Squeezing out the Drop$
Improving Water Utility Efficiency through Performance-Based Investment

PUBLIC-PRIVATE PARTNERSHIPS CONFERENCE

JUNE 5-8, 2012 | DAKAR, SENEGAL

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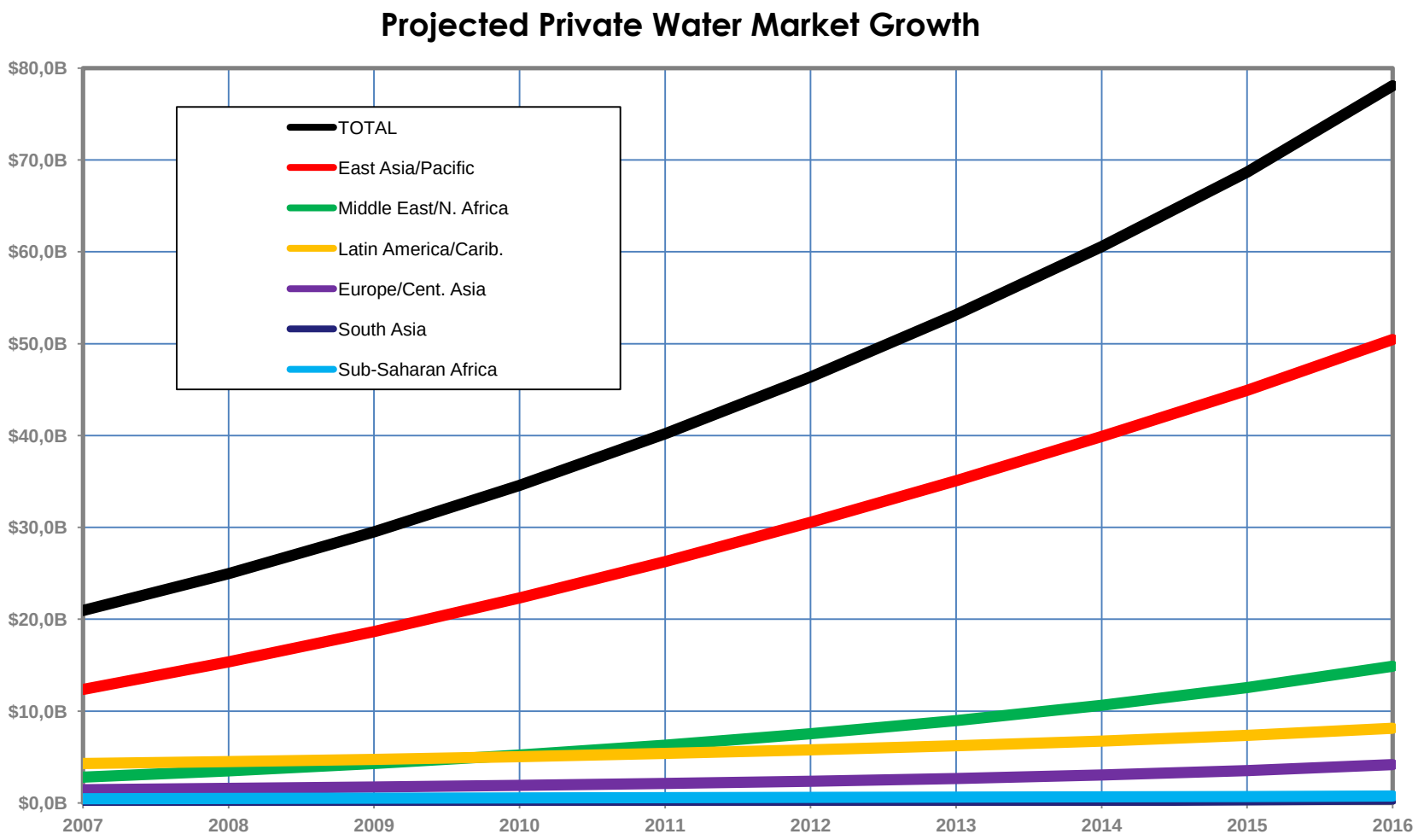
There is an $80B global water market for private sector



Source: Global Water Intelligence (GWI) – Global Water Market 2008

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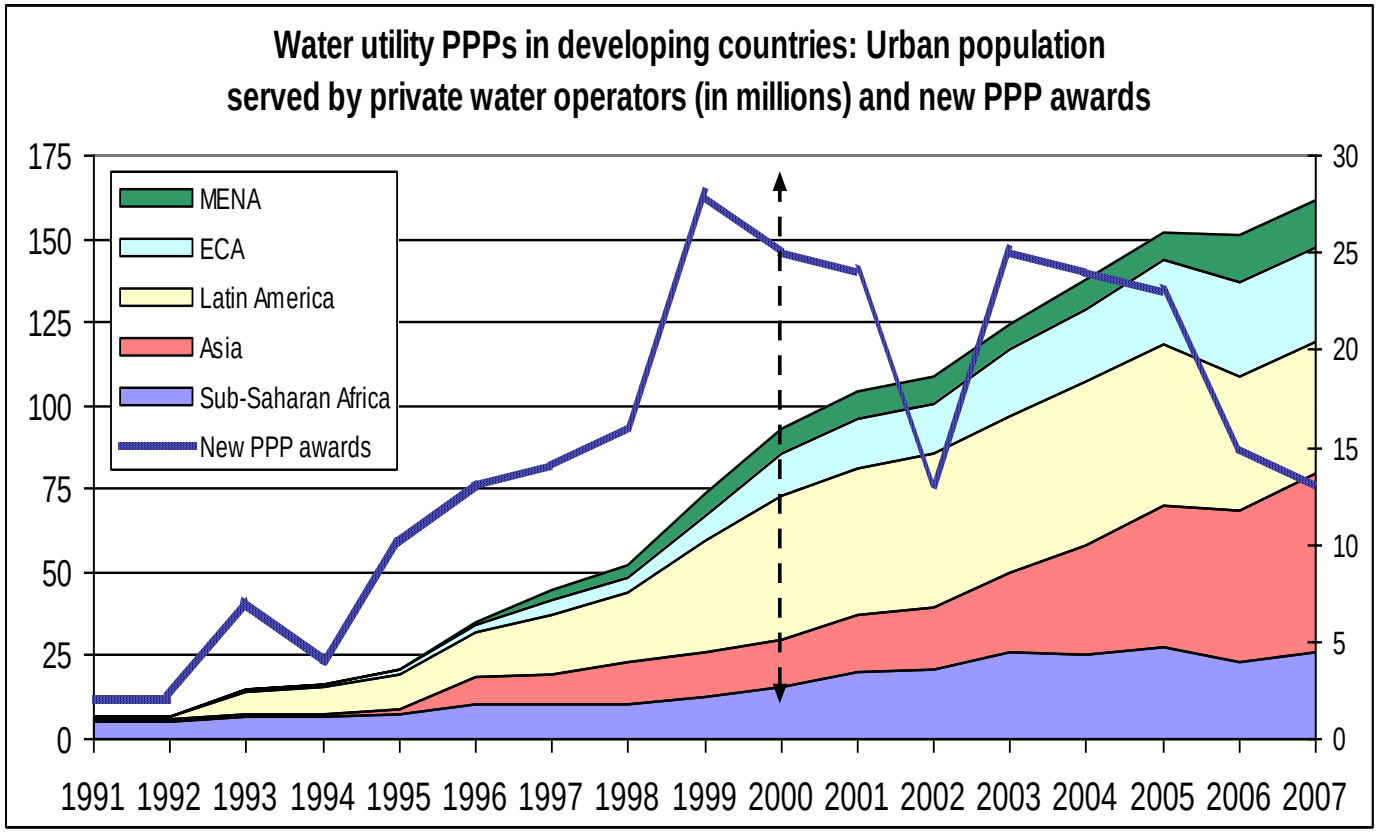
But private sector participation has been limited due to 3 Rs

Risk
- Political risk in large scale concessions

Returns
- Tariff issues limit bankable deals

Regulations
- Private investment tends to flow to countries with favorable regulation, political support



Source: Public-Private Partnerships for Urban Water Utilities - A Review of Experiences in Developing Countries by Philippe Marin (World Bank)

