

WATER DEMAND MANAGEMENT: DOMESTIC (& INDUSTRIAL) SECTORS

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19TH OCTOBER 2009, PWTC, KUALA LUMPUR

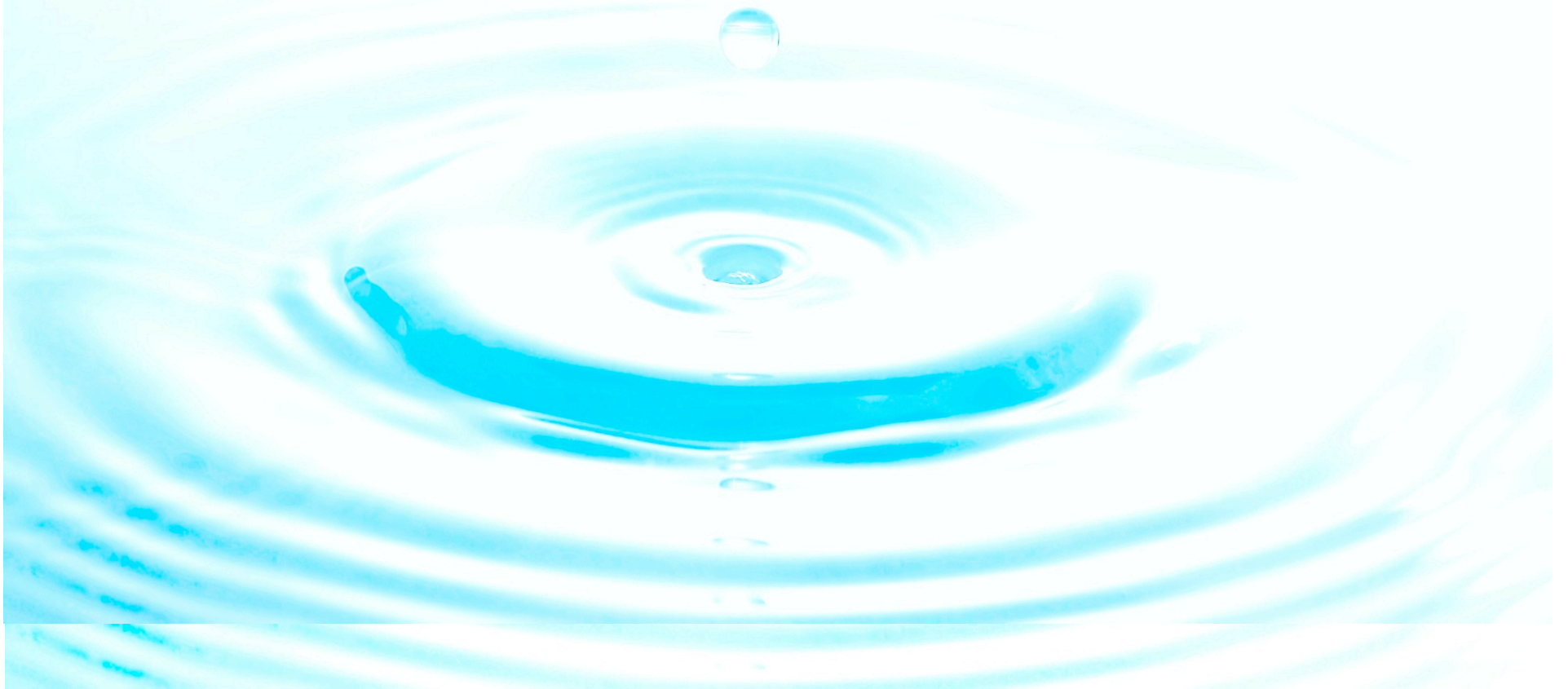
Presentation Overview

- **INTRODUCTION**
- **DRIVERS OF WATER DEMAND**
- **WATER DEMAND MANAGEMENT**
- **CASE STUDIES**
- **LOOKING AHEAD**

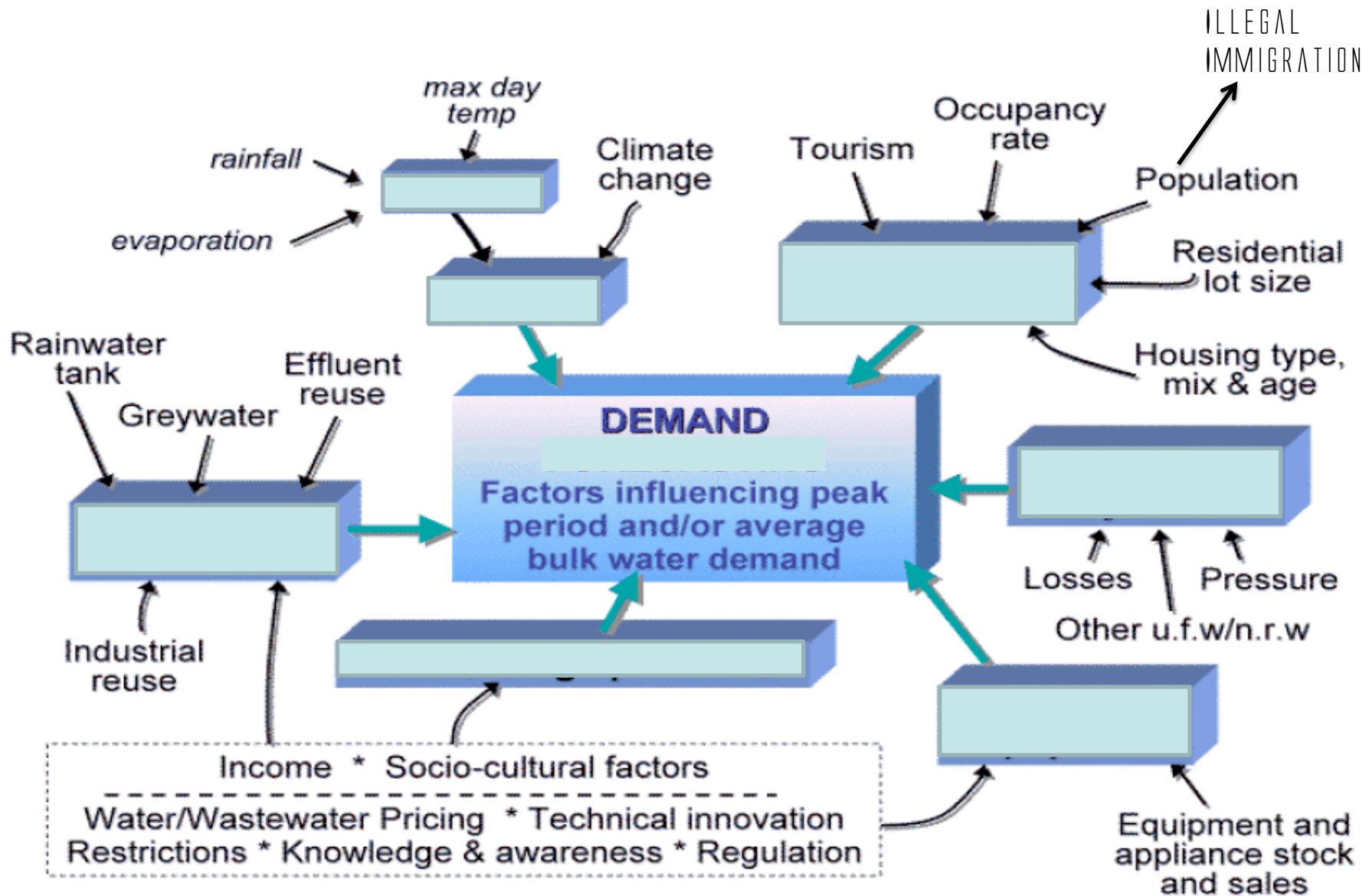
Introduction

- ENSURING FUTURE WATER SECURITY A PRIORITY FOR GOVERNMENTS ACROSS THE WORLD DUE TO MULTIPLE THREATS
- MANY ADOPTING A TWIN-TRACK APPROACH — INCREASE SUPPLY AND REDUCE DEMAND
- IN SOME COUNTRIES GREATER SCOPE FOR INCREASING SUPPLY WHILST IN MANY ARID REGIONS, DEMAND MUST BE REDUCED
- WATER DEMAND MET BY NON-POTABLE AND POTABLE WATER
- NON-POTABLE WATER, PRIMARILY FOR INDUSTRY AND AGRICULTURE REPRESENTS 85 OF WATER DEMAND GLOBALLY

