to 2035.



What is water sensitive urban design (WSUD)?

Potable Water

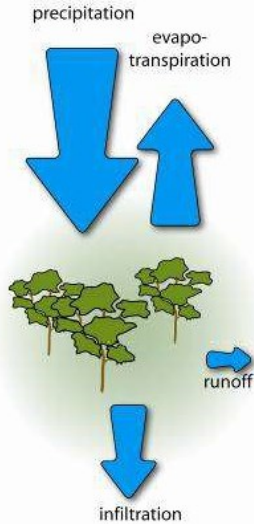
Waste Water



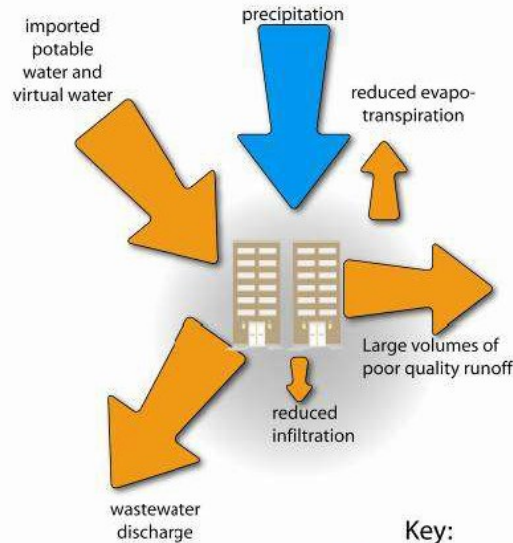
- An approach to urban planning that integrates all parts of the water cycles
- Applies to all urban scales: whole-of-city planning, new communities to in-fill developments
- Reduces demand for external fresh water through: demand management, reuse of grey water, treated black water for non-potable/env uses/industries, capture and reuse of storm water, promote sustainable use of ground water
- It generates economic, environmental and social benefits, and leads to improved water security
- Considers the environment in conjunction with infrastructure planning, design and management

Influence of WSUD on the urban water cycle

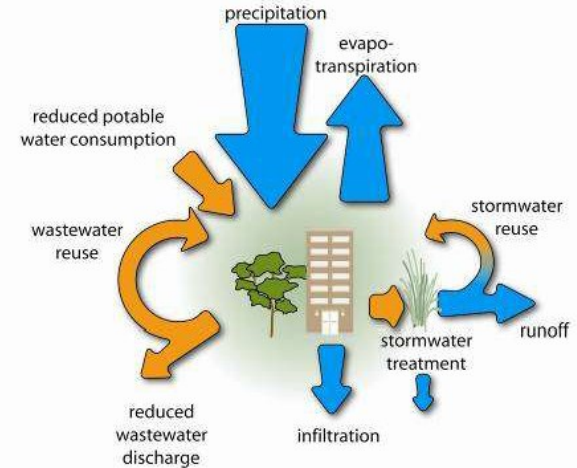
natural water balance



Urban water balance



WSUD water balance



Key:



The old and the new paradigms...



Human waste is a nuisance	Human waste is a resource
Storm water is a nuisance	Storm water is a resource
Build to meet the demand	Manage demand
Demand is a matter of quantity	Demand is multifaceted
One use (throughput)	Reuse and reclamation
Grey infrastructure	Green infrastructure
Bigger/centralised is better	Small/decentralised is possible, desirable
Use standard solutions	Allow diverse solutions
Integration by accident	Design physical & institutional integration
Collaboration = public relations.	Collaboration = engagement.

IUWM Projects in Africa

● Integrated Urban Water Management New Projects



Sustainable Urban Resilient Water and Sanitation in the face of climate change (SURE WATER)

- Working with 6 local governments in South Africa, Botswana, Zambia, Malawi, Namibia and Zimbabwe
- Overall objective: To contribute to sustainable climate change (CC) resilient urban water planning mechanisms and actions, based on international benchmarking within LAs and ensuring multiplier effects to the region.
- **Cities:** Francistown; Livingstone; Bulawayo; Knysna; Walvis Bay; Blantyre.