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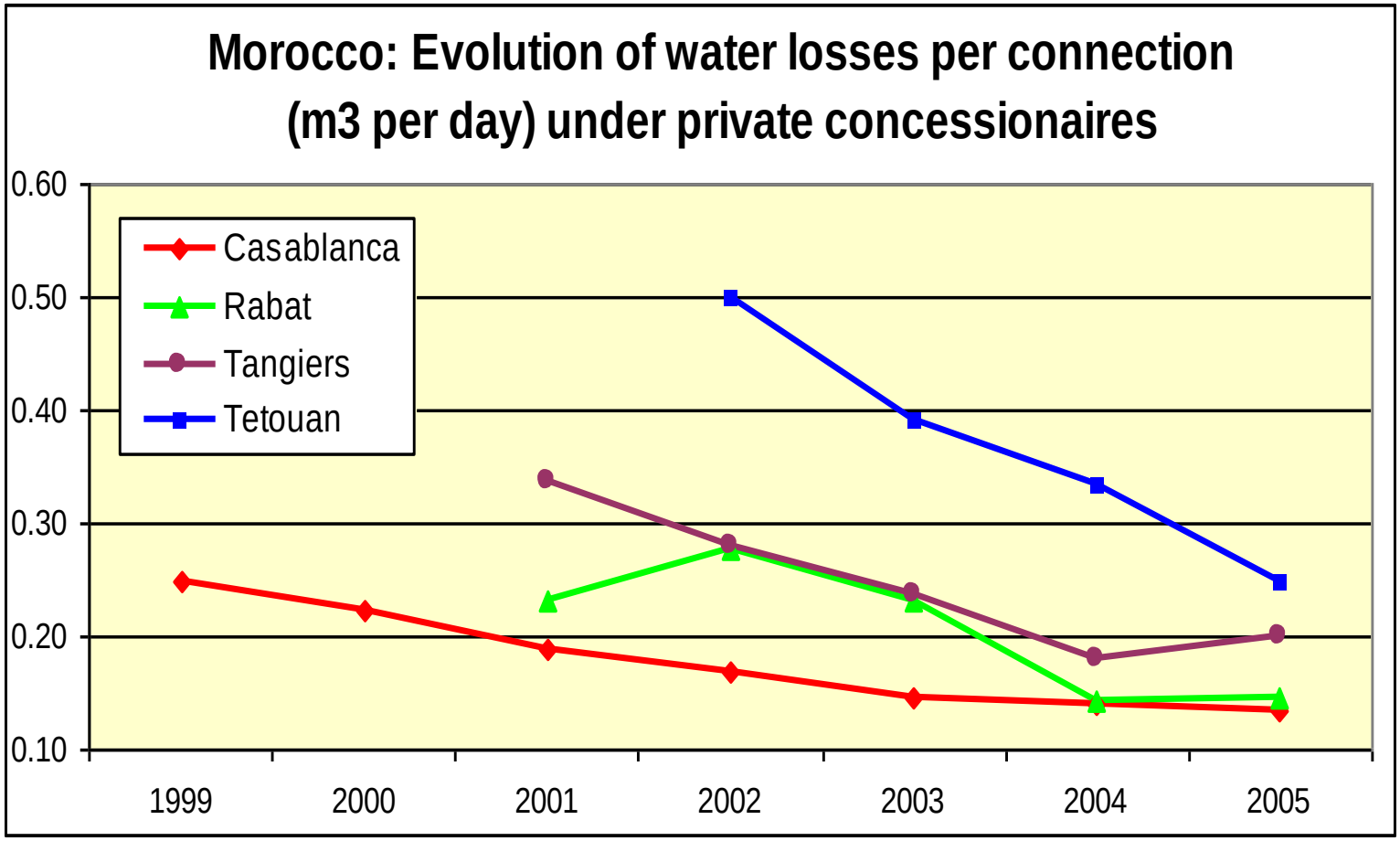
Need to focus on what private sector does best



Water Utility Efficiency Improvement

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Squeezing out Every Last Drop
Resource Efficiency in the Water Sector

Non- Revenue Water (NRW)

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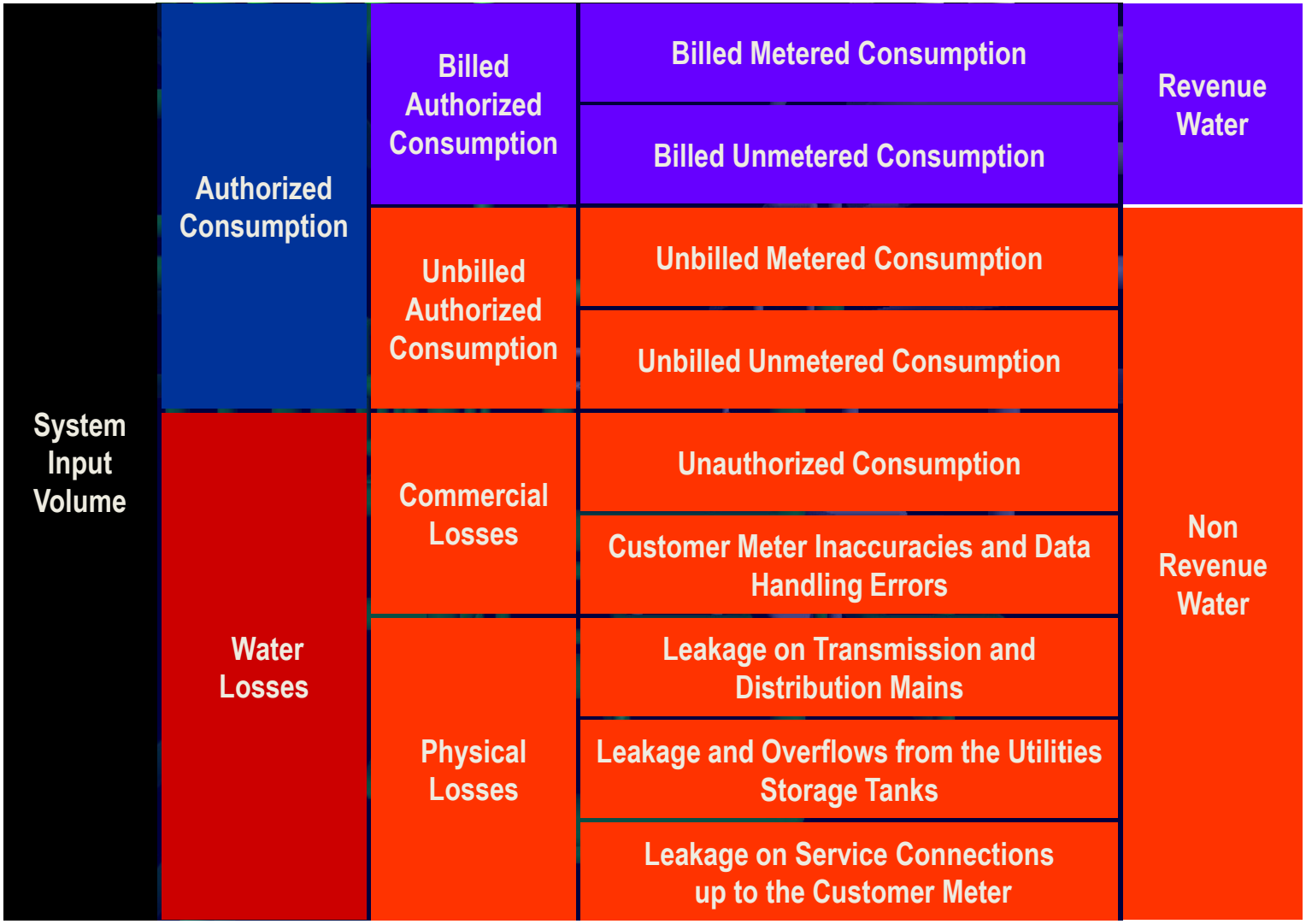
The Water Balance Table



Source: International Water Association (IWA)

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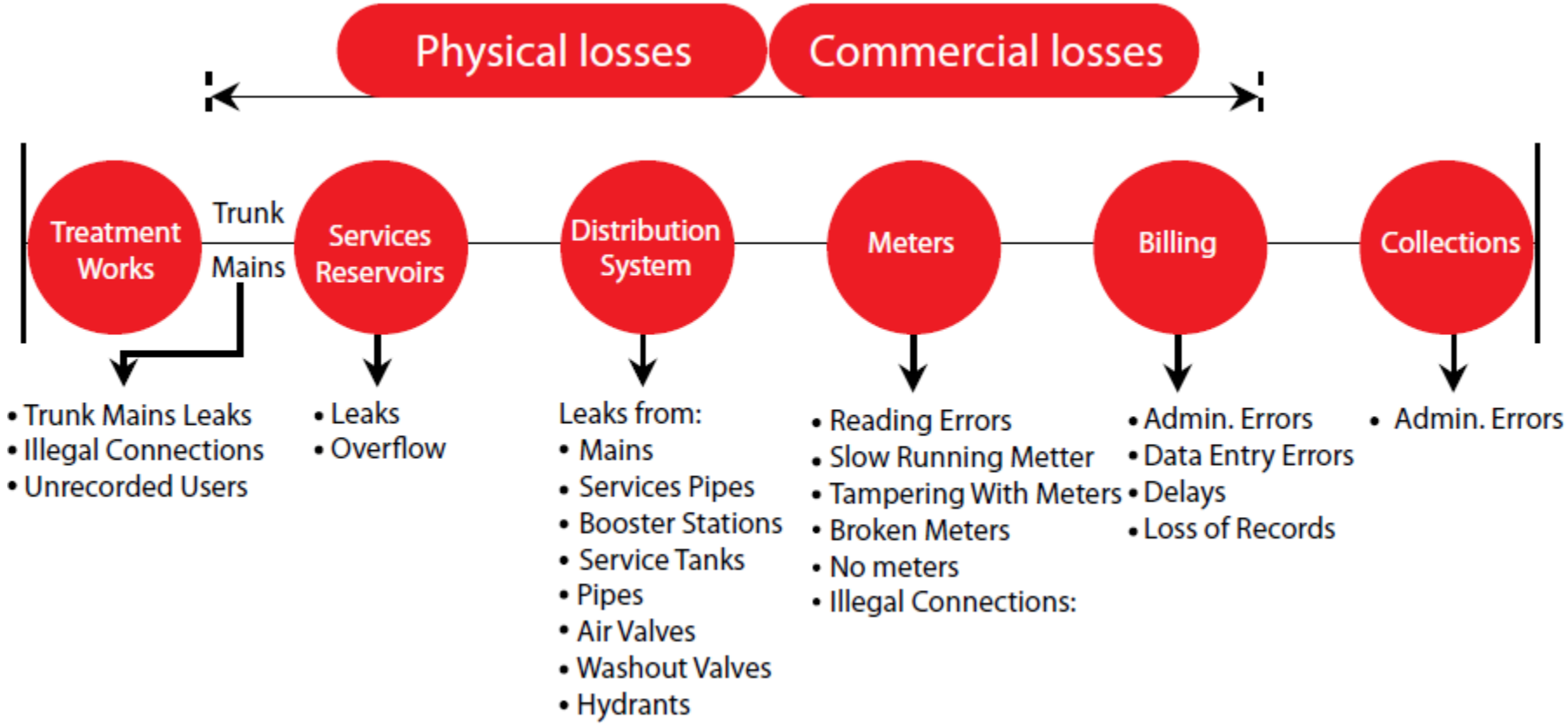
Typical Losses from a Water System