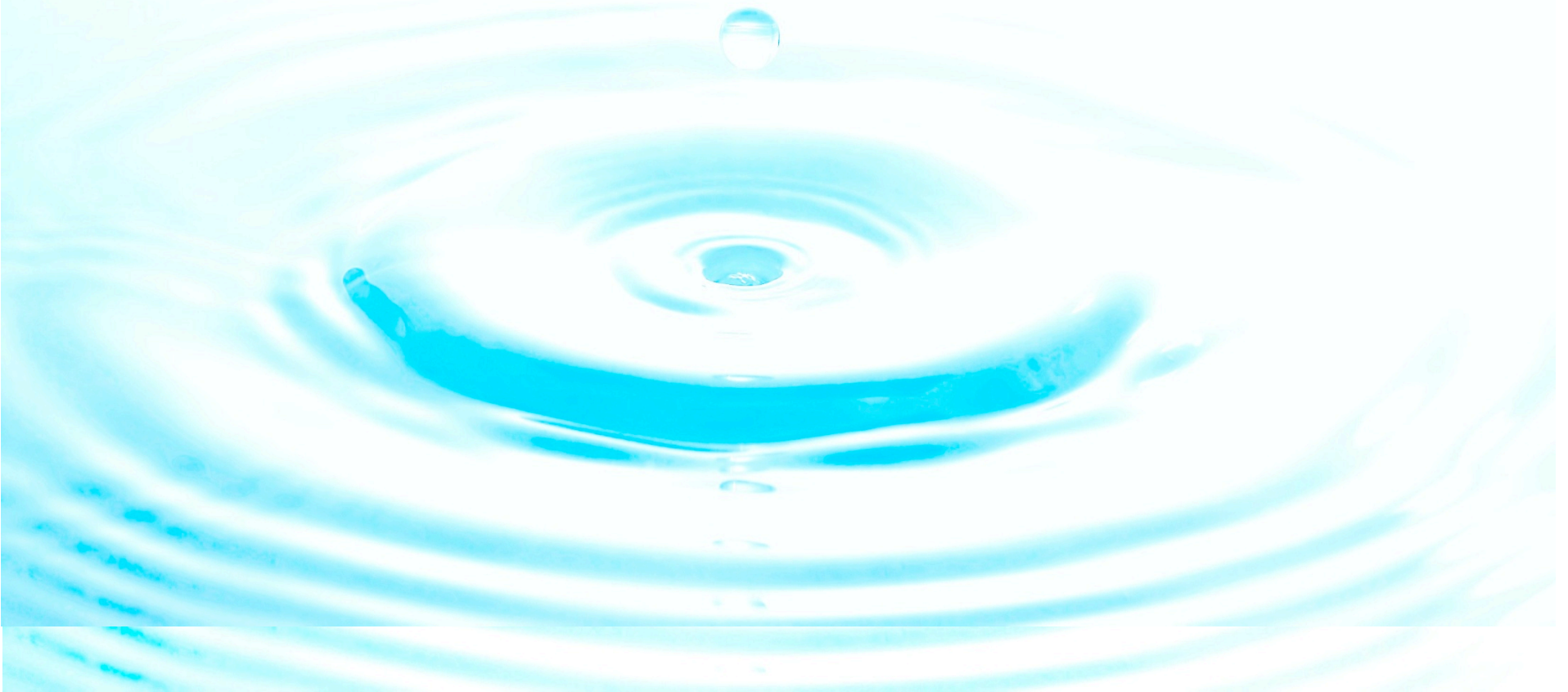
DRIVERS OF DEMAND



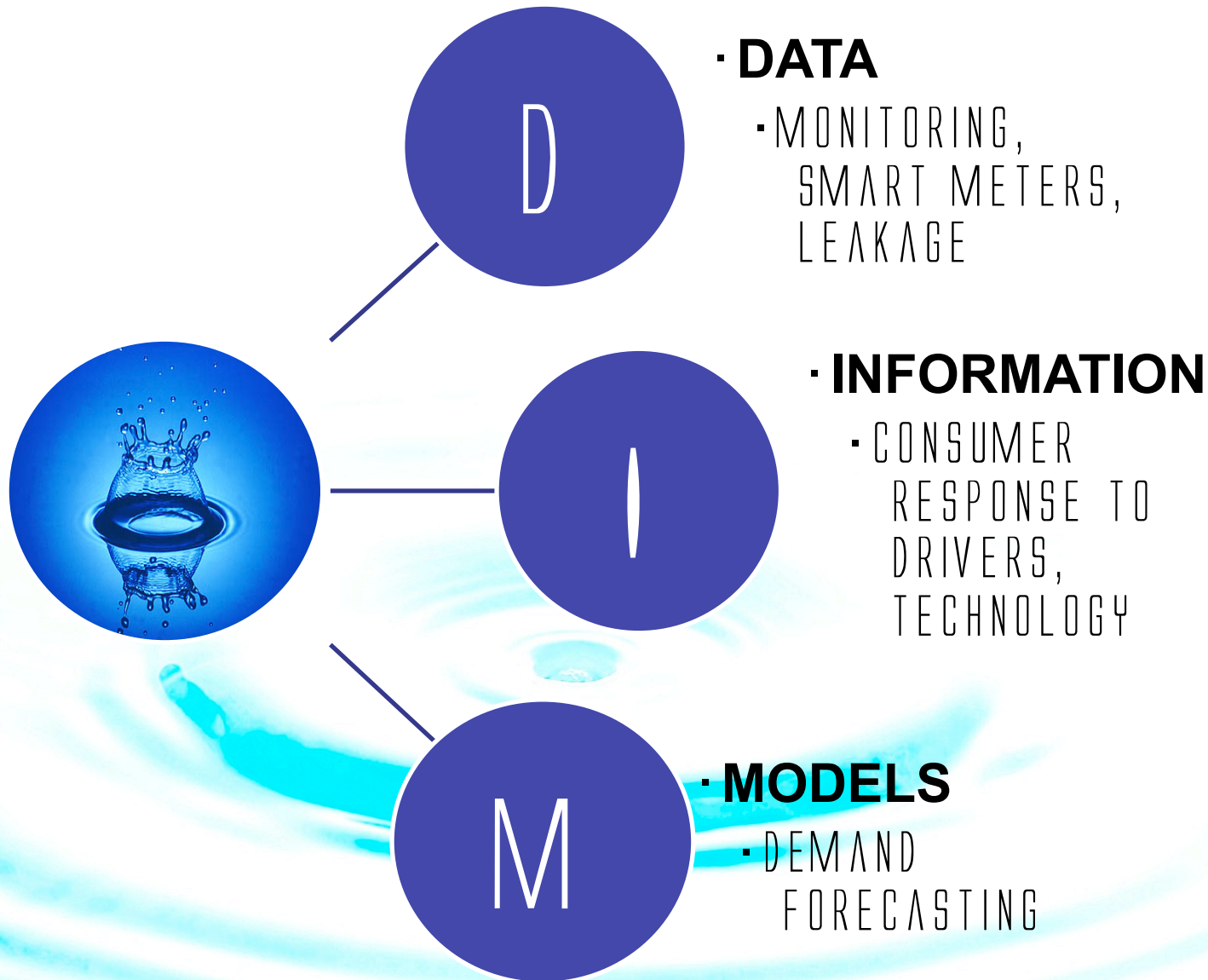
Drivers of Demand



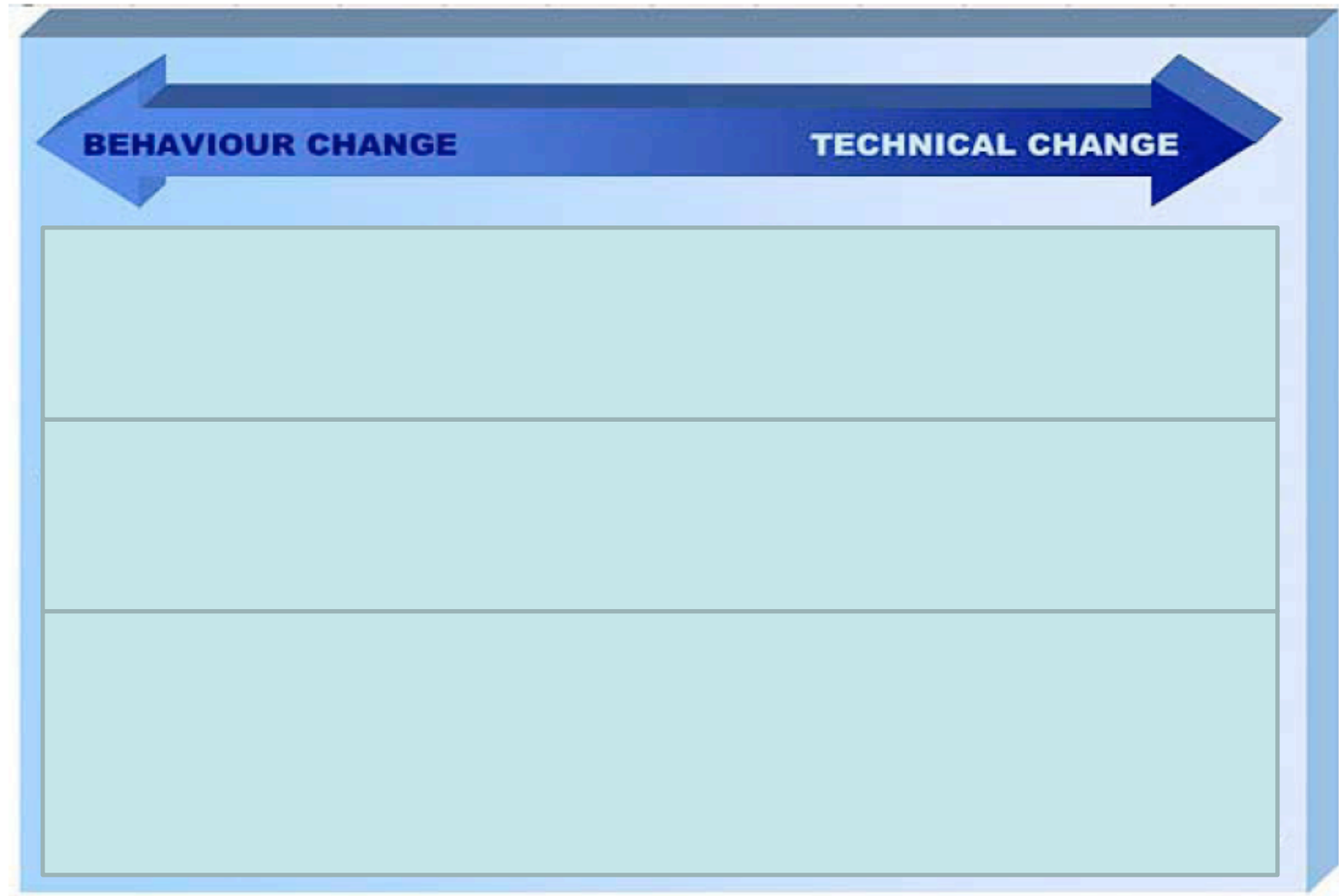
MANAGING DEMAND



Effective Management - DIM



Information: Domestic Demand



Models

- ACCURATE DEMAND FORECASTING CRUCIAL
- ALLOW PLANNERS TO IDENTIFY HOTSPOTS
- VARIOUS APPROACHES TO FORECASTING
- BECOMING MORE SOPHISTICATED AS MORE DATA AND AVAILABLE INFORMATION