A dynamic, interactive and dedicated network for African local governments committed to addressing urban water and sanitation challenges on the continent

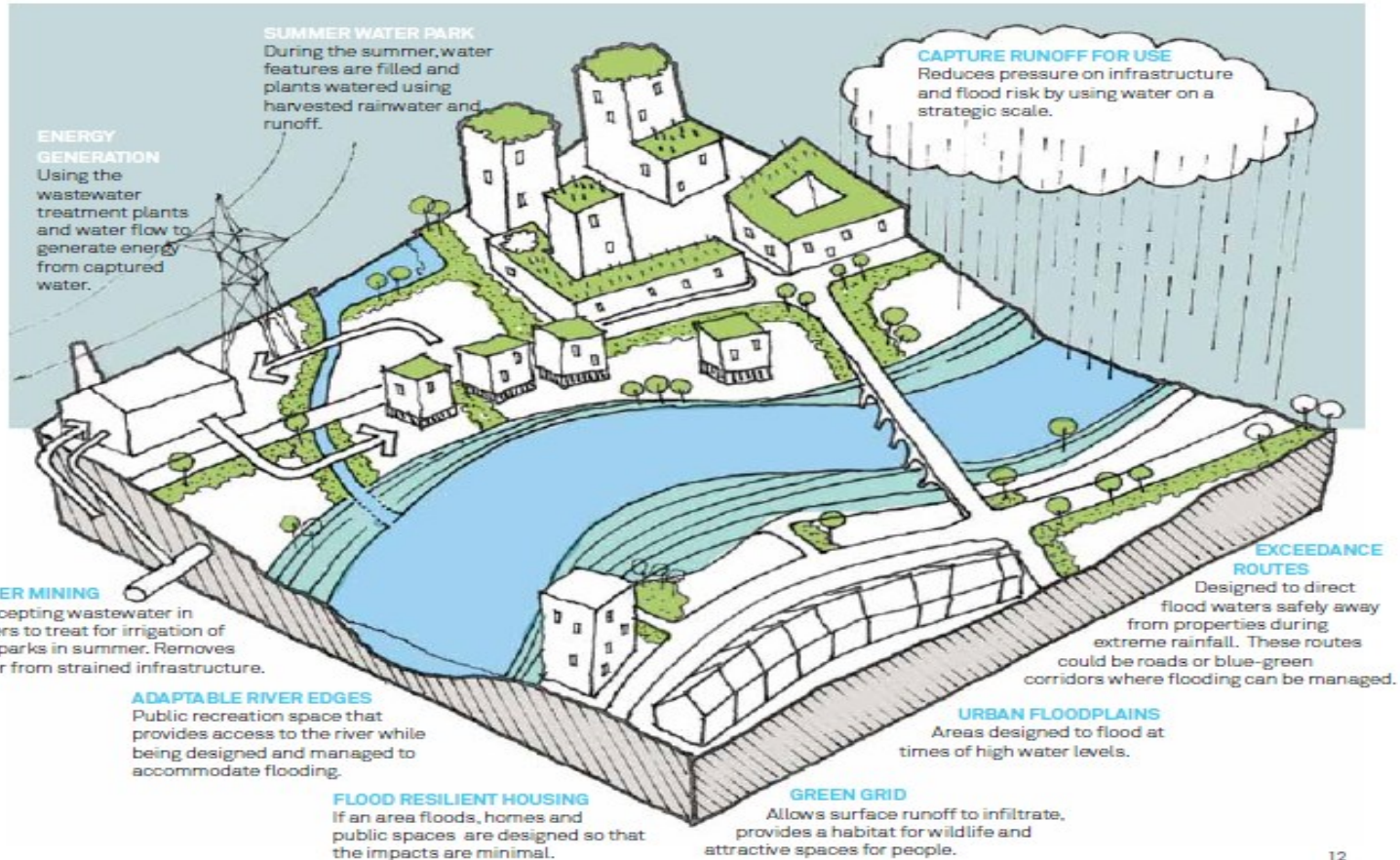
Dialogues

Knowledge
centre

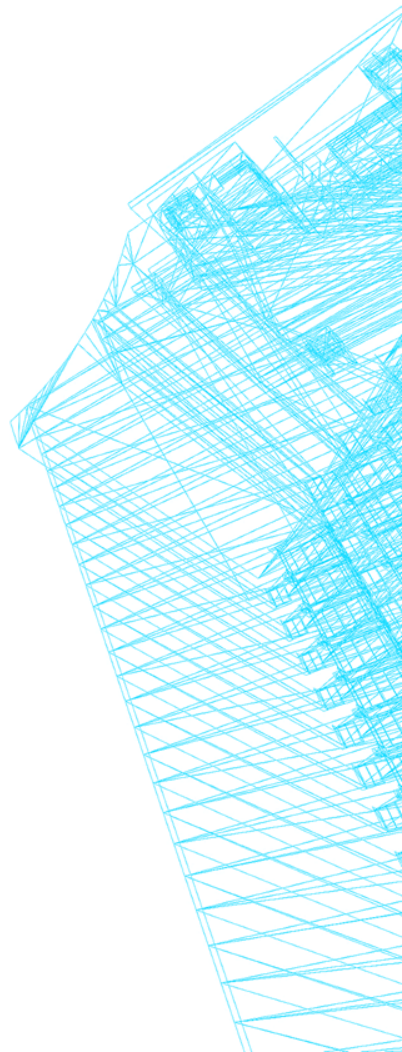
Tailored
training
programmes

Future cities will look like this someday

WHAT COULD A WATER SENSITIVE CITY LOOK LIKE?



From building infrastructure
to delivering UWSS services



From infrastructure to service delivery

Infrastructure approach



'PROJECT'
based approach

Oriented towards achieving **OUTPUTS**

Starting point is an assessment of funding resources available – **SUPPLY DRIVEN**

Focus on developing **INDIVIDUAL PROJECTS** of various sectors

Service delivery approach



'SERVICE'
based approach

Oriented towards achieving **OUTCOMES**

Starting point is measurement of current performance and local priorities – **NEED DRIVEN**

Focus on developing integrated **SECTORAL SOLUTIONS**

Informed decision making for planning and investment

- Aggregate statistics suggest good coverage of water and sanitation in urban areas