Source: The Manager's Non-Revenue Water Handbook
A Guide to Understanding Water Losses (July 2008)
Ranhill Utilities Berhad and the United States Agency for International Development (USAID)

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Global Non-Revenue Water (NRW) Volumes

	Supplied Population - millions (2002)	System Input l/capita/day	ESTIMATES OF NRW					
			Level of NRW % of System Input	Ratio		Volume, billion m^3/year		
				Physical Losses	Com-mercial Losses	Physical Losses	Com-mercial Losses	Total NRW
Developed Countries	744.8	300	15%	80%	20%	9.8	2.4	12.2
Eurasia (CIS)	178.0	500	30%	70%	30%	6.8	2.9	9.7
Developing Countries	837.2	250	35%	60%	40%	16.1	10.6	26.7
				TOTAL		**32.7**	**15.9**	**48.6**

Source: The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help:
A Look at Performance-Based Service Contracting – World Bank (December 2006 - Bill Kingdom, Roland Liemberger, Philippe Marin

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Cost of Non-Revenue Water (NRW)

	Marginal cost of water (US$/m³)	Average tariff (US$/m³)	(Estimated values, billions of US$/year)		
			Cost of physical losses	Lost revenue resulting from commercial losses	Total cost of NRW
Developed countries	0.30	1.00	2.90	2.40	5.30
Eurasia (CIS)	0.30	0.50	2.00	1.50	3.50
Developing countries	0.20	0.25	3.20	2.60	5.80
		TOTAL	8.10	6.50	14.60*

Source: The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help:
A Look at Performance-Based Service Contracting – World Bank (December 2006 - Bill Kingdom, Roland Liemberger, Philippe Marin

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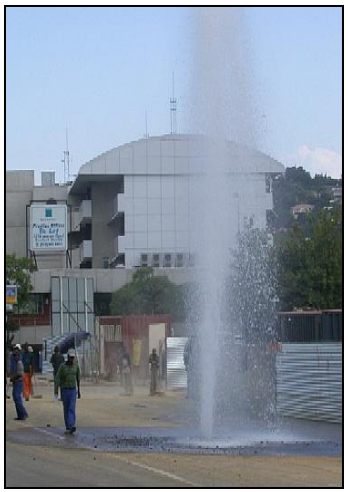
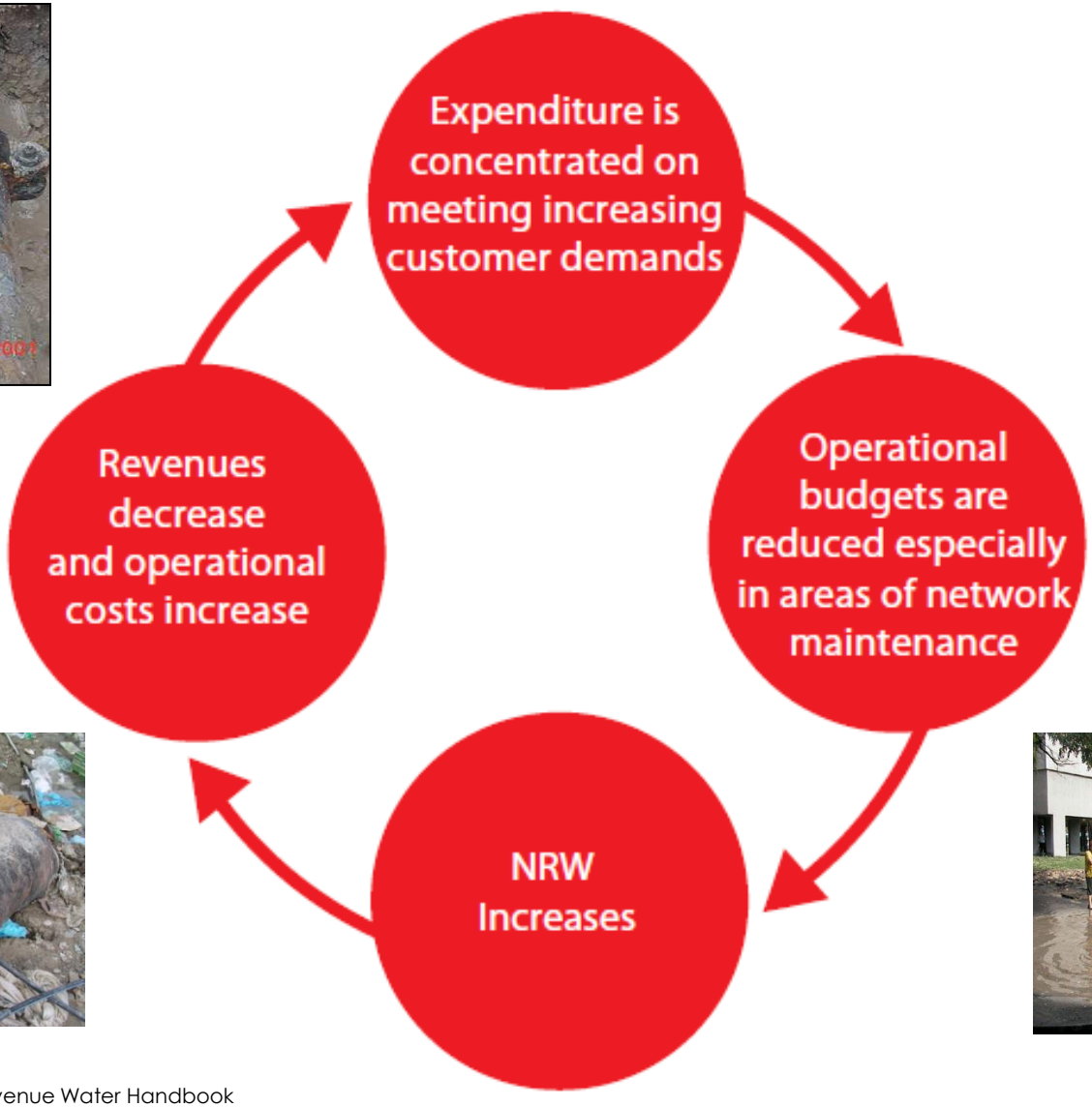
Many water utilities spiral down in the vicious NRW cycle





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Squeezing out Every Last Drop
Resource Efficiency in the Water Sector

Commercial Loss Reduction

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Commercial Loss Reduction
First Priority in NRW Reduction Effort

- Low Hanging Fruit
- Reducing commercial loss is easier than physical loss
- Customer data base
- Improved metering
- Improved billing
- Improved collection
- Illegal connections
- Reduction to 2 - 5% easy
- Investments are low
- Short payback period
- Increased revenues can help to fund physical loss reduction

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Water Utility NRW/Energy Efficiency Study
AAA Colombia – Commercial Efficiency

Priority	Type of Intervention (Commercial)	Est Minimum Rate of Water Usage (m^3/sec)	Est Minimum Monthly Water Usage (m^3/mo)	Estimated Revenue per AAA Tariff from Customers (US$/$m^3$)	Est Average Additional Revenue per Month (US$/mo)	Investment (US$)	Monthly Water Savings ($/mo)	Monthly Energy Savings (US$/mo)	Other Savings (US$/mo)	Total Savings (US$/yr)	Pay-back Period (Years)
1	Install new meters on industrial high usage customers	0.03000	77,760	4.00	311,040	162,947	311,040	0	0	3,732,480	0.04
2	Replace older customer meters with new technology	0.01000	25,920	3.00	77,760	1,899,958	77,760	0	0	933,120	2.0
3	Install small meters on currently unmetered customers	0.01000	25,920	3.00	77,760	1,631,063	77,760	0	0	933,120	1.7
4	Detect fraud and meter irregularities and correct them	0.01000	25,920	3.00	77,760	692,021	77,760	0	0	933,120	0.7
				Sub-total estimated investment:		$4,385,990		Sub-total estimated annual savings:		$6,531,840	