Effective Demand Management

CASE STUDIES

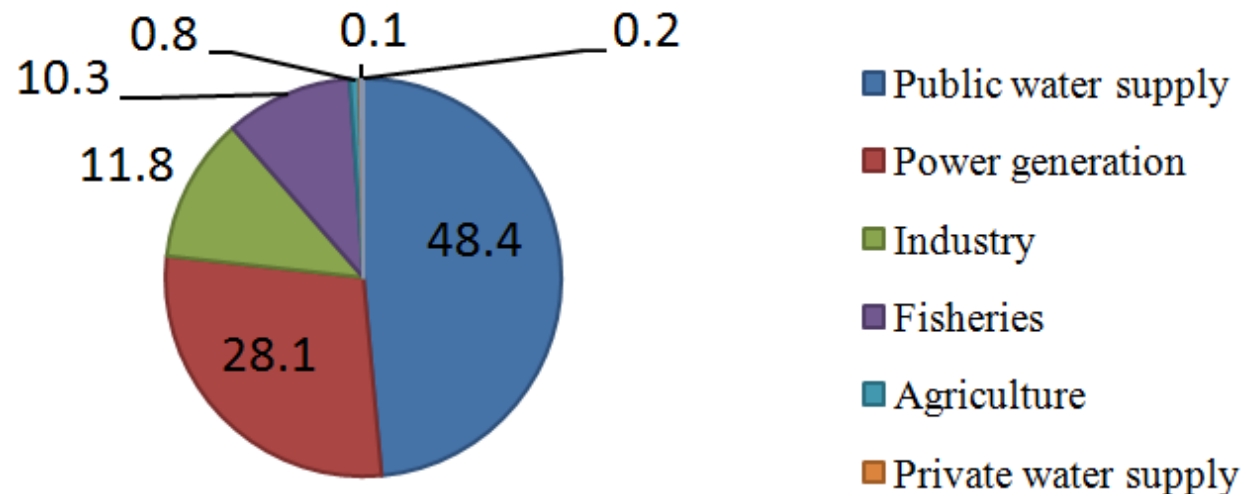
ENGLAND & WALES



Water Demand Management in the UK

- ANNUAL WITHDRAWALS 18 BCM
- DOMESTIC CONSUMPTION BY FAR THE LARGEST PROPORTION IN THE UK

Water abstraction in England and Wales

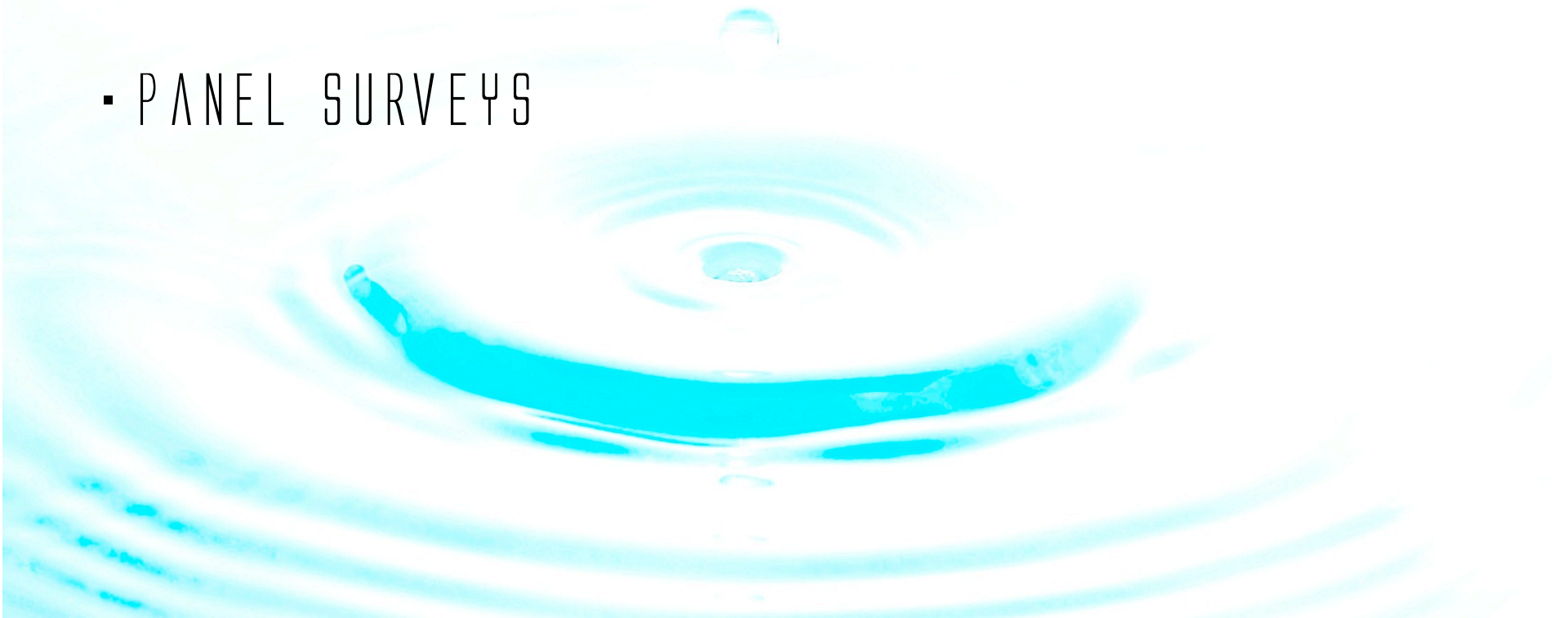


Domestic Water Demand Management

- PARTS OF UK DRIER THAN NORTH AFRICA
- A TWIN TRACK APPROACH ADOPTED; INCREASE SUPPLY
REDUCE DEMAND
- CURRENT USE 150 LPD
- WATER FOR DOMESTIC PURPOSES ACCOUNTS FOR NEARLY
HALF OF ALL WATER USED IN THE UK
- GOVERNMENT TARGET: REDUCE DOMESTIC DEMAND BY
20 IN THE NEXT 20 YEARS
- HOW IS THIS BEING ACHIEVED? DIM

Data (Domestic Demand)

- MICRO-COMPONENTS DATA
- DOMESTIC CONSUMPTION MONITOR (DCM)
- PANEL SURVEYS



Information (Domestic Demand)

CONSERVATION

- WATERWISE -
- DOMESTIC WATER DEMAND CONTINUES TO GROW AT SOME 1-2 PER YEAR
- WILL CONSERVATION WORK IN THE LONG TERM?
- VOLUNTARY CONSERVATION UNLIKELY TO WORK IN THE (ENERGY EXAMPLE)
- REBOUND EFFECT

Information (Conservation)

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Water Use and Conservation Survey

UNIVERSITY OF LEEDS

Part I: About you and your household Page 2 of 3

1. Are you:

☐ Male
☐ Female

2. Age at last birthday:

☐ <16 ☐ 16-24 ☐ 25-34 ☐ 35-44 ☐ 45-60 ☐ 61-65 ☐ 66-74 ☐ 75+

3. Which category best describes your annual household income?

☐ less than £7,000
☐ £7,000-£15,000
☐ £15,000-£25,000
☐ £25,000-£35,000
☐ £35,000-£50,000
☐ £50,000-£65,000
☐ £65,000-£80,000
☐ over £80,000

4. Qualification:

☐ GSCE/O-Level ☐ A level ☐ NVQ/Diploma ☐ Degree ☐ Higher degree

5. Which of the following best describes what you do at present:

☐ Employed ☐ In education ☐ Retired ☐ Carer ☐ Unemployed ☐ Disabled
☐ Other (please specify):

If employed, what is your occupation:

Part III: Water conservation measures

18. If you were asked to conserve water, how likely would you be to adopt the following measures? [More Info](#)

	I do it already	Very likely	Fairly likely	Neither likely or unlikely	Fairly unlikely	Very unlikely	I would not do	Not applicable
a. Turning off tap while brushing teeth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Taking a shower instead of a bath	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Reducing the frequency of showers/baths	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Not washing fruit and vegetables under a running tap	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Ensuring washing machine and dishwasher are fully loaded before use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Installing a water displacement device in your toilet cistern (e.g. hippo/hog-bag/save-a-flush)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Installing water-efficient showerheads and taps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Installing a dual flush/low flush toilet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Watering the garden with a watering can	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Washing the car with a bucket and not a hose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Installing a water-butt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. Installing a greywater recycling system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. Which of the following measures would encourage you to conserve water:

	Very likely	Likely	Neither likely or unlikely	Unlikely	Very unlikely	Don't know	Not applicable
a. A 20% increase in my water bill	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Installing a water meter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Restrictions on water use (e.g. hosepipe bans, pressure reductions)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