- BUT little is known about the **quality, level and financial sustainability of service**



Need to move from laying pipes to delivering water



PAS

Performance Assessment System
PAS Programme at CEPT University

in over **400+**
cities in two states

covering **76 million**
urban population

**Urban services for: Water Supply, Sanitation, Solid Waste
Management & Storm Water Drainage**

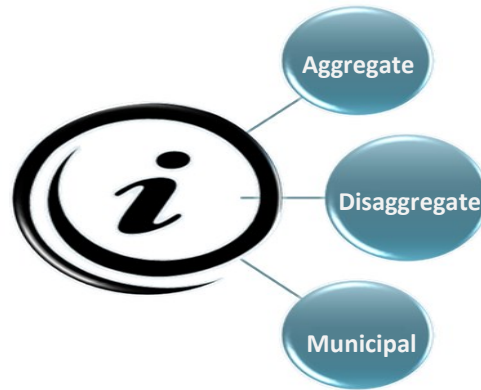


Performance measurement and monitoring: Brazil and Kenya

SNIS – Brazil

Data component are grouped according to three bases:

- Aggregate data
- Disaggregated data
- Local

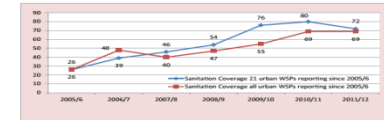
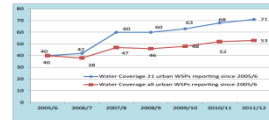


The application of historical series of the SNIS provides amicably all the data collection system, allowing unrestricted access to information and indicators contained in the database.

Source: <http://www.cidades.gov.br/serieHistorica/>

WASREB – Kenya

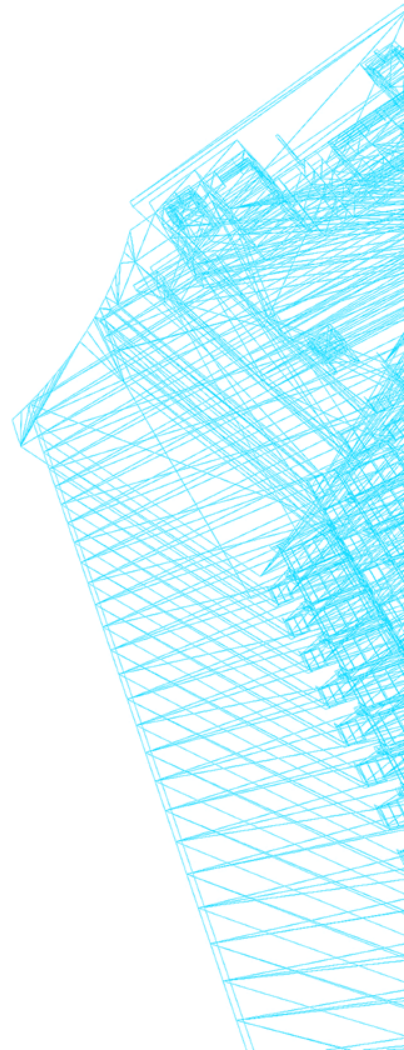
water supply providers' (WSP) performance are analysed with respect to the nine KPIs.