Average Payback = 9 months

Improvements

- New meters – high use customers
- New consumer meters – unmetered customers
- Fraud detection and regularization

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Resource Efficiency in the Water Sector

Leakage Reduction

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Leakage Reduction Strategies

- Water Balance
- Consumer metering
  - Often reduces usage
- District Metering
  - Bulk Metering
  - Hydraulic Zones
- Leak Detection
  - Night Flows
  - Telemetry/SCADA
  - Flow Statistics
- Pressure Management
  - Pressure zones
  - Pressure reducing valves
  - Pump VFDs
- Leak Reduction
  - Leak repairs
  - Pipe replacement

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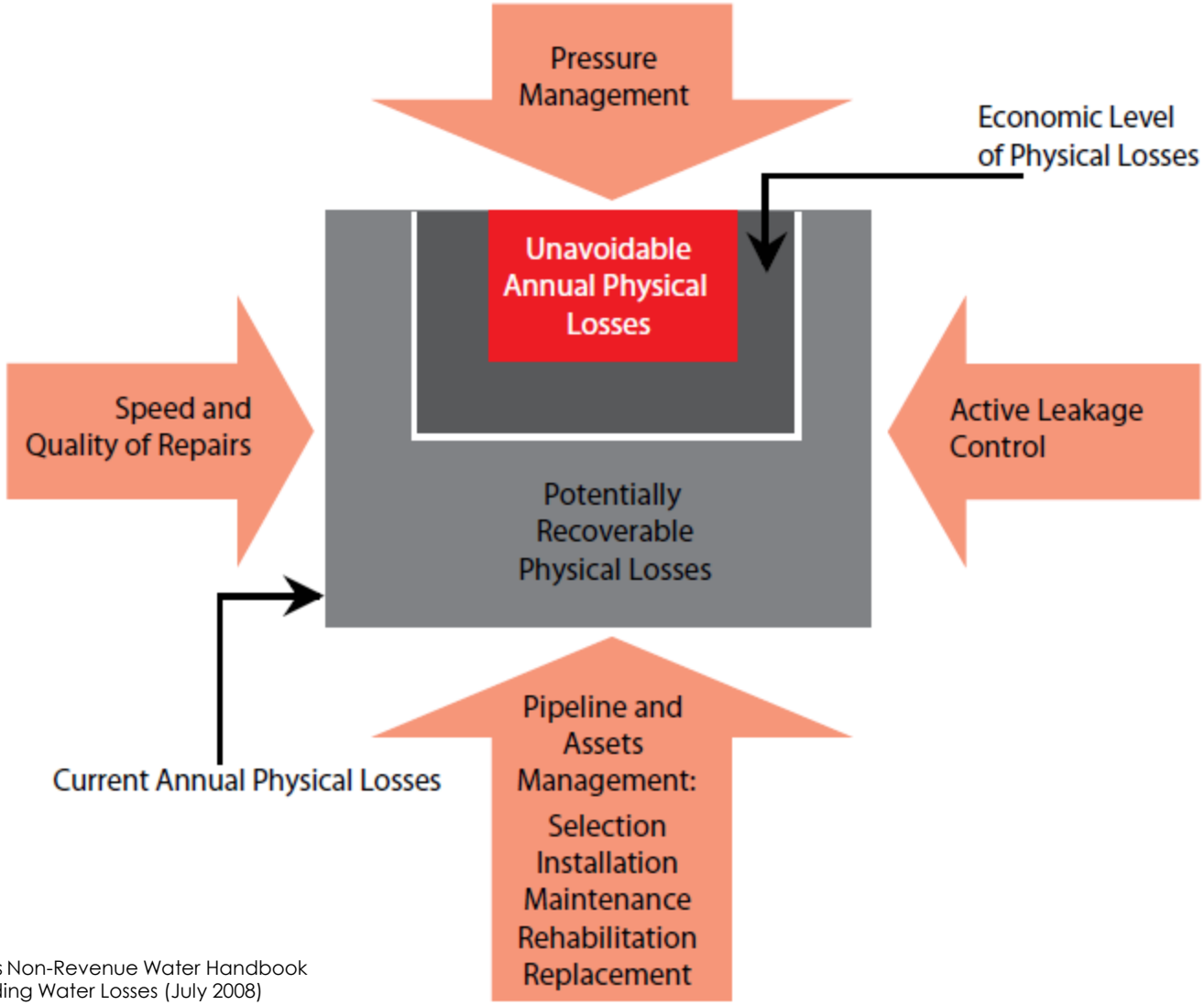
Leakage Reduction Strategies



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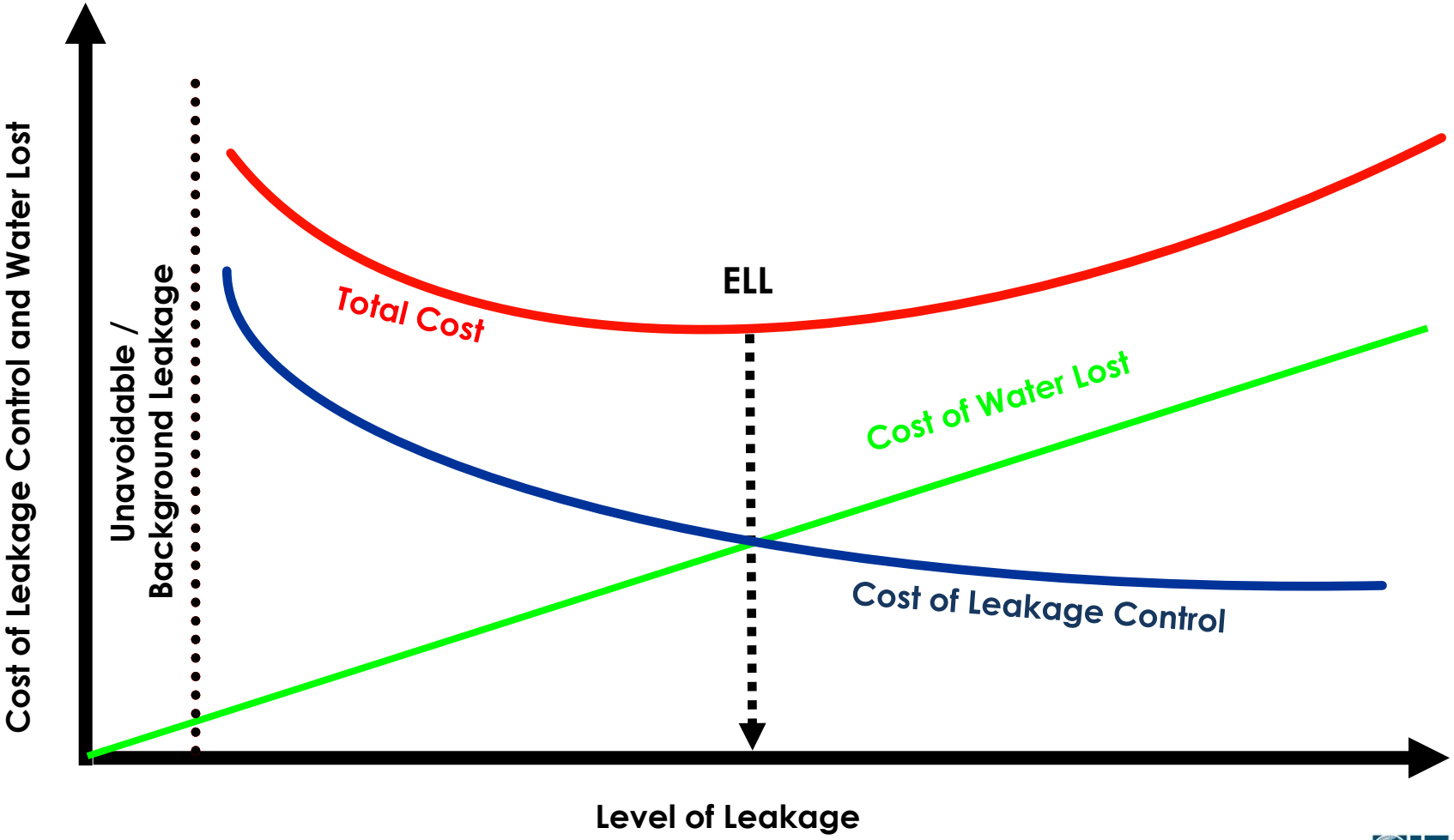
The Economic Level of Leakage (ELL)



