

# Research Needs for Supply of Water Services in Cities in Developing Countries

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# Integrated Water Resources Management - IWRM

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Department of Water Affairs  
and Forestry Guidelines,  
March 2004



Case Studies from South Africa  
eThekwinini & Cape Town



# Integrated Water Resources Management - IWRM

IWRM is the process of meeting the needs for use of the water resource, as expressed by the stakeholders, in such a way as to ensure the equitable, beneficial and sustainable use of the water resource.

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# Integrated Water Resources Management - IWRM

It is based on the principle that, in order to maximise the benefits of use of the water resource and to ensure equitable use of water, you must balance the needs of all the water users (and discharges) in the catchment.

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# Water Management in South Africa

Water  
Resource  
Management  
National Water  
Act, 1998

Water Services  
Provision  
Water Services  
Act, 1997

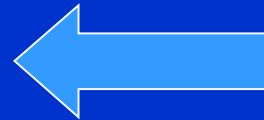
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# Water Resource Management

Water

Protected  
Used  
Developed  
Conserved  
Managed  
Controlled



National  
Water Act  
1998



Environmental  
Sustainability

Social Equity

Economic Efficiency

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Abstraction  
Conveyance  
Treatment  
Distribution



Collection  
Removal  
Treatment  
Disposal



**Water  
Services  
Provision**

Water Services  
Act, 1997

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# Integrated Water Resources Management - IWRM

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## *Cross-sectoral Integration*

*Principles: Equity, Environmental Sustainability, Economic Efficiency, Redress, and Participation.*