		Sector Benchmarks			Scoring Regime														
Indicators		Good	Acceptable	Not Acceptable	URBAN		RURAL												
		≥91%	80-90%	≤79%	Performance	Score	Performance	Score											
1	Water Coverage				≥91%	30	≥91%	30											
2	Sanitation																		
3	Drinking Water Qua	Impact 1		Impact 2		Impact 3		Impact 4		Impact 5		Impact 6							
		2005/6		2006/7		2007/8		2008/9		2009/10		2010/11		2011/12					
		Status of data submission		Status of data submission		Status of data submission		Status of data submission		Status of data submission		Status of data submission		Status of data submission					
		No. of WSPs		No. of WSPs		No. of WSPs		No. of WSPs		No. of WSPs		No. of WSPs		No. of WSPs					
		%		%		%		%		%		%		%					
		Complete		Complete		Complete		Complete		Complete		Complete		Complete					
		Incomplete		Incomplete		Incomplete		Incomplete		Incomplete		Incomplete		Incomplete					
		Non-submission		Non-submission		Non-submission		Non-submission		Non-submission		Non-submission		Non-submission					
		Total		Total		Total		Total		Total		Total		Total					
		Rank		WSP		Score 2011/12		Score 2010/11		Scores +/-		Rank		WSP		Score 2011/12		Score 2010/11	
1		Nyeri		179		169		10		33		Wote		67		67		-4	
2		Embu		138		107		31		34		Yalla		63		49		14	
3		Eldoret		138		124		14		35		Item Tambach		63		68		-5	
4		Malindi		133		130		3		36		Mombasa		63		66		3	

WSPs are ranked on the basis of their performance on these KPIs as well as with respect to their performance development from the previous to the current reporting period.

Leveraging public finance
using new and innovative
sources of funds





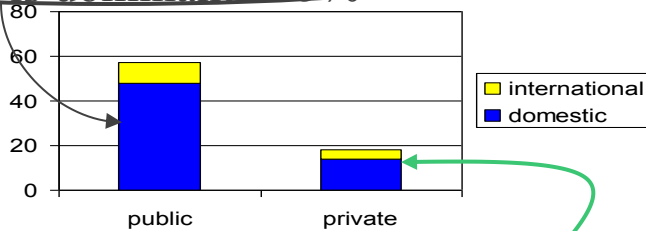
1990s... the hope...

- ✓ Large infrastructure investment needs
- ✓ Limited – or even declining public resources
- ✓ Limited share of international aid
- ✓ Worldwide interest from private sector in cross border infrastructure investments
- ✓ *So... the private sector will “fill the gaps”...*

The realities...

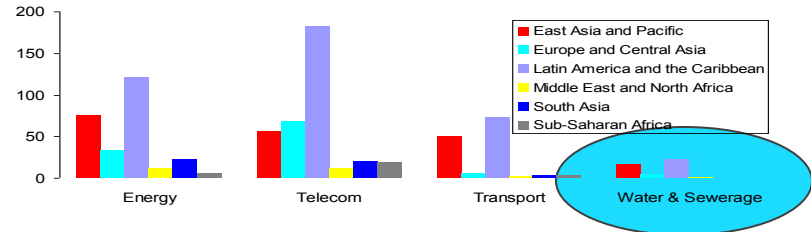
Financing flows into water in 2000

Public is dominant ~85%



Domestic is dominant ~ 85%

International private investment in infrastructure in 1990-2002 –Very low in WSS





In the new millennium – 2000s: A plea for aid resources

✓ Camdessus Panel Report

- *“There is widespread agreement that the flow of funds for water infrastructure has to roughly double...”*

✓ Sachs Report - UN Millennium Project

- *“The report says the MDGs can be achieved if total annual development assistance is doubled to \$135 billion—or 0.44 percent of donors’ GNP—in 2006, and rises to 0.54 percent of donors’ GNP by 2015. “(The Economist)”*