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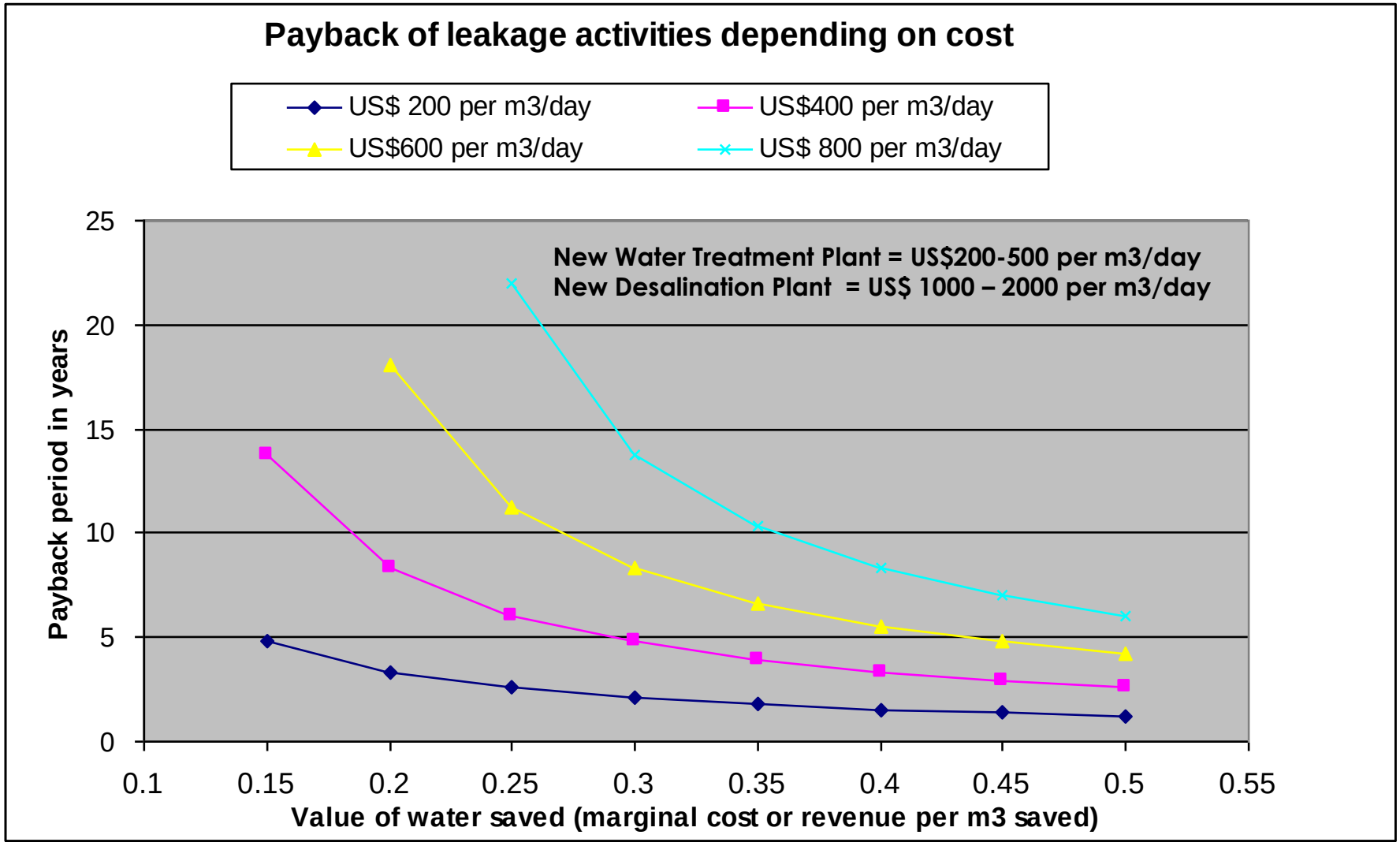
NRW Payback Period Calculations



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Water Utility NRW/Energy Efficiency Study
AAA Colombia – Leak Reduction

Type of Intervention (Technical)	Estimated Rate of Water Leakage (m^3/sec)	Estimated Monthly Water Leakage (m^3/mo)	Estimated Average Cost of Leaking Water (US$/$m^3$)	Est Cost of Leaking Water per Month (US$/$m^3$/mo)	Investment (US$)	Monthly Water Savings ($/mo)	Monthly Energy Savings (US$/mo)	Other Savings (US$/mo)	Total Savings (US$/yr)	Pay-back Period (Years)
Subdivide Zone 3 into gravity and pressure districts, served from Recreo tanks	0.07231	187,428	1.00	187,428	355,753	9,370	590	9,750	236,520	1.5
Replace AC pipe in selected circuits	0.07231	187,428	1.00	187,428	2,586,924	18,740	590	9,750	348,960	7.4
Replace older valves in selected circuits	0.01392	36,082	1.00	36,082	171,579	720	0	9,750	125,640	1.4
Complete macro metering of all unmetered circuits	0.07231	187,428	1.00	187,428	955,263	9,370	0	0	112,440	8.5
Install pressure regulator valves on selected circuits	0.07231	187,428	1.00	187,428	338,193	9,370	0	9,750	229,440	1.5
Investigate circuits for leakage in Barranquilla + Soledad	0.07231	187,428	1.00	187,428	94,737	5,620	0	0	67,440	1.4
Investigate circuits for leakage in Atlantic coastal region	0.07231	187,428	1.00	187,428	31,579	5,620	0	0	67,440	0.5
Install monitoring equipment to measure pressure in real time	0.07231	187,428	1.00	187,428	121,053	3,750	0	9,750	162,000	0.7
Other activities including linking customer connections with GIS database and matching with circuits	0.07231	187,428	1.00	187,428	105,263	5,620	0	0	67,440	1.6
Procurement of additional leak detection and fraud detection equipment to accelerate water loss reductions	0.07231	187,428	1.00	187,428	500,000	5,620	300	9,750	188,040	2.7
			Sub-total estimated investment:		$5,260,344		Sub-total estimated annual savings:		$1,605,360	

Improvements

- Macro-metering
- Leak detection
- Pipe replacement

Average Payback = 3.5 years

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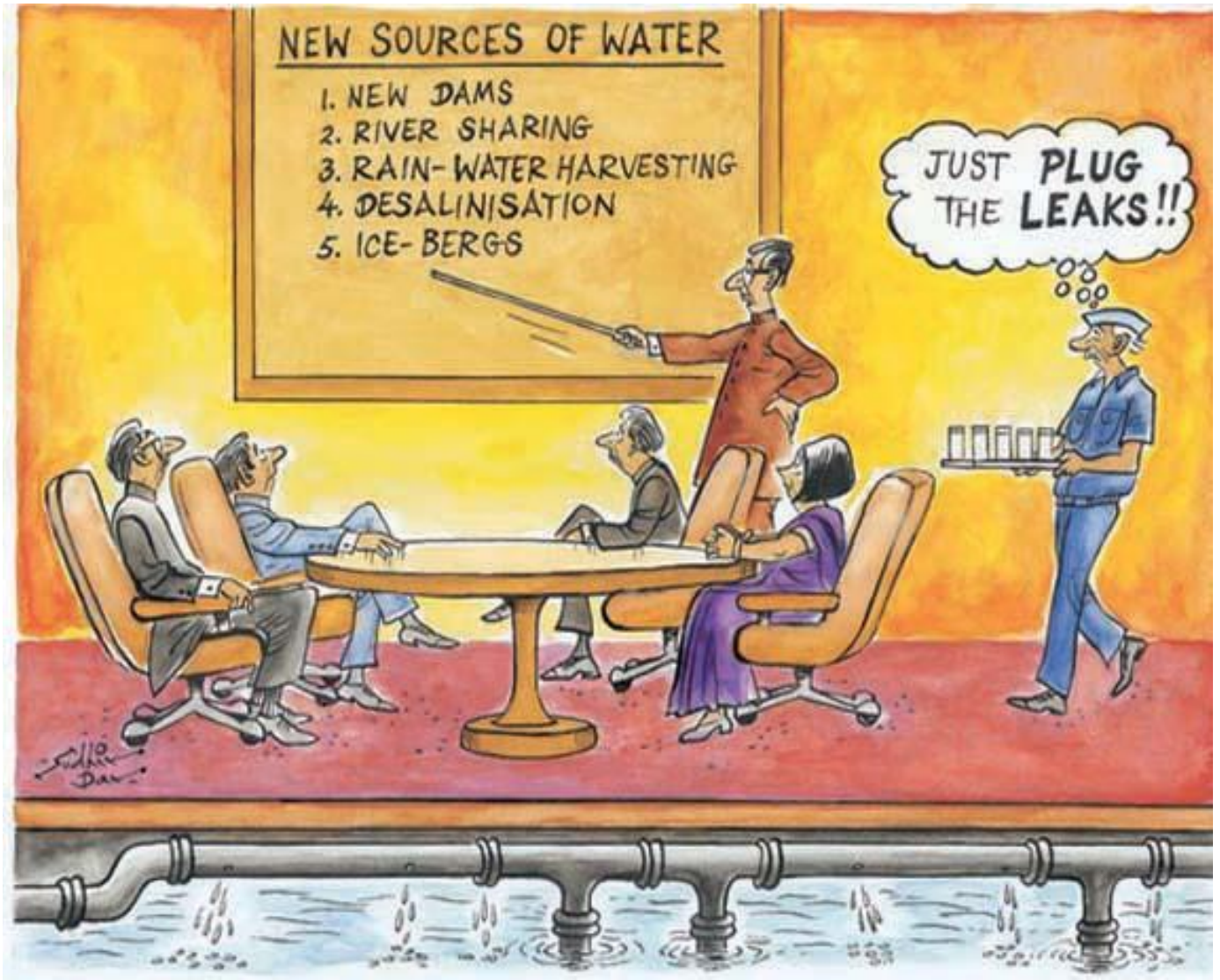
Sometimes the Best Supply is Plugging the Leaks