*Enabling Environment*

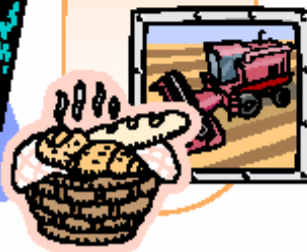
*Institutional Roles & Functions*

*Management Instruments*

*Water for People*



*Water for Food*



*Water For the Environment*



*Water for Industry & others*



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# Case Studies

- eThekweni (Durban) Municipality
- City of Cape Town

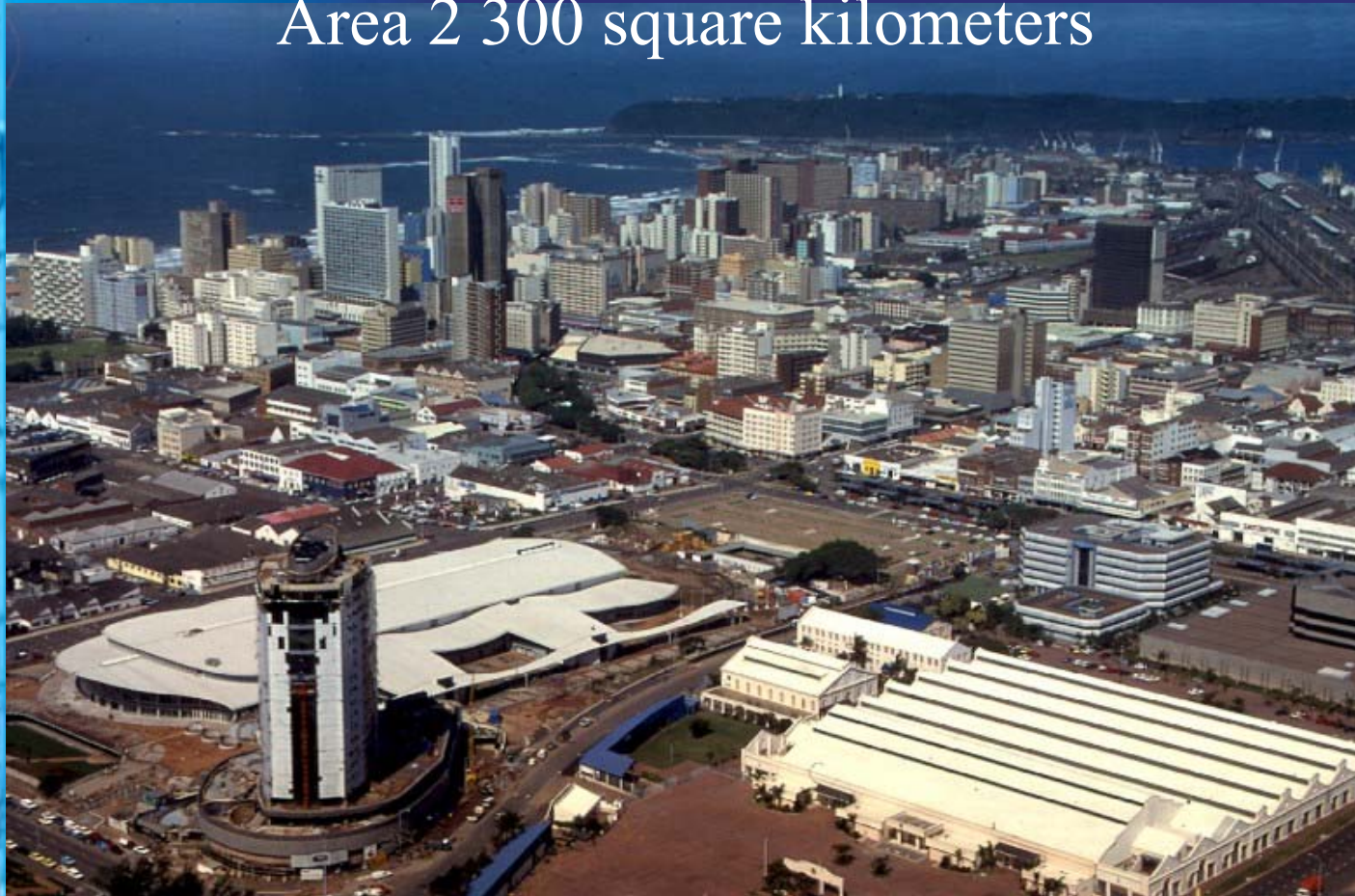
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# eThekweni Municipality

Population 3 million

Area 2 300 square kilometers



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# eThekwini – Highlights

- Saving wasted-water by repairing leaks, pressure management, prepaid water meters, water-saving fittings
- Communicating with community, adopted by World Bank
  - Roadshow (with Coca-Cola vehicle)
  - School Theatre Campaign
- Winner of Dubai and UN-HABITAT International Award for Best Practices (Sewage Disposal Education Programme )

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# eThekwini – Highlights

- First S.A. recycled waste-water plant
- First city in S.A. to provide free basic water (6 kl/month)
- Water Supply is financially ring-fenced , i.e. no cross-subsidization
- Graded level of service for different socio-economic circumstances
  - Standpipes, ground tanks, roof tanks, full pressure reticulation

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# eThekweni – Saving Water



Neil Macleod  
Head: Water &  
Sanitation

- R100M /year lost due to water leaks
- 90 000 illegal water connections
- 700 faults reported daily
- After repairing leaks
  - KwaMashu's av.daily consumption dropped from 25000 kl/d to 17000 kl/d
  - City's water losses were halved
  - Water consumption dropped to 1995 levels
  - Revenue was increased by 40% (new meters)

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# eThekwini : Water Learner Production Programme

- Ongoing school theatre campaign
- Over 100 schools involved
- Play about water and sanitation
- Combination of Mime, Song, Dance, Dialogue
- Demonstrations with models showing causes of blockages and leaks
- Focus is on first time users