Rethinking Waste water and sanitation as social investments

- There is a need to rethink waste water and sanitation as social investments as they accord high level of positive externalities and help reduce disparities
- They also help generate positive and wider environmental impacts

Sources of funds for water management

Sustainable urban water service

Revenue

there are two primary sources of financing:

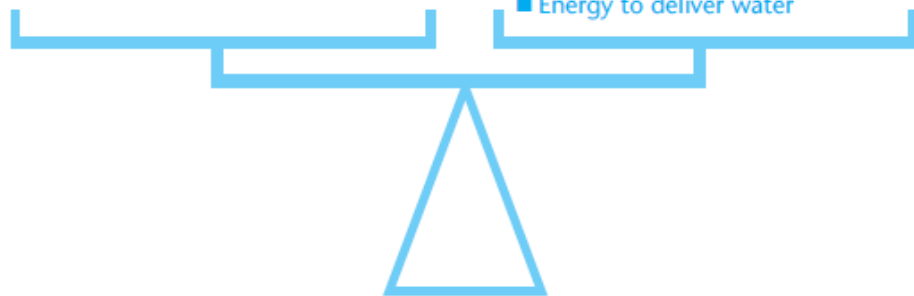
- User fees
- Public funds
- **Social investment funds**
- **CSR**
- **Crowd funding**

Examples of expenses

to build operate and maintain water supply and sanitation systems:

- Training and paying workers
- Repay loans for infrastructure investment
- Maintenance of pipes, pumps and equipment
- Materials for cleaning water
- Energy to deliver water

Need to identify additional sources of funds beyond user charges and public finance