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Resource Efficiency in the Water Sector

Energy Efficiency

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Water Utility NRW/Energy Efficiency Study
AAA Colombia – Energy Efficiency

Priority	Location	Annual energy cost (US$ /yr)	Type of intervention	Investment (US$)	Energy savings (kWh/yr)	Energy savings (US$ /yr)	Other savings (US$ /yr)	Total savings (US$ /yr)	Pay-back
1	Alta 3 pumping station (E.T.A.P)	$4,040,150	Variable speed drive to control two pumps - Alta 3	$550,000	1,700,964	$202,075	$117,000	$319,075	1.7
2	Delicias re-pumping station	$1,059,495	Variable speed drive to control two pumps - Delicias	$420,000	696,120	$105,949	$117,000	$222,949	1.9
3	Baja 1 pumping station (E.T.A.P)	$989,366	Replacement of 2 vertical pumps with 2 horizontal pumps	$380,000	612,000	$72,706	$0	$72,706	5.2
4	Alta 2 pumping station (ETAP) main pipe to Recreo	$1,747,786	Replacement of 150 mts of pipe to remove 36"-24"-36" constraint	$150,000	294,240	$34,956	$0	$34,956	4.3
5	Motor associated with re-pumping stations in low voltage (440)	$146,006	Replacement of standard motor with high efficiency motor	$16,000	99,924	$15,208	$0	$15,208	1.1
			Total estimated investment:	**$1,516,000**		**Total estimated savings per yr:**		**$664,894**	

Improvements

- Pumps Efficiency – Pump Curve Position
- Hydraulics – Gravity feed vs. Pumping
- Pipeline hydraulics – excessive head loss
- Pump Motor Efficiency
- Load Factor Correction
- Water Loss Reduction – Less Water Pumped

Average Payback = 2.3 years

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Squeezing out Every Last Drop
Resource Efficiency in the Water Sector

Performance Based Contracting (PBCs) &Water Efficiency Service Cos (WESCOs)

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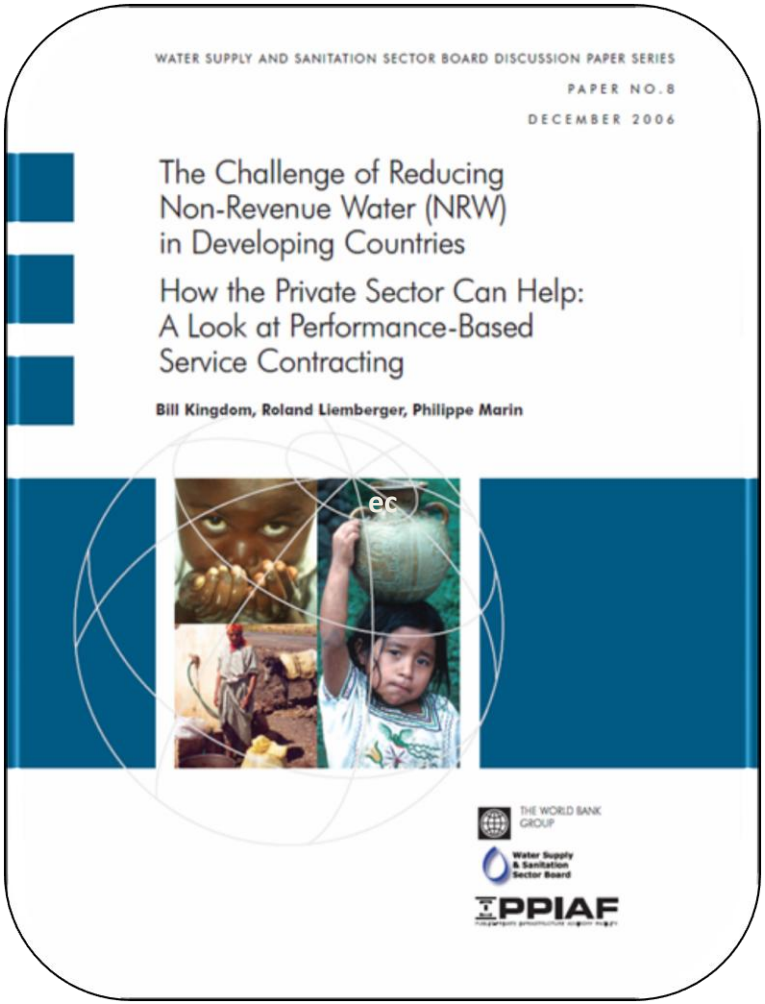
Performance-based contracting
An innovative delivery model



Performance-Based Contracting (PBC)

- Private companies work at risk
- Out-sourced contracts/ lower profile
- Performance reward for savings
- Shared savings / returns
- Favors WESCO companies
- Targets greatest efficiency gains

Examples of NRW PBCs

- Selangor (Malaysia)
  - NRW reduction
- Bangkok (Thailand)
  - DMA leakage reduction
- Ho Chi Minh City (Vietnam)
  - DMA and NRW reduction
- Dublin (Ireland)
  - DMA and leakage reduction
- São Paulo (Brazil)
  - Debt Collection
  - Large Customer Meter Replacement

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SABESP – Commercial Efficiency PBC Successes

- SABESP - serves the São Paulo Metropolitan Region,
- One of largest public water utilities in the world (population: 25 million).
- Proactive approach to water loss reduction with the help of the local private sector.
- Commercial management traditionally left to in-house crews.
- SABESP was losing revenues in the equivalent of one million cubic meters per day.
- SABESP decided to experiment with some innovative performance-based contracts

Reduction of bad debts

1. Contract local private firms to negotiate unpaid invoices
2. Contractors paid 6% to 20% of debt collected (bonus for cash)
3. Original value of bad debt was US$ 65 M
4. Total Collected was US$ 43 M (78%)
5. Contractors' payment was US$ 6.6 M

Increase of large customer meter accuracy

1. Largest customers (2%) account for 34% of revenues
2. Large meters were under-registering compared to true consumption
3. Innovative solution => turnkey contracts for meters replacement.
4. Replace meters of 27,000 large revenue accounts
5. Five 36-month contracts were put in place
6. Design, supply and installation of the new meters.
7. No upfront payment / contractor had to pre-finance the entire investments.
8. Payment based on the average increase in consumption volume
9. Results => volume of metered consumption increased by 45 million m^3
10. Revenues increased by BRL 172 million (US$ 72 millions).
11. BRL 42 millions (US$18 millions) was paid to the contractors
12. Net benefit to SABESP three times as high at BRL 130 million (US$ 54 millions).

Source: The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help:
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Sebokeng/Evaton (South Africa) - NRW Reduction PPP Advanced Pressure Management

- **Emfuleni Township , ±50 km south of Johannesburg**
- **500 000 residents in low-income township**
- NRW before project was 75-80%
- Annual water bill R 150 million ($20 million).
- Pressure reduction facility with PRVs
- Designed, built, operated financed by WRP
- Contract period - period of 5 years.
- Payment to WRP based upon 15% of savings
- Remaining 85% returning to Municipality
- Saved 30 million m3 in water in first 36 months
- Saved more than R90 million ($12 million)
- Sewer flows reduced from 2500 m3/h to 1800 m3/h
- Annual energy savings in excess of 14 000 MWh
- Equivalent 12 000 Tons of CO_2 per year
- Pressures also reduced number of bursts in the area.
- **Payback Less Than One Year**

wrp
A Miya Group Company

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Resource Efficiency in the Water Sector

Brazil WESCO Project

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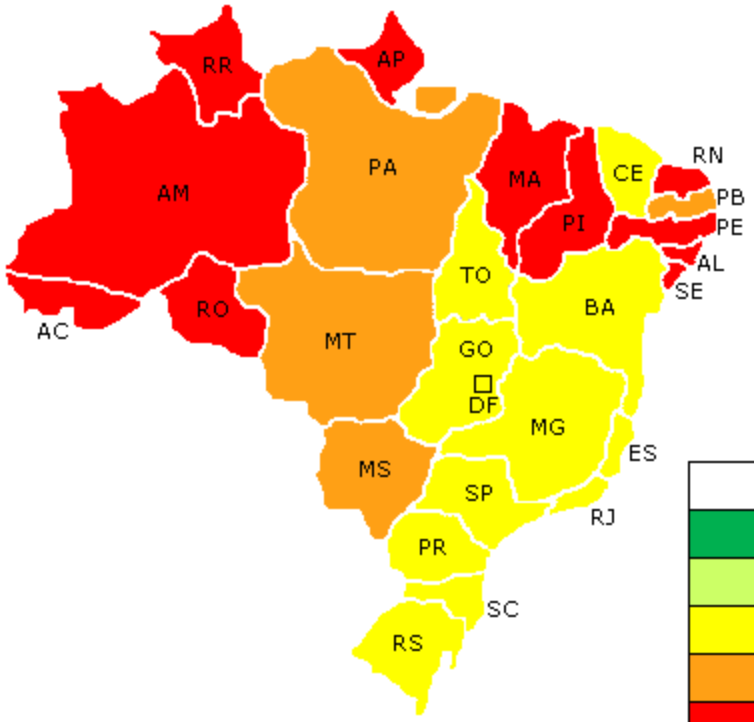
Water efficiency is an issue in Brazil…
NRW averages 43%