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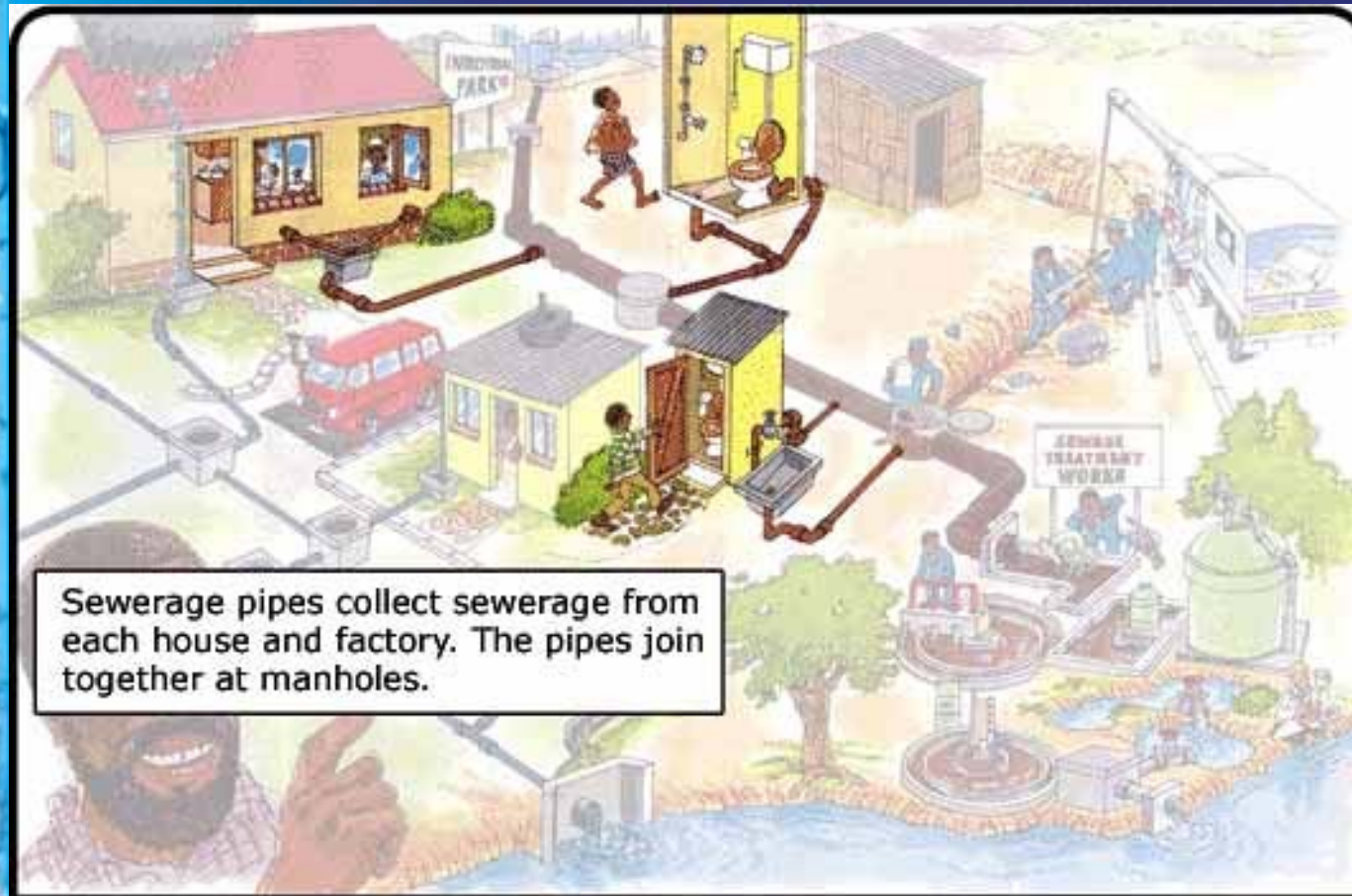


Blockages have reduced by one-third in 12 months.