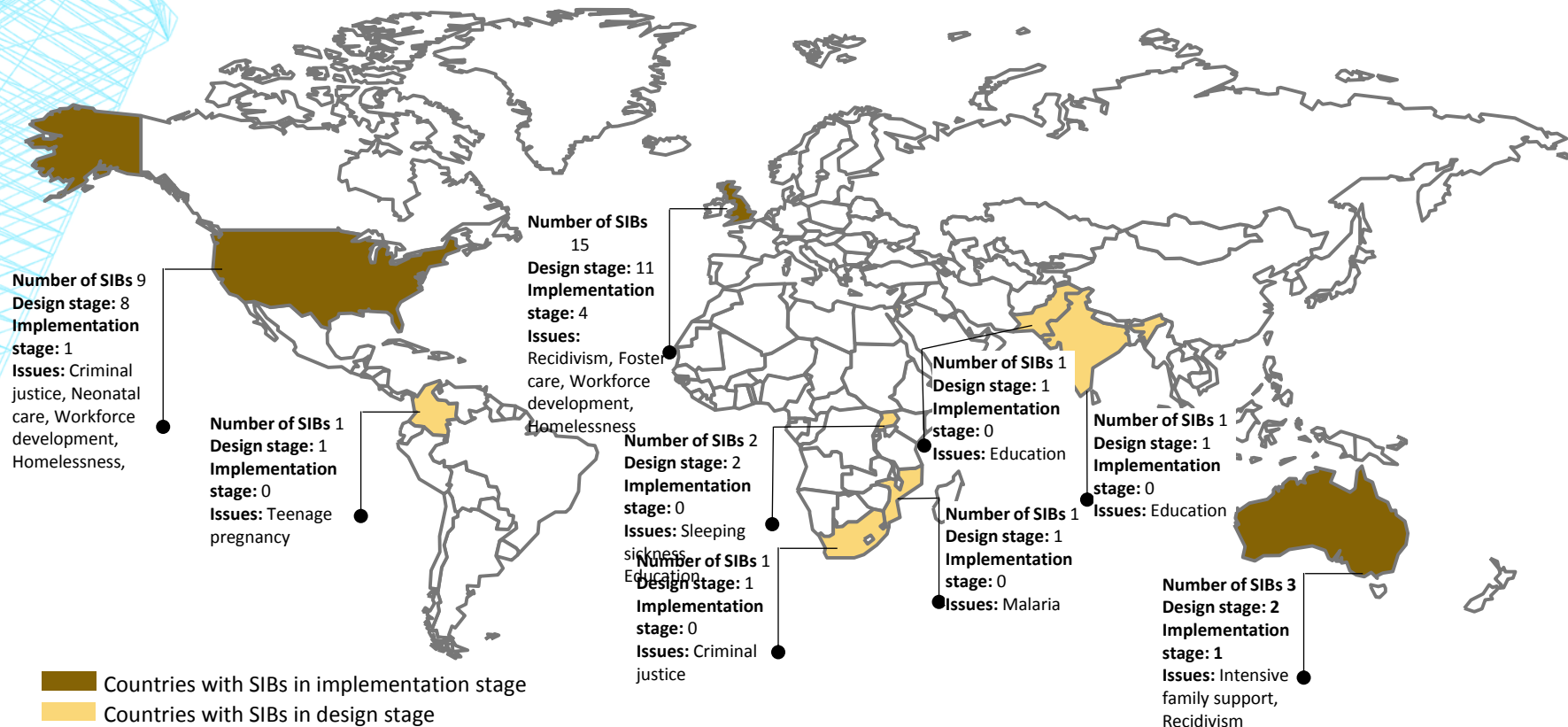
Social impact investors

- Social impact investors emerging as a potential new source.. **High net worth individuals (HNI), Institutional social investors, Foundations**
- For example, a recent 3-year Debt Fund for Cancer Cure by HDFC Mutual Fund mobilized about Rs 77 + Rs 180 crore (~USD 40million). **The dividend from this was provided to Indian Cancer Society.**

HDFC DEBT FUND FOR
CANCER *cure* **2014**
A 3 year closed ended capital protection oriented income scheme®



SIBs have been used in developed countries as well as developing countries to generate investment for a range of social issues



CSR – A potential new source

- In India, the Companies Act, 2013 promotes new models of social engagement by mandating that large companies spend 2% of their annual profit for corporate social responsibility (CSR)
 - potential estimated annual flows from CSR of nearly **USD 3,000 million**
- Though sanitation is included in the list of activities, it is still challenging to direct **CSR funds to urban sanitation**
- Many companies already active in sanitation space but largely in rural areas – HUL, Ambuja Cement, ACC, Amul, GAIL, NTPC



Our work is based on our mission and underscores our belief in communities and in our role as catalysts to bring in change.

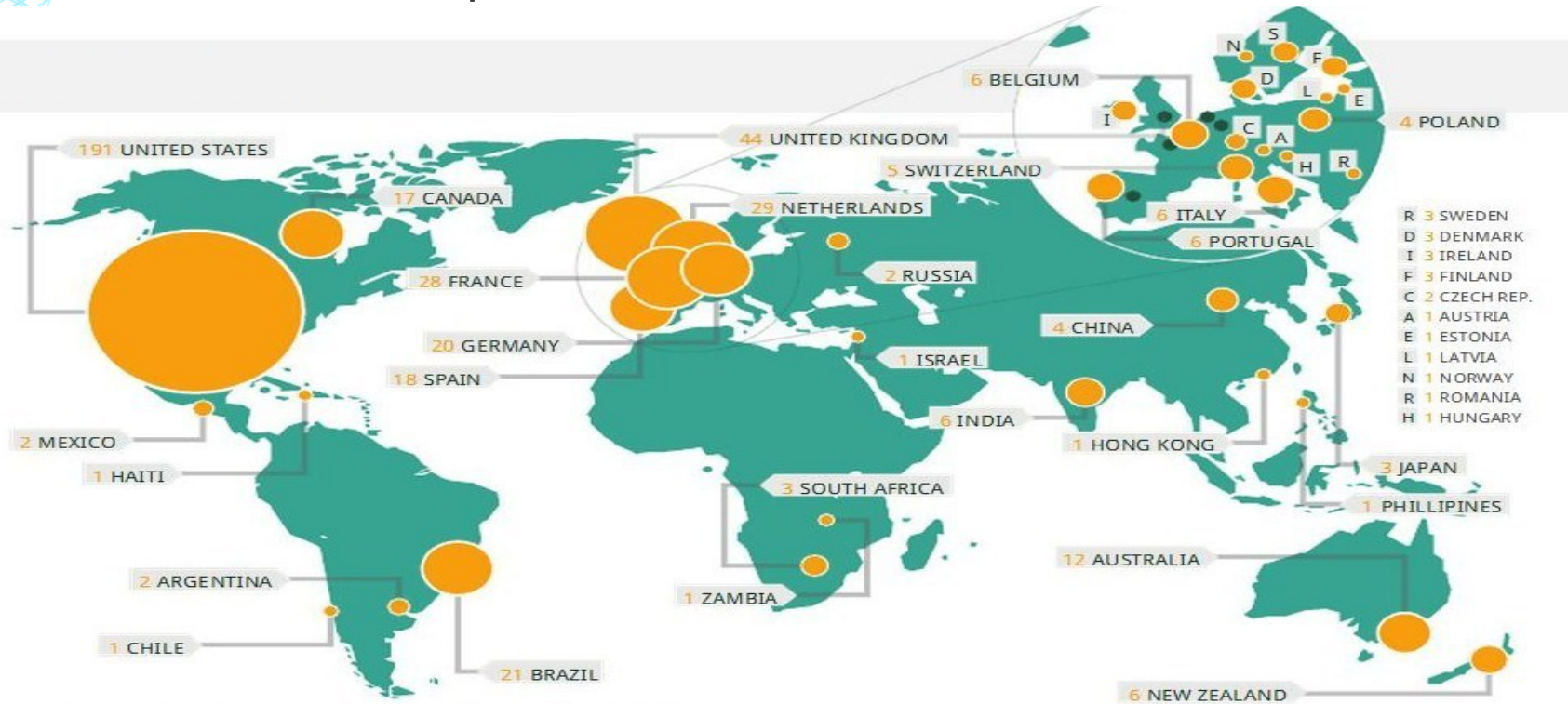
Some of the major corporates have invested in water and sanitation projects as a part of their CSR