Perdas
0 a 20%
20 a 30%
30 a 40%
40 a 50%
50 a 100%

	Population (million)		NRW	Max NRW
NORTH	5.03	4%	54%	68%
NORTHEAST	30.52	27%	53%	70%
SOUTHEAST	56.28	49%	37%	59%
SOUTH	13.55	12%	36%	58%
CENTER-WEST	9.76	8%	37%	52%
Total	**115.13**		43%	

Total water losses of 6 Billion m^3 per year

Source: Diagnostico dos Servicos de Agua e Esgotos – 2008, Ministerio das Cidades, Secretaria Nacional de Saneamento Ambiental, Sistema Nacional de Informacoes sobre saneamento (SNIS)

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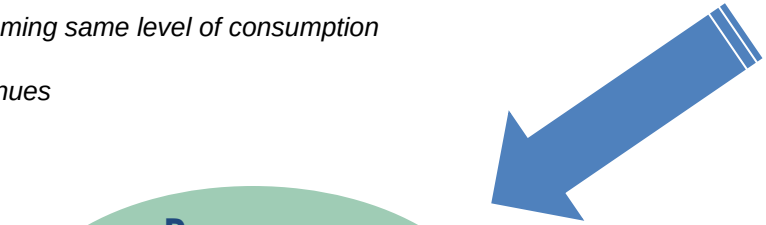
Reducing NRW would increase revenues by US$4B

Potential Savings if top water utilities reduced NRW to an efficient benchmark

	# of companies	Average NRW	Water Losses (M m3/yr)	Savings (a) (M m3/year)	Savings (b) (M BRL)
Public-State	20	41%	3,994	2,525	5,667
Public-Local	16	41%	441	280	502
Private	6	49%	198	104	271
Total	**42**	**44%**	**4,634**	**2,910**	**6,440**

(a) If NRW reduced to SABESP levels (26%) and assuming same level of consumption
(b) Based on the water tariff of each company. (IN005)
(c) Companies with more than BRL50 mm in Op. Revenues



Revenue Increases BRL 6 Billion (US$4B) per year

Source: Diagnostico dos Servicos de Agua e Esgotos – 2008, Ministerio das Cidades, Secretaria Nacional de Saneamento Ambiental, Sistema Nacional de Informacoes sobre saneamento (SNIS)

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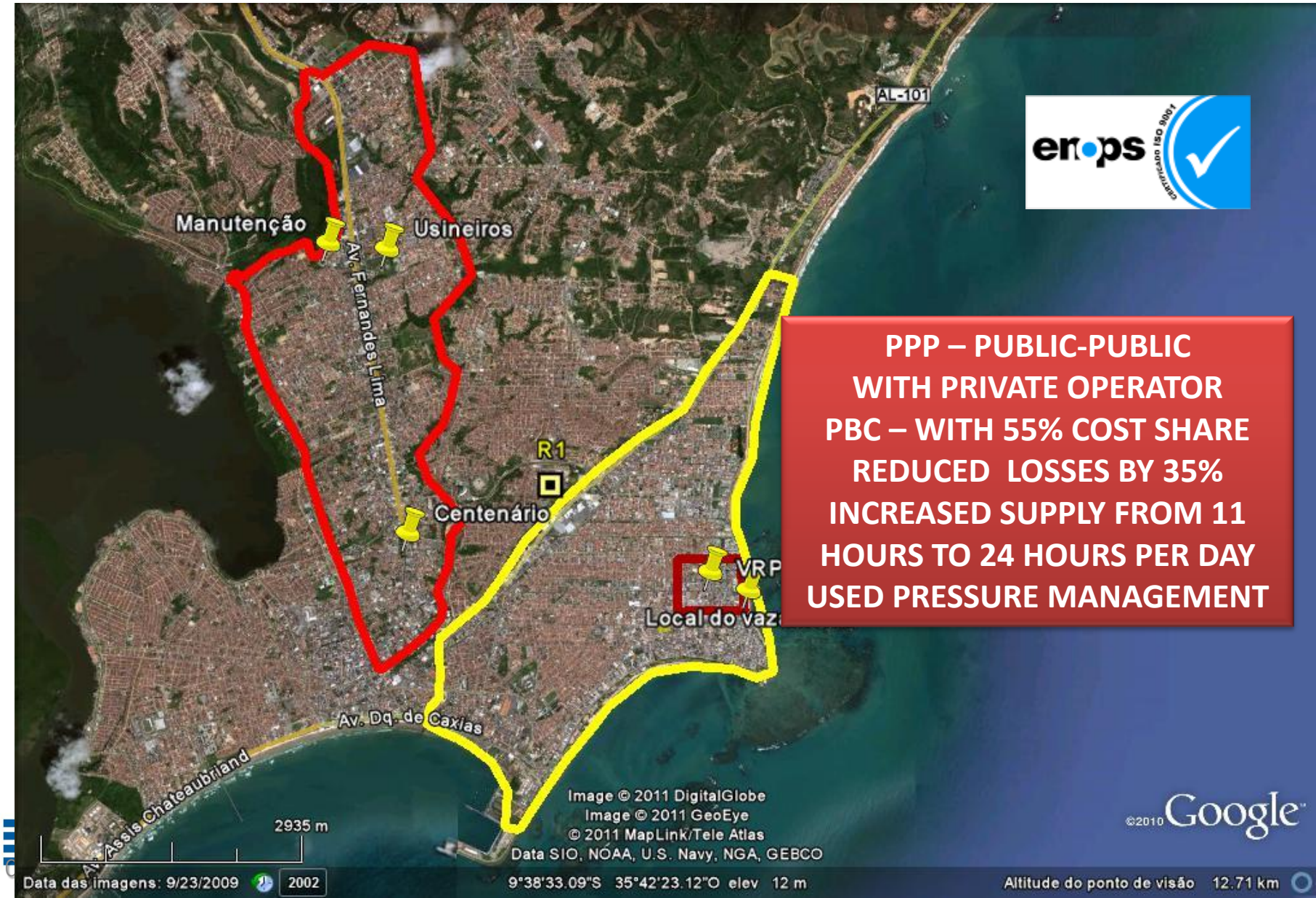
Maceio/CASAL NRW PBC



PPP – PUBLIC-PUBLIC
WITH PRIVATE OPERATOR
PBC – WITH 55% COST SHARE
REDUCED LOSSES BY 35%
INCREASED SUPPLY FROM 11 HOURS TO 24 HOURS PER DAY
USED PRESSURE MANAGEMENT

Energy Efficiency for Rio de Janeiro

- Guandu Water Treatment Plant
- Capacity 43 m3/s (3.7 Mm3/day)
- One of the largest in the world
- ANEEL (Brazilian Electricity Regulatory Agency) Energy Efficiency Program
- Pump/Motor replacement
- Valve installation
- Variable frequency drives
- Energy savings = 25 M kWhr/yr
- Total investment = US$12M
- Annual Savings = US$1.67M
- Payback Period = 7.2 Years

vitalux
Uso Eficiente de Energia e Água

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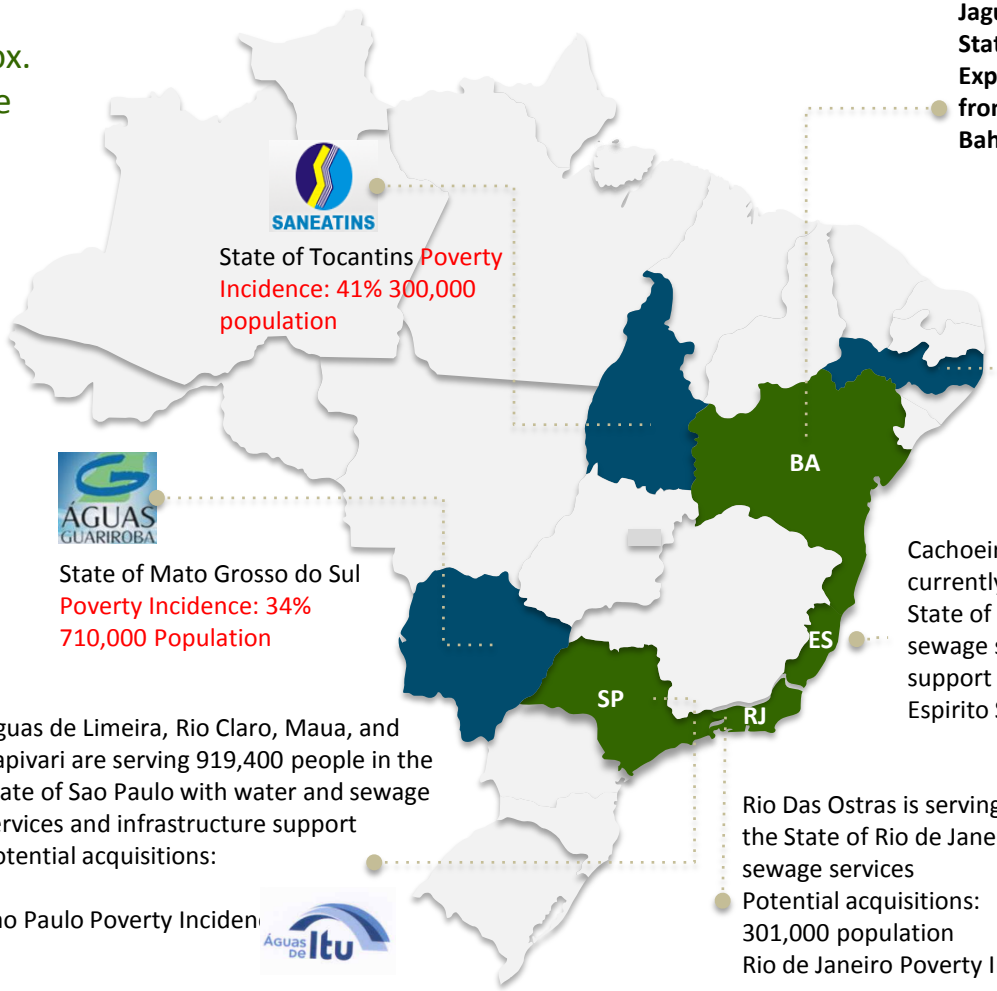
FOZ - Brazil Private Concessions