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# Sewage-to-clean-Water Recycling Plant

- 450 Ml of wastewater treated daily
- Plant commissioned in May 2001
- 47.5 Ml treated for industrial purposes
- Capital cost was R74.5M
- Frees up water for 300 000 people
- Provides cheaper water for industry

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# eThekwini : Challenges



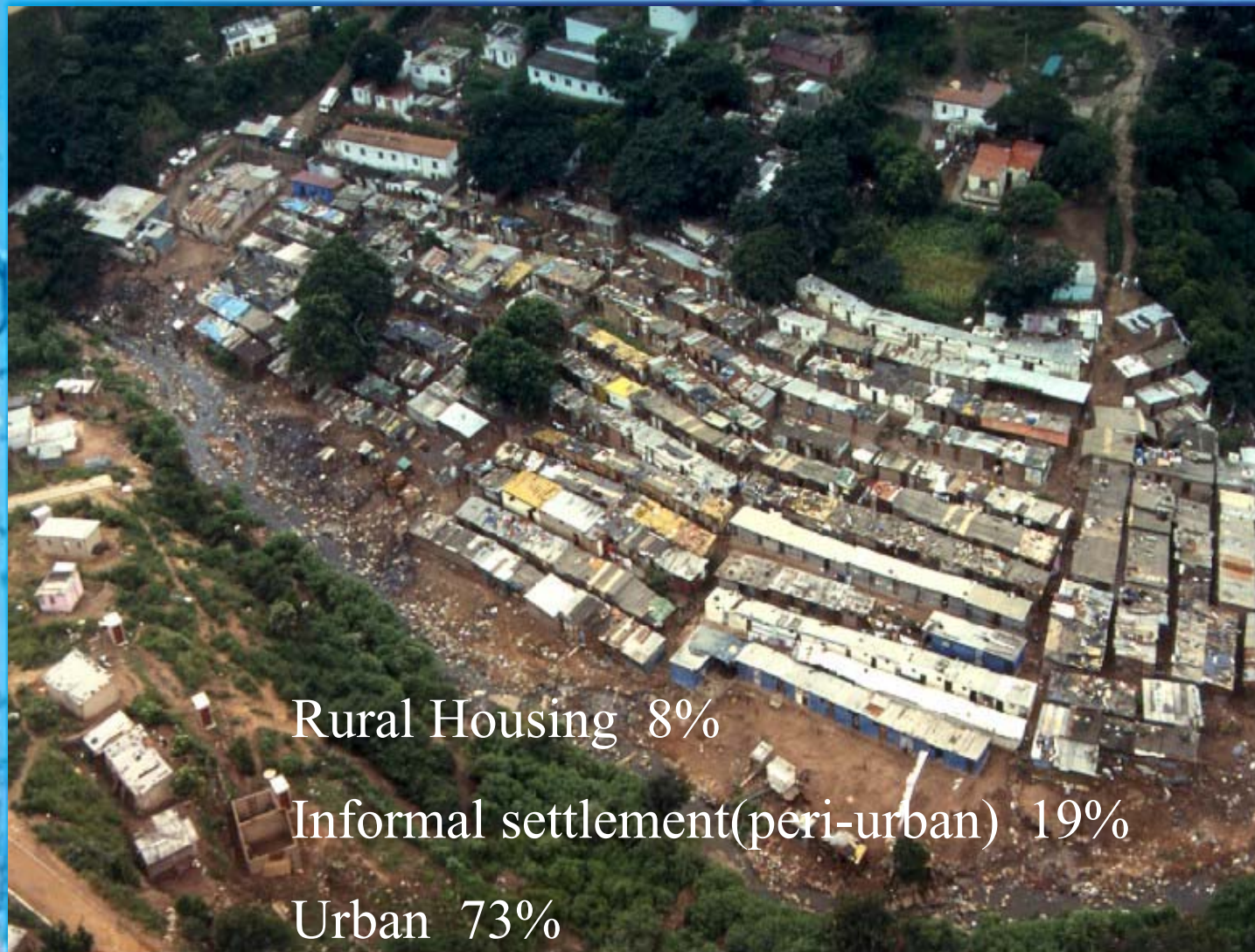
- water meters removed due to:
  - customers tampering with water meters repeatedly, removing flow restricting devices which allow 6 to 10 kl of water per month
- they owe R4.8M to the Municipality
- eThekwini water debt in 2003 was R250M

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# Informal Settlement Water and Sanitation Provision



Rural Housing 8%

Informal settlement(peri-urban) 19%

Urban 73%

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... dictated by a thriving city trying to attract tourism,...