	Company	Description	Geographical focus
FMCG	Hindustan Uniliver Ltd. (HUL)	<ul style="list-style-type: none"> Unilever Foundation and Domestos, HUL's toilet hygiene brand support UNICEF's Community Approaches to Toilet Sanitation (CATS) Program through Community Awareness Domestos educates customers and raises awareness about the Sanitation Crisis. 	India, Gambia, Ghana, Nicaragua, Nigeria, Pakistan, Philippines, South Sudan, Sudan and Vietnam.
	Nestle	<ul style="list-style-type: none"> Sponsors the construction of sanitation facilities for female students in village schools around their factories. 37 sanitation facilities invested in so far, benefiting over 15,000 female students. 	Tamil Nadu, Karnataka, Haryana, Punjab, Uttarakhand, Himachal Pradesh
	Amul	<ul style="list-style-type: none"> Has initiated a Rural Sanitation Campaign with the aim of making the milk producers community OD free. Has prepared a model low cost toilet block which costs Rs. 11,500 per unit. Provides interest free loans to the milkmen to purchase the toilet block. The loan amount is recovered by deducting Rs. 100 from the monthly salary. 	Gujarat
Cement	ACC Ltd.	<ul style="list-style-type: none"> Aims to provide better Sanitation facilities for families living around their factories. Spent 1.48 Cr in 2012 on health and sanitation programs. Built 7 community toilets and 310 household toilets. Installed new sewage treatment plants in Jamul and Chanda. 	Maharashtra, Jharkhand

- 2011

2012- More than 450 Crowdfunding Platforms

- 2011- Amount raised **US\$1.5 billion**
- 2014- amount increased to **US\$ 5.1 billion**



Source: Based on Crowdsourcing.org Directory of Sites as of April 2012

Spacehive - Transforming civic spaces

- ✓ World's first funding platforms for civic projects
- ✓ Since Dec. 2011, platform to more than 240 civic initiatives in UK
- ✓ Hives- online hubs, bring local people and councils together
- ✓ Charges 5% fee (only when target is achieved)



Raised more than 792,000 pounds to build a multi-purpose, energy efficient community center



Raised 36,850 pounds to provide free access to Wi-Fi for visitors to Mansfield Town