2.5 million people served (approx. 17.5% served by the WSS private sector)

By 2010, about 15% (486,000 people) of the population served by Foz will be located in Bahia (frontier)

Foz's short-term growth targets would, even if achieved partially, consolidate Foz's market share, while being strongly anchored in serving low-income population ("BOP") concentrated in Brazil's frontier markets (particularly with Compesa and Saneatins).



Jaguaribe (pre-operational) in the State of Bahia
Expected to serve 486,000 people from 2010 with sewage services
Bahia Poverty Incidence: 43%

State of Tocantins Poverty Incidence: 41% 300,000 population

compesa

State of Pernambuco
Poverty Incidence: 53%
6.9 million population

ÁGUAS GUARIROBA

State of Mato Grosso do Sul
Poverty Incidence: 34%
710,000 Population

Cachoeiro (formerly Citagua) and Cesan currently serve 1,401,000 people in the State of Espirito Santo with water and sewage services and infrastructure support
Espirito Santo Poverty Incidence: 31%

Aguas de Limeira, Rio Claro, Maua, and Capivari are serving 919,400 people in the State of Sao Paulo with water and sewage services and infrastructure support
Potential acquisitions:

Sao Paulo Poverty Incidence

Águas de Itu

Rio Das Ostras is serving 120,000 people in the State of Rio de Janeiro with water and sewage services
Potential acquisitions: Pro Lagos with a 301,000 population
Rio de Janeiro Poverty Incidence: 32%

Source: Brazilian Institute of Geography and Statistics (IBGE), Map of Poverty elaborated in 2003, based on the census of the year 2000

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Brazil - Water Utilities / WESCO Performance-Based Contracting (PBC) Manual

Phase 1

- **Market Scoping**
- **Water Utility PBC Manual**
  - **Water loss reduction**
  - **Energy efficiency**
  - **Commercial efficiency**
  - **PPPs for water utility efficiency**
  - **Guidelines on performance contracts**
  - **Economic, legal, engineering aspects**
  - **Case studies**

Phase 2

- **Preparation of standard WESCO contracts**

Phase 3

- **Seminars**
- **Training**

sabesp

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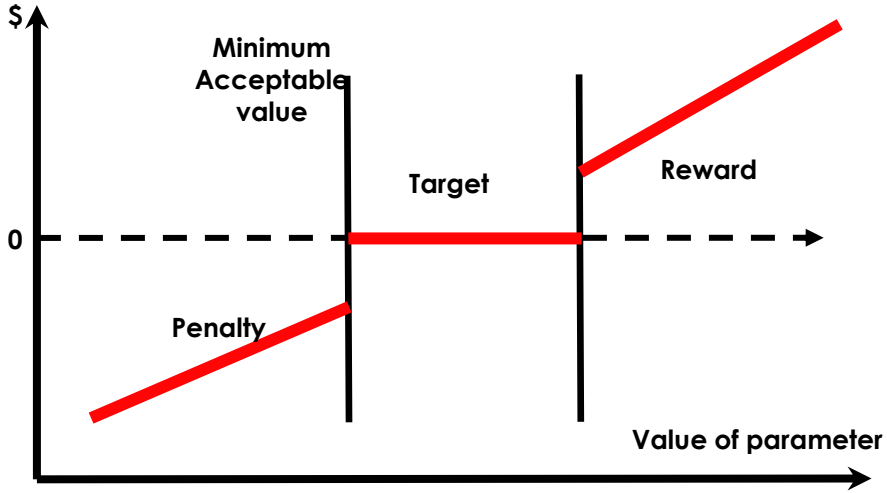
Keys to Success for Performance-Based Contracts

- Procurement methods
- Solid, transparent, agreed Baseline
- Understanding of existing conditions
- Measurable performance metrics
- Achievable, measurable targets
- Alignment of interests
- Well-designed incentives
- Performance monitoring system
- Payments linked to metrics
- Access to sites
- Clear accountability
- Risk allocation
- Ease of installation
- Security on investment/equipment
- Ownership of assets
- Payback periods



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Thank You

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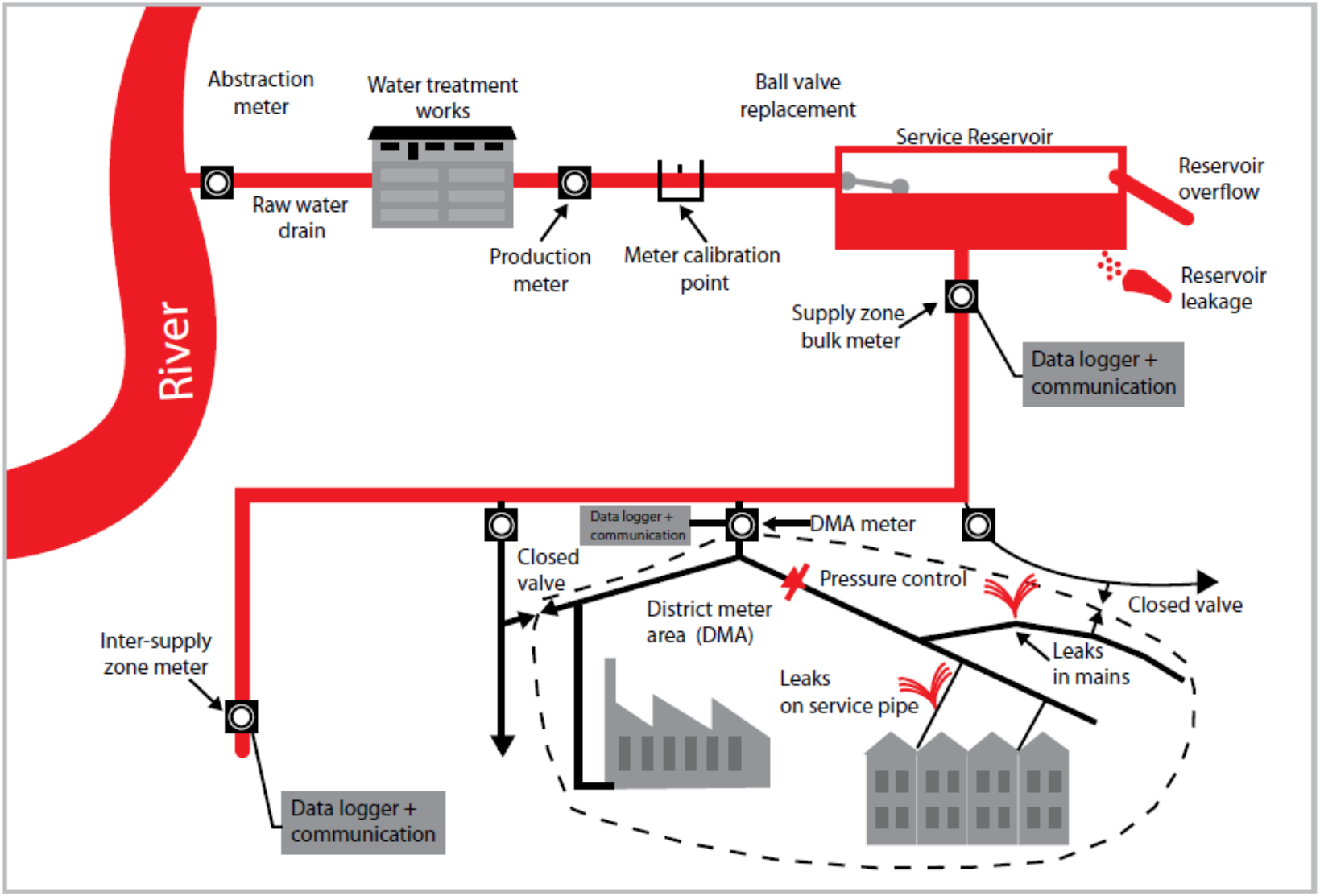
Typical Water Supply System



Source: The Manager's Non-Revenue Water Handbook
A Guide to Understanding Water Losses (July 2008)
Ranhill Utilities Berhad and the United States Agency for International Development (USAID)

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