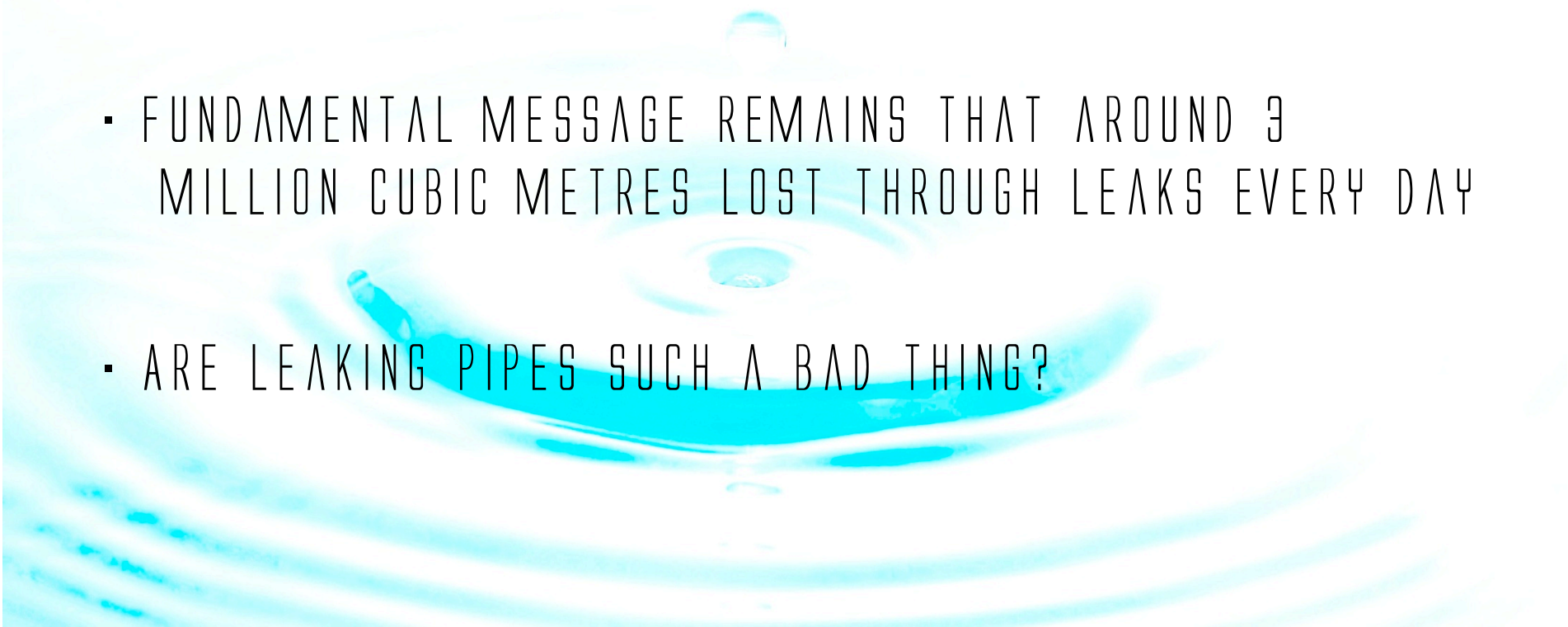
WWW.SURVEY.LEEDS.AC.UK/WATERSURVEY

Information (Conservation)

15.a. "I HAVE THE RIGHT TO USE AS MUCH WATER AS I WANT"	LESS THAN £1,000 E	£1,000- £15,000 D	£15,000- £25,000 C2	£25,000- £35,000 C1	£35,000- £50,000 B	£50,000- £65,000 A	£65,000- £80,000 A	OVER £80,000 A	No Answer	Totals
STRONGLY AGREE	1	1	3	10	13	6	2	5	5	46
AGREE	1	1	22	38	37	17	11	9	7	143
NEITHER AGREE OR DISAGREE	0	3	24	36	39	27	17	19	11	176
DISAGREE	1	2	24	52	60	83	41	32	17	312
STRONGLY DISAGREE	0	0	7	20	19	11	9	8	5	79
Totals	3	7	80	156	168	144	80	73	45	756

Information - Leakage

- IMPORTANT LOSS OF WATER RESOURCES
- CONSTITUTES ALMOST A QUARTER OF THE TOTAL WATER SUPPLY IN ENGLAND WALES
- FUNDAMENTAL MESSAGE REMAINS THAT AROUND 3 MILLION CUBIC METRES LOST THROUGH LEAKS EVERY DAY
- ARE LEAKING PIPES SUCH A BAD THING?



Information (Domestic Demand)

Water Saving Technology

Water Saving Technology	Number of Studies	Average water saving (litres/property/day)
Toilets		
Cistern displacement devices	16	12
Dual flush toilet	2	103
Dudley Turbo 88	6	16
ecoBETA	8	21
Ecoflush	2	20
Variflush	3	23
Shower & Bath		
Shower timer	8	4
Shower flow restrictor	1	6
Showerheads	11	12
Bath measure	1	4
Replacing bathing with showering		38
Taps		
Tap inserts and restrictors	9	10
Tap washers	5	8
Turning tap off when brushing teeth	4	22
Outdoor		
Water butts	4	3
Hose gun	8	1
Soil crystals	1	0.02
Plumbing		
Fixed external leaks	1	12
Float valve repair	1	34

Long Term Savings??

Domestic Demand - Metering

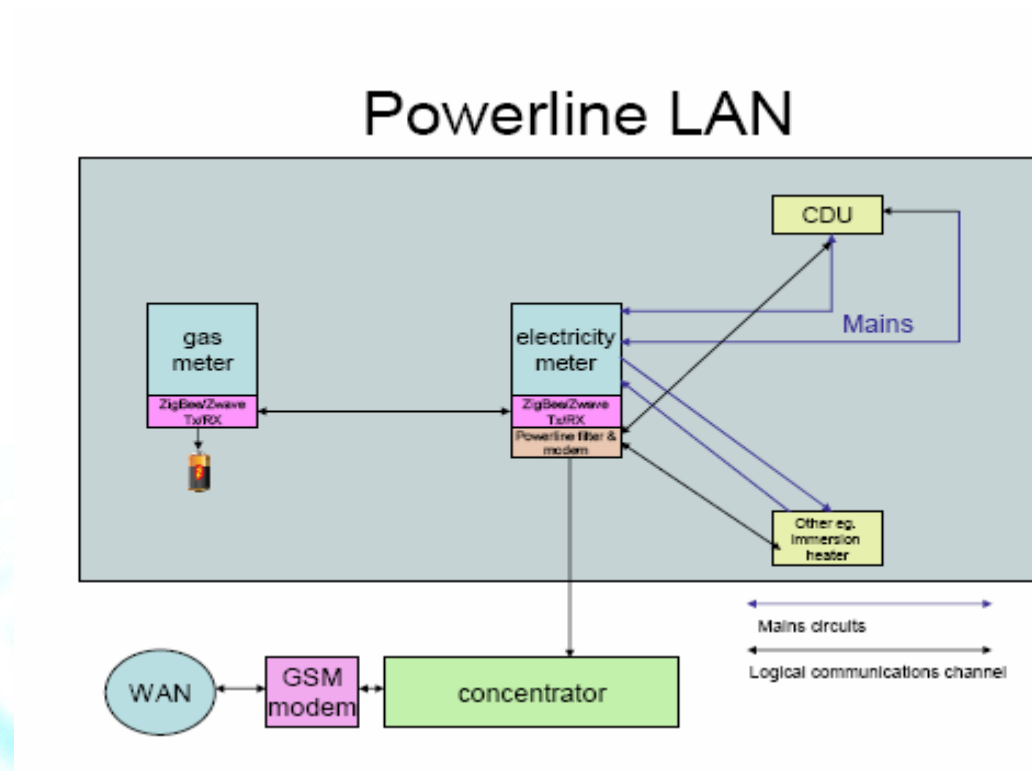
- ONLY 26% OF HOUSEHOLDS IN ENGLAND & WALES METERED
- 9-21% REDUCTIONS FOR THOSE OPTING FOR A METER AND 10-15% FOR THOSE COMPULSORILY METERED
- COMPULSORY METERING COULD AFFECT POOR
- SMART METERS THE ANSWER?