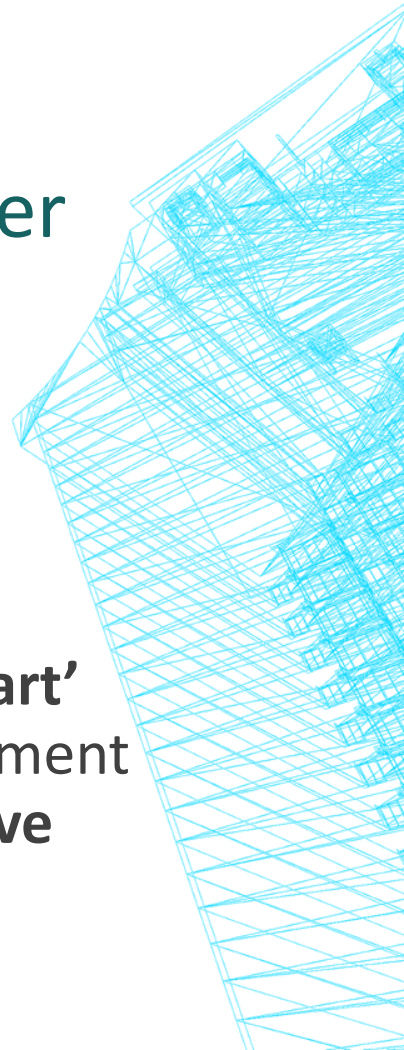


Till now raised 40,800 pounds for turning derelict flyover into urban park, backed by City Council

In Summary..

From challenges to opportunities in water and sanitation management

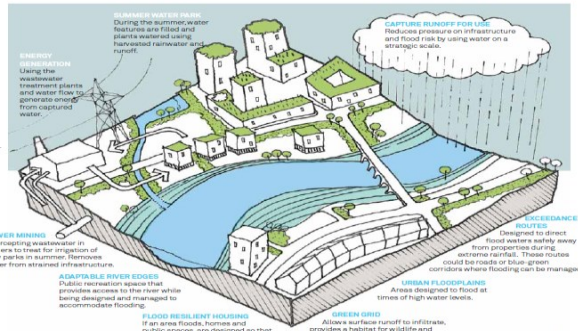
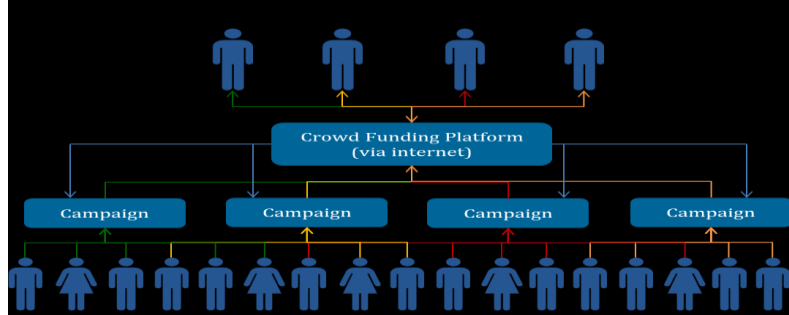
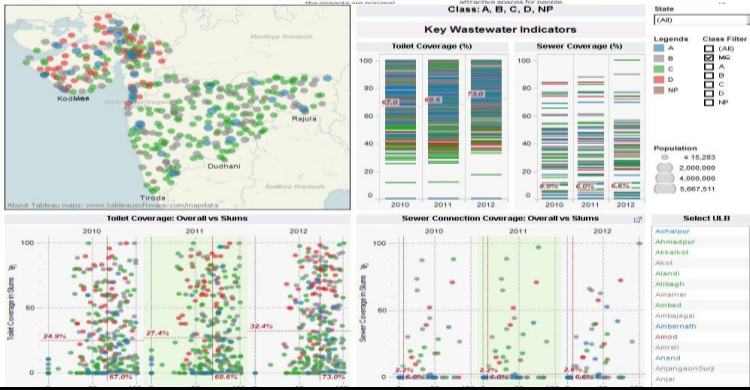
- ✓ Meeting the rising water demand and waste treatment requirement through **Water Sensitive urban Design (WSUD)**
- ✓ To improve service performance and reduce disparities focus on **service delivery** – set up ‘**smart monitoring systems**’ for assessment and improvement
- ✓ To meet the investment needs, **tap new innovative finance** for urban development



URBAN FORM:
Large urban area centred on river corridor
City centre dominated by paved areas
Significant growth targets

WATER CONTEXT:
Lack of capacity in sewer system
Serious flood risk
High rainfall and low water stress

COMMUNITY CONTEXT:
Pockets of deprivation
Neighbourhood parks and recreation
space needed

water
sensitive
urban
design

Thank you...

meeramehta@cept.ac.in
www.pas.org.in