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... sports,  
businesses,  
conferences...





...and also by the past imbalances in service provision.

Graded level of service from pit latrines to small  
packaged plants to formal sewerage



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## Pollution from informal settlement areas contaminates streams

Measurements of faecal contamination in streams in eThekweni area have yielded E.Coli counts of 300 000 to 10 Million Per 100 ml of water.

The causes have been identified as inadequate sanitation from informal communities and broken sewers.



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## Pollution from informal settlement areas contaminates streams



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# Illegal Industrial Discharges to River

Promotion of cleaner production and  
waste minimization at source has  
shown savings for industry



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# Solid and Hazardous Waste Sites



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# City of Cape Town



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# Water Demand Management (WDM)

- Increase Supply
- Reduce Demand
  - Significantly lower implementation cost
  - Shorter implementation time frame
  - More environmentally and socially acceptable

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From: INTEGRATED WATER RESOURCE PLANNING IN THE CITY OF CAPE TOWN, J. Frame and M. Killick, ISA 2004

# WDM Strategy – 3 packages

1. WDM options that may be implemented by the City of Cape Town
2. WDM options that may be implemented by individual consumers
3. supply augmentation options that may be implemented by the CCT

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# Options considered for meeting additional water demand

OPTION	YIELD	FINANCIAL	SOCIO-ECON.	ACCEPTABILITY	ENVIRONMENT	OVERALL SCORE
Pressure management	64	84	62	95	93	83
Elimination of automatic flushing urinals	57	76	59	94	93	79
Tariffs, metering and credit control	69	100	69	29	93	75
Voelvlei *	87	83	54	83	51	74
Leakage repair	52	64	85	75	93	73
Lourens River Diversion	78	84	66	74	44	72
TMG Aquifer *	70	75	73	79	39	70
Eerste River Diversion	70	75	54	78	53	69
Cape Flats Aquifer	66	69	57	75	70	69
Treated wastewater for local urban and industrial use	41	75	31	68	97	67
Promotion of private boreholes	38	59	61	74	37	57
Desalination *	73	25	63	85	82	57
Introduction of water-efficient fittings	48	50	64	38	93	56
Promotion of grey-water use	29	55	28	63	82	54
Treated wastewater for commercial irrigation farmers	48	72	10	26	82	51
Treated wastewater reclaimed to potable standard	71	17	71	38	97	47