Domestic Demand - Metering

Location	Year(s)	Reduction in Demand	
		average	peak
Four Major Studies			
Fylde	1970/1-1971/2	11-14.5%	-
Mansfield & Malvern	1976	12.5% (range: 8-17%)	-
Isle of Wight	1988/9-1991/2	21.3% (19.1%-23.5%)	-
National Metering Trials: 11[9] sites (s.) in England	1988/9-1991/2	11% (-2%/17%)[11sites] 12% (7%/17%) [9sites]	aver.P7D [11sites]: 18%/27% (wet/dry years)
Other Studies			
Anglian Water (SODCON)	1995	‘around 15% – 20%’	P7D: 25% to 35%
WRc: 11 UM & 8 M DMAs	1994-96	-	PHR/DR/WRs: ↓ by 16%/13%/10%
Mid-Kent: Oaks Park)Canter-	1993-96	26% (Acorn group J)	3Q (1995): 50%
Mid-Kent: St. Peters)bury	1993-96	14% (Acorn group C)	3Q (1995): 32%
Two Chelmsford areas	1994-95	-	PDR:25%;PWR:26%
F/stone/Dover: 4 retmt.areas	Jan-Aug 1995	-	PWR: 44%/32%
NERA optants only:			
I (5 WCos.)	7/1996 – 12/2001	9%, ↑ to 11% after 1 yr ⁺	PM:16%; PQtr.:13% [*]
II (3 WCos.)	7/1995 – 6/2002	2-4%,↑to 8-9% after 3yrs ⁺	-

Abbreviations: UM: unmetered; DMAs: District Metering Areas; P7D: Peak 7-day Demand M: metered
+ vol.charging; PM: Peak Month Demand (Aug) PHR/DR/WR: Peak Hour/Day/Week Ratios;
PQtr: June-August Demand. *estimates.at aver. real vol. charge of £1.60/m³ (Jan.2000 prices)

Information & Technology: Smart Meters



APPRAISAL OF COSTS

BENEFITS OF SMART METER ROLL
OUT OPTIONS

Information – Commercial Demand

- MAJORITY OF USERS PAY FOR WATER
- INCENTIVE TO REDUCE CONSUMPTION
- PAYBACK PERIODS
- FOOD INDUSTRY A MAJOR USER
- FISS CHALLENGED FOOD INDUSTRY TO REDUCE WATER CONSUMPTION BY 20 (FROM 2007 LEVELS)
- ENVIROWISE WARNS BUSINESSES ARE MISSING OUT ON COST SAVINGS OF UP TO **£**10 MILLION PER DAY.

Information – Commercial Demand



REGISTER YOUR INTEREST

THE BIG SPLASH FORM

HELPLINE 0800 585794

• **FREE CASH!!**

WWW.ENVIRONMENTALGOVERNANCE.GOV.UK/BIGSPLASH

Centreparks

- HOLIDAY VILLAGE USES LARGE AMOUNTS OF WATER IN MEETING THE DOMESTIC, CATERING AND LEISURE NEEDS OF THEIR VISITORS
- DURING 2003, TOTAL USE WAS 301,600 M³ OF WATER, WHICH EQUATES TO AROUND 34M³/HOUR OF WATER CONSUMED AND DISCHARGED TO SEWER
- LEAKAGE DETECTION SURVEY PERFORMED BY THE LOCAL WATER COMPANY IN APRIL 2003 IDENTIFIED A TOTAL OF 89 LEAKS AROUND THE SITE
- REPAIRS TO THESE LEAKS WERE CARRIED OUT AS PART OF THE EVERYDAY SITE MAINTENANCE PROGRAMME, RESULTING IN A REDUCTION OF OVER 6,000 M³/YEAR IN WATER USE AND £4,200/YEAR IN SEWERAGE CHARGES

Centreparks

- FLOW REGULATORS HAVE BEEN FITTED TO 750 SHOWERS, REDUCING THEIR FLOW RATE FROM 30 TO 9 LITRES/MINUTE.
- THIS REDUCED WATER USE BY 23,000 M³/YEAR, SAVING OVER £16,000/YEAR IN SEWERAGE CHARGES
- CISTERN VOLUME ADJUSTERS SAVING 1 LITRE OF WATER PER FLUSH HAVE BEEN FITTED TO 740 TOILETS
- THIS RESULTED IN WATER SAVINGS OF OVER 1,000 M³/YEAR, REPRESENTING COST SAVINGS OF £156/YEAR IN SEWERAGE COSTS

Modelling - Domestic Demand

- TWO APPROACHES:
 - MICRO-COMPONENT APPROACH
 - MICRO-SIMULATION APPROACH



Microsimulation

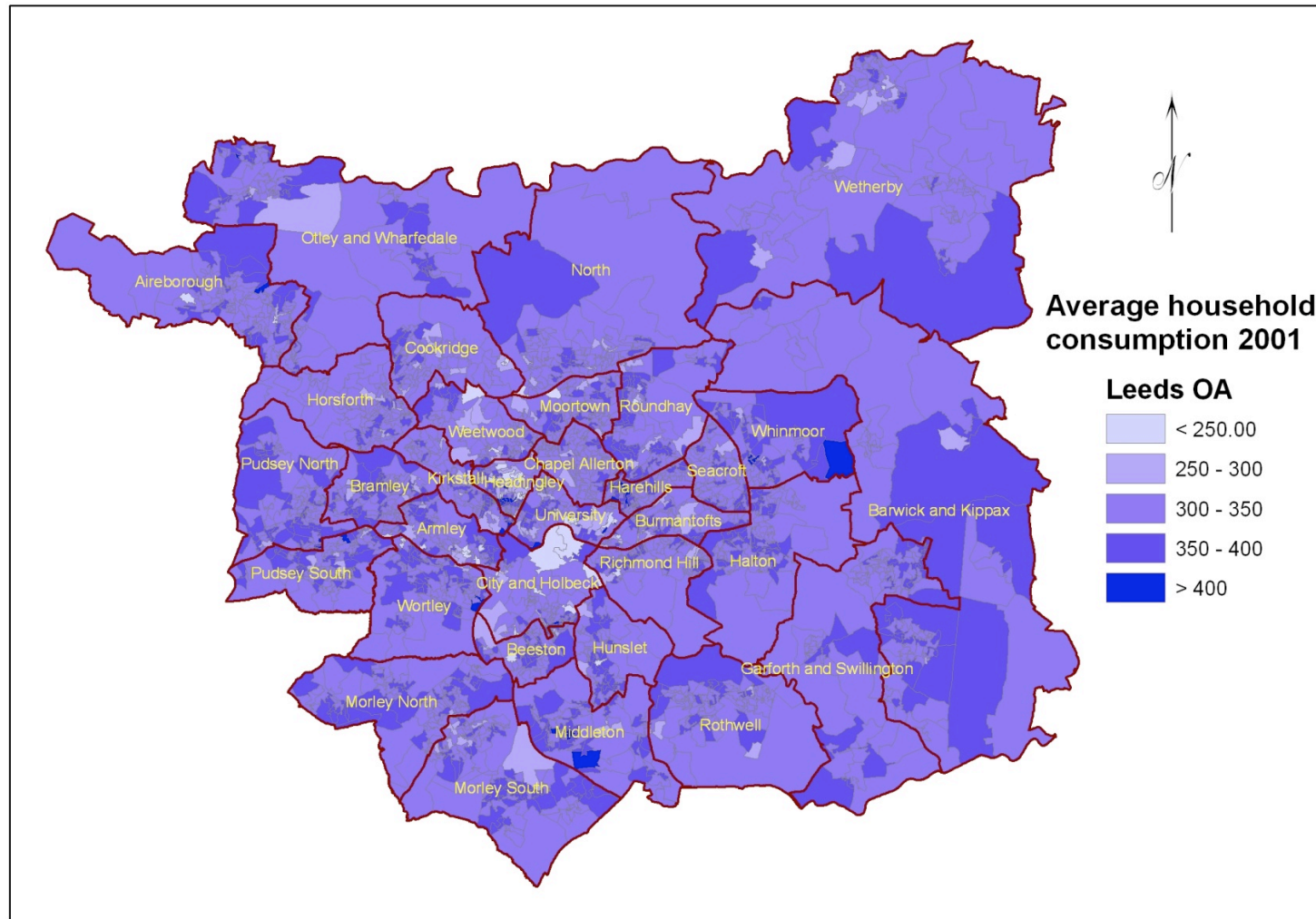
- MICROSIMULATION:

“Microsimulation is a methodology aimed at building large-scale data sets on the attributes of individuals or households and on the attributes of individual, firms or organisations and at analysing policy impacts on these micro-units”