\*Options investigated in CMA bulk Water Supply Study

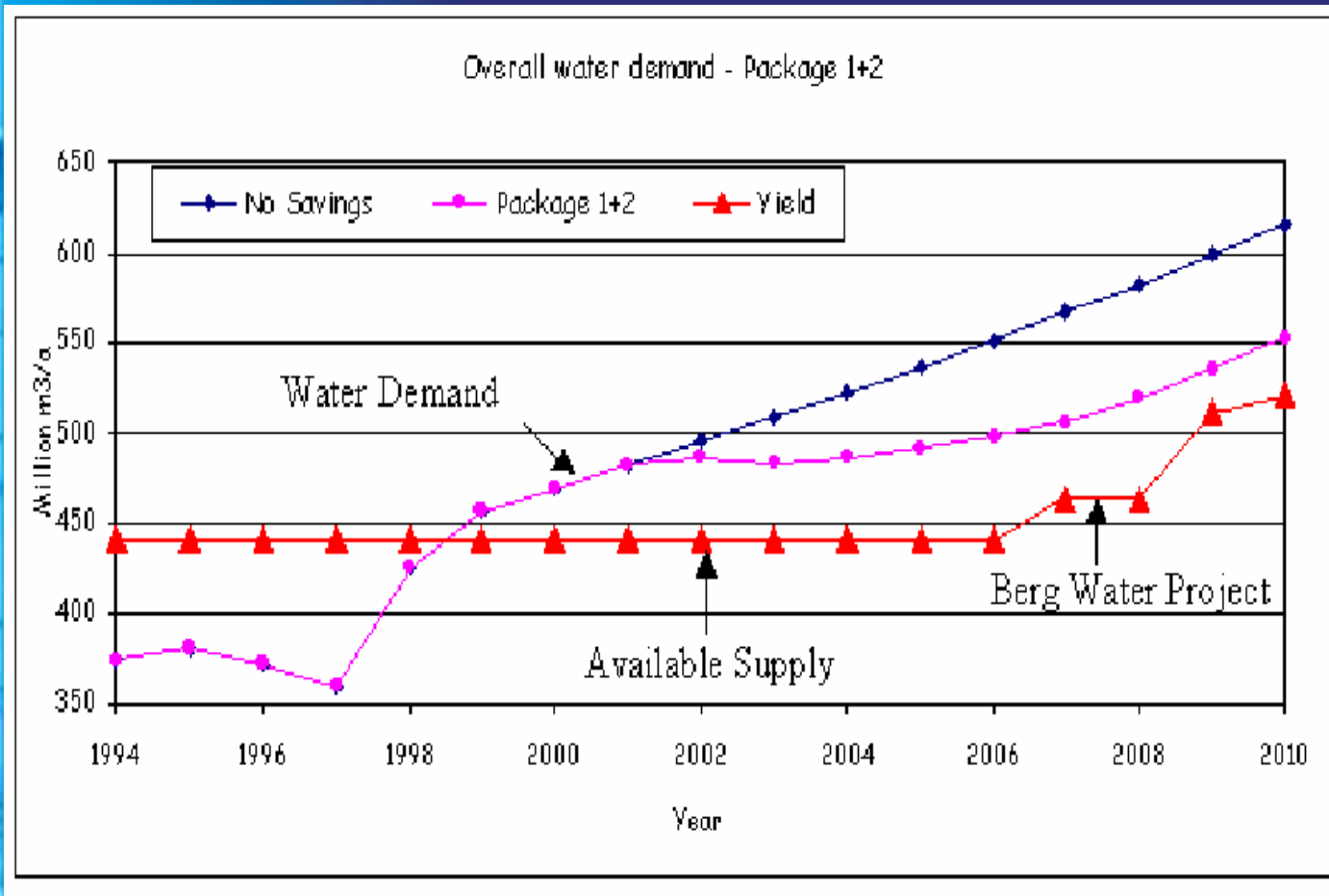
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# Water Demand — Urban and Agricultural