- SPATIAL MICROSIMULATION – ABILITY TO PROVIDE SPATIAL INFORMATION

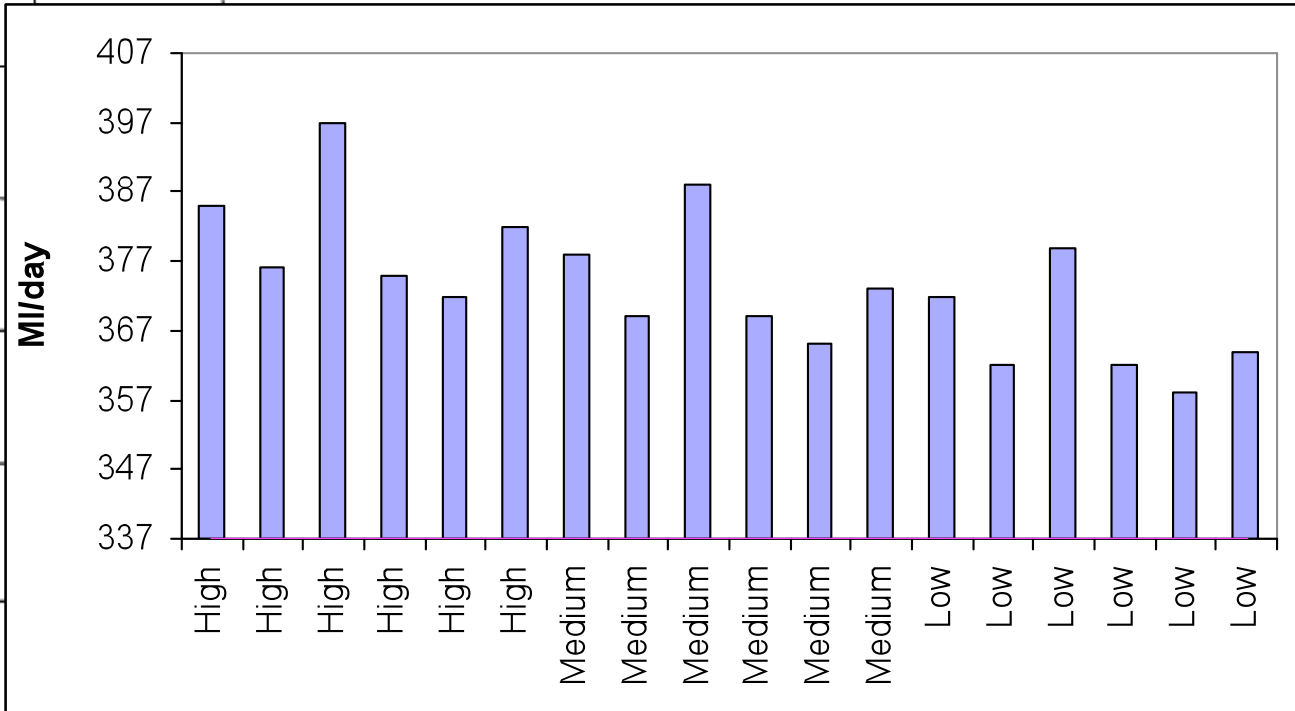


Microsimulation – Results Leeds



Industrial Demand Modelling

Table 4. Total non-household metered demand forecasts for year 2010 (YWS)

Demand scenarios		Model	MI/d in 2010 (1995 = 337)	% change per annum
Economic growth†	Price change (% per annum)			
High	-1.5	A B D		
	0	A B D		
Base	-1.5	A B D		
	0	A B D		
Low	-1.5	A B D		
	0	A	362	+0.42
		B	358	+0.34
		D	364	+0.44

†High and low economic forecasts deviate from base forecast by $\pm 15\%$, all based on Cambridge Econometrics economic forecasts. SMD is constant between all scenarios.

CASE STUDIES

JAPAN



Water Saving - Japan

- TWICE THE RAINFALL THAN THE UK
- LEAKAGE IS LOW
- UNDERGONE AN OVERNIGHT CHANGE OF MINDSET AND BECOME LESS WASTEFUL OF WATER – 1997 KYOTO DEAL
- EFFICIENT WATER FILTERING SAVES 1000 LITRES PER YEAR
- 150L PRIOR TO DISHWASHERS
- 80 TOILETS HAVE A SINK ON TOP
- WORLD LEADER IN INDUSTRIAL WATER EFFICIENCY
- AVERAGE RECYCLING RATE OF 79



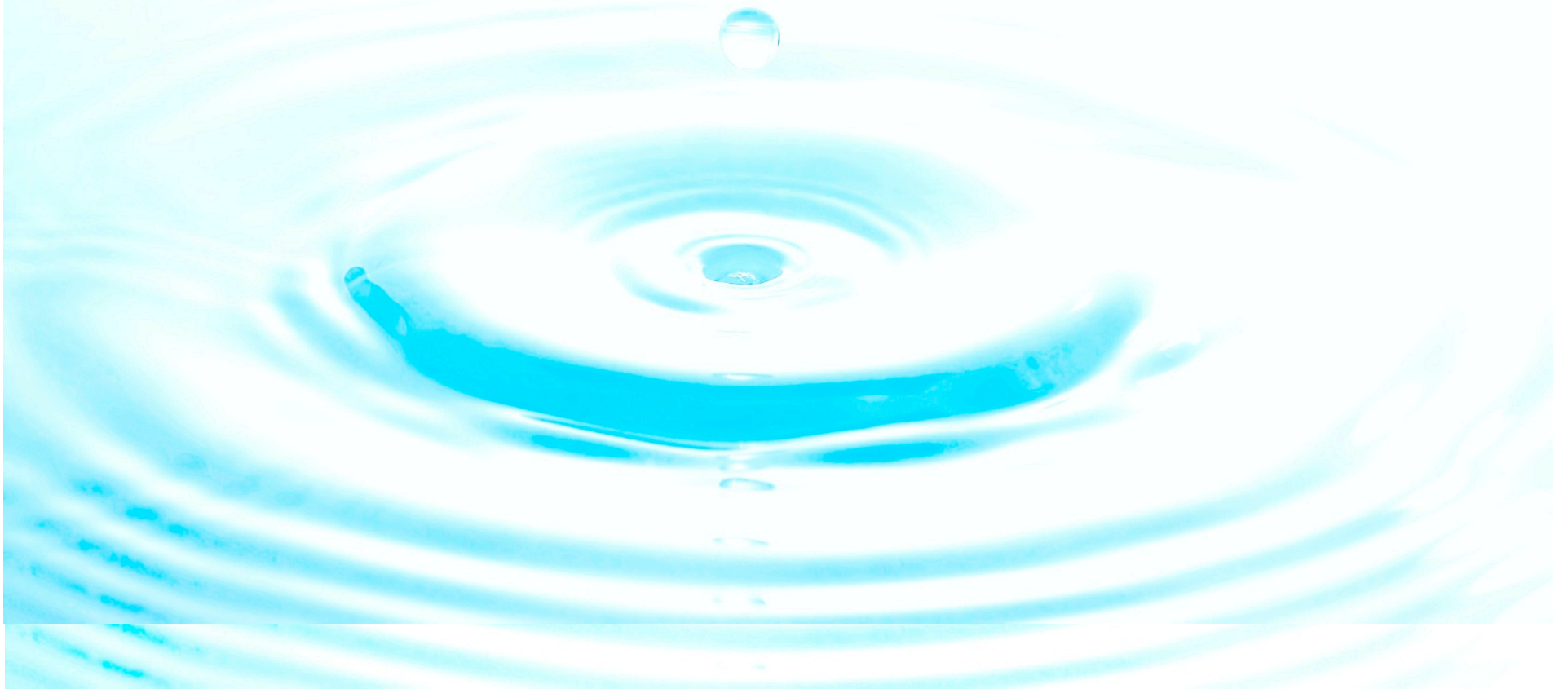
Industrial Demand Japan

- CURRENTLY THE LOWEST WATER-CONSUMING SECTOR OF THE JAPANESE ECONOMY
- WATER RECLAMATION AND RECYCLING IS WIDESPREAD
- PUBLIC-FUNDED RESEARCH AND DEVELOPMENT ORGANISATION - 'WATER RE-USE PROMOTION CENTER WRPC'
- SUPPORT AND EXTEND THE USE OF WATER REUSE AND DESALINATION TECHNOLOGIES
- THE PROMOTION OF RAINWATER AND RECYCLED WASTEWATER UTILIZATION IS GATHERING PACE
- RESULTING IN INCREASED PUBLIC AWARENESS OF WATER CONSERVATION IN JAPAN

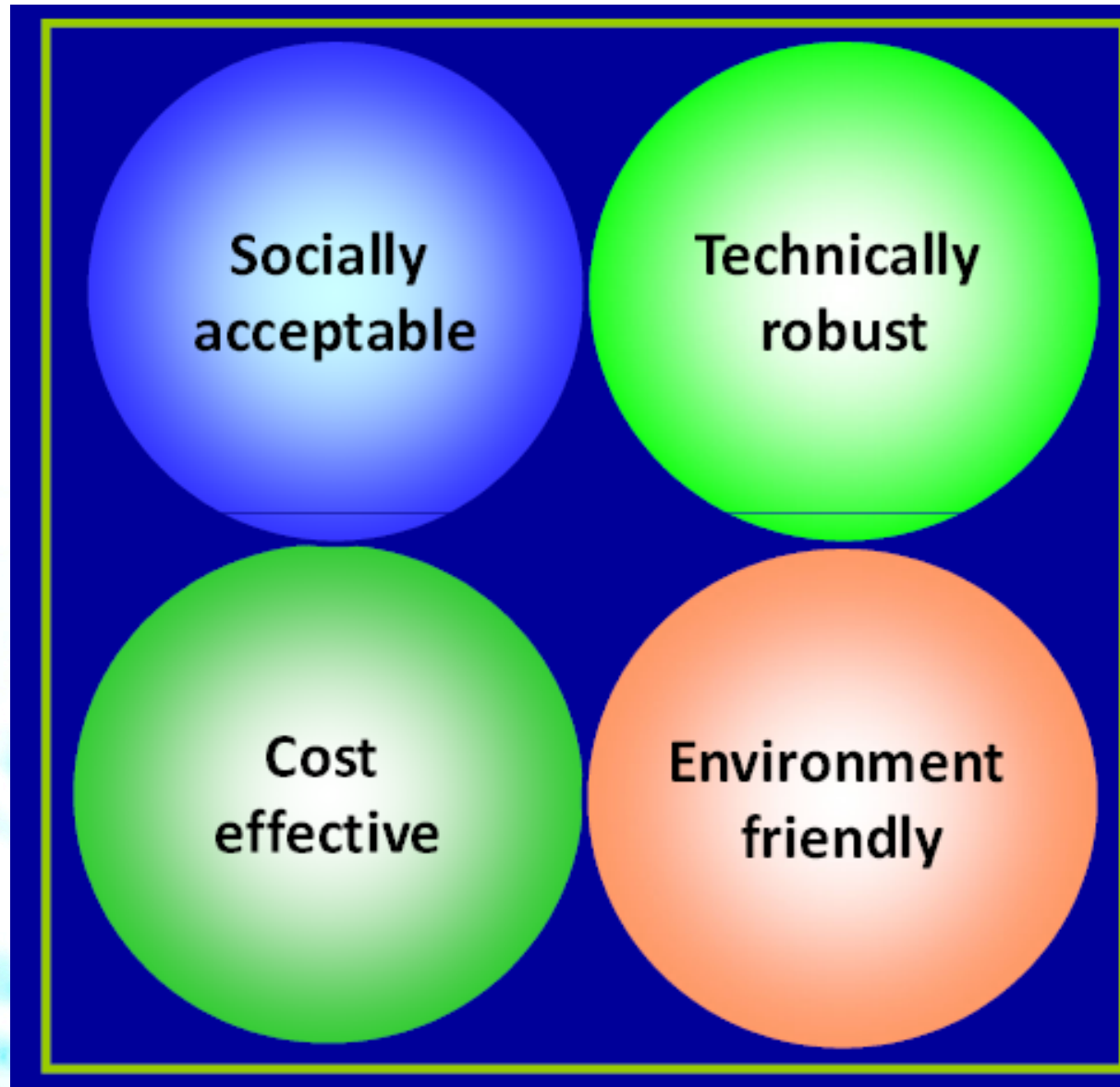
Industrial Demand Japan

- WATER REUSE COMPULSORY FOR BUILDINGS WITH FLOOR SPACE 3000M^2 IN SOME CITIES
- RAINWATER AND RECYCLED WASTEWATER UTILIZATION NOW TOTALS 280 MILLION M^3 /YEAR.
- HAS THE WORLD'S LARGEST SHARE OF ACTIVITY IN MEMBRANE TECHNOLOGY, PRODUCING 60% OF THE WORLD'S MEMBRANES FOR WATER TREATMENT.
- INDUSTRIAL WATER SUPPLY WORKS DELIVER WATER NOT ONLY TO FACTORIES AND INDUSTRIAL FACILITIES BUT ALSO TO OTHER PLACES FOR OTHER USES
- IN TOKYO 2000 M^3 /DAY OF RECYCLED WATER IS USED FOR TRAIN WASHING.

THE WAY FORWARD



The Way Forward



The Way Forward

- **Twin Track Approach**

- INCREASE SUPPLY (WHERE WATER RESOURCES ABUNDANT SUCH AS MALAYSIA)
- REDUCE DEMAND
- BALANCED APPROACH
- LEARN FROM SUCCESSFUL PROJECTS BUT
- HOW DO YOU DEFINE SUCCESS?

The Way Forward: Lifestyle Change

CIWEM:

NO FAITH IN A CONSUMING SOCIETY

- THIS WEEK, FAITH, BUSINESS, GOVERNMENT AND ENVIRONMENTAL LEADERS CHALLENGED THE PREMISE OF A CONSUMER SOCIETY THAT DEVOURS ITSELF.
- QUESTIONED WHETHER THE POLITICAL LEADERSHIP NEEDED IS IN PLACE TO ACHIEVE THE ENORMOUS SOCIAL, CULTURAL AND ENVIRONMENTAL CHANGE REQUIRED TO AVOID CLIMATE CATASTROPHE.
- FAITH LEADERS CAN BETTER ENGAGE CONSUMERS
- FAITH BASED APPROACH TO CONSERVATION COULD WORK IN MALAYSIA GIVEN THE DIVERSE POPULATION.

Water Sustainability, Redang Island



INHABITANTS APPEARED TO WELCOME FAITH
BASED APPROACH TO CONSERVATION

FURTHER DETAILS IN PAPER — TYPE 'REDANG RIZWAN' IN GOOGLE

The Way Forward

ACTION

REDUCE LEAKS



REACTION (LONG TERM)

INCREASE SUPPLY



- DRIER GROUND
CONDITIONS
- AFFECT SEWER
CLEANSING ABILITY

The Way Forward

ACTION

REACTION
(LONG TERM)

PRICING



REDUCE DEMAND



AFFECT POOR

The Way Forward

ACTION

REACTION
(LONG TERM)



REDUCE DEMAND?

TECHNOLOGY