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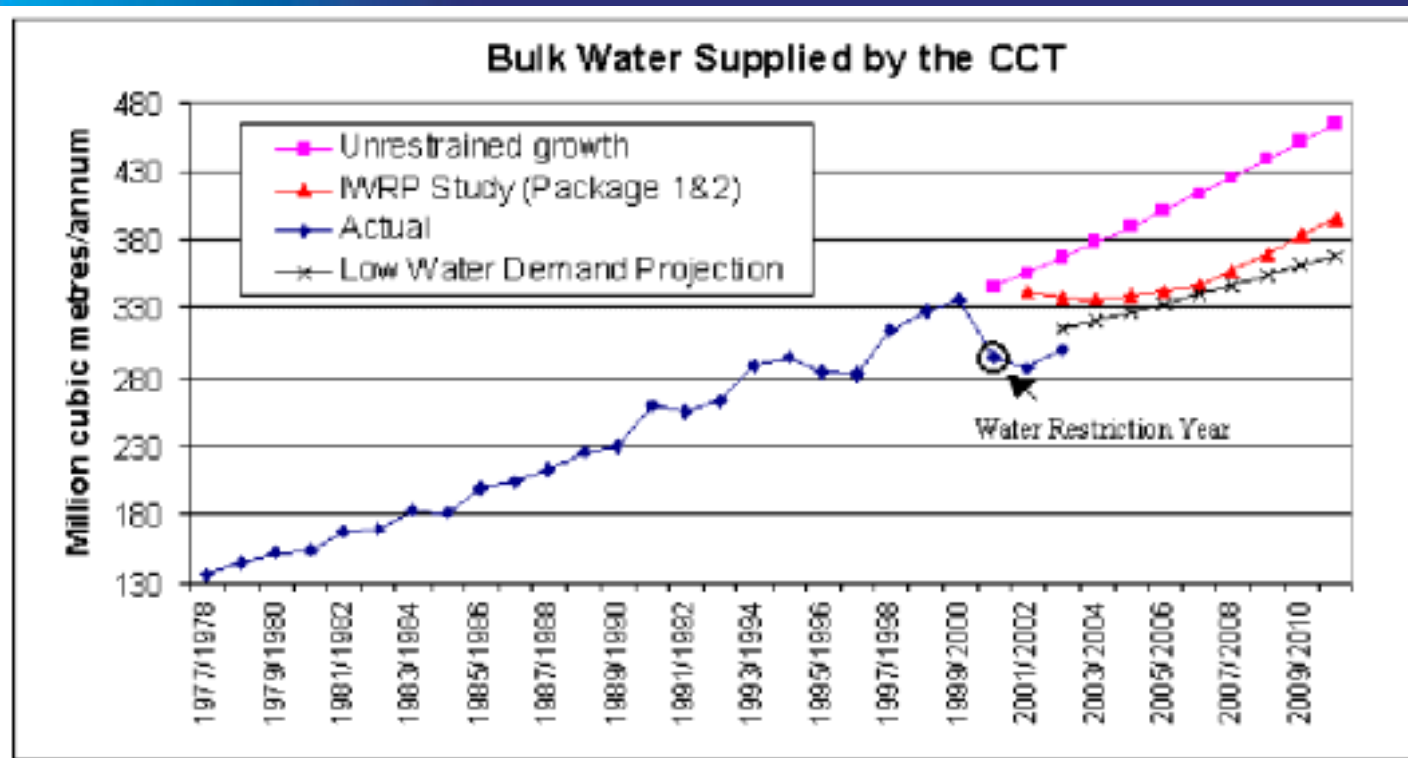


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# Water Supply

historical trend and future demand projection

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# WDM options that may be implemented by CCT (Package1)

- pressure management
- user education
- elimination of automatic flushing urinals
- leakage repair
- tariffs metering and credit

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# WDM options that may be implemented by consumers

(Package 2)

- promotion of private boreholes
- introduction of water efficient fittings
- promotion of grey water use

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# Customer Survey Results

- 57% have changed water use habits:
  - 41% of them due to higher tariffs
  - 32% of them due to water restrictions, e.g. no garden watering between 10:00 and 16:00

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# CCT Conclusions

- Optimum Integrated Water Resources Management will keep water
  - affordable
  - Sustainable
  - Minimise environmental impact by delaying future water augmentation schemes

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# CCT – Research Areas Identified

- Optimum expenditure for WDM
  - Learning more about the water network
  - Relative effectiveness of various WDM measures

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# Research Areas

- Charge system for polluting water (legal & technical)
- Water and sanitation for informal housing in cities
- Grey water reuse for households
- Ecological sanitation
- Stormwater harvesting
- Groundwater recharge
- Treated wastewater reuse & Water recycling for industry
- Optimum expenditure for WDM
- Informal Settlement Water and Sanitation Provision

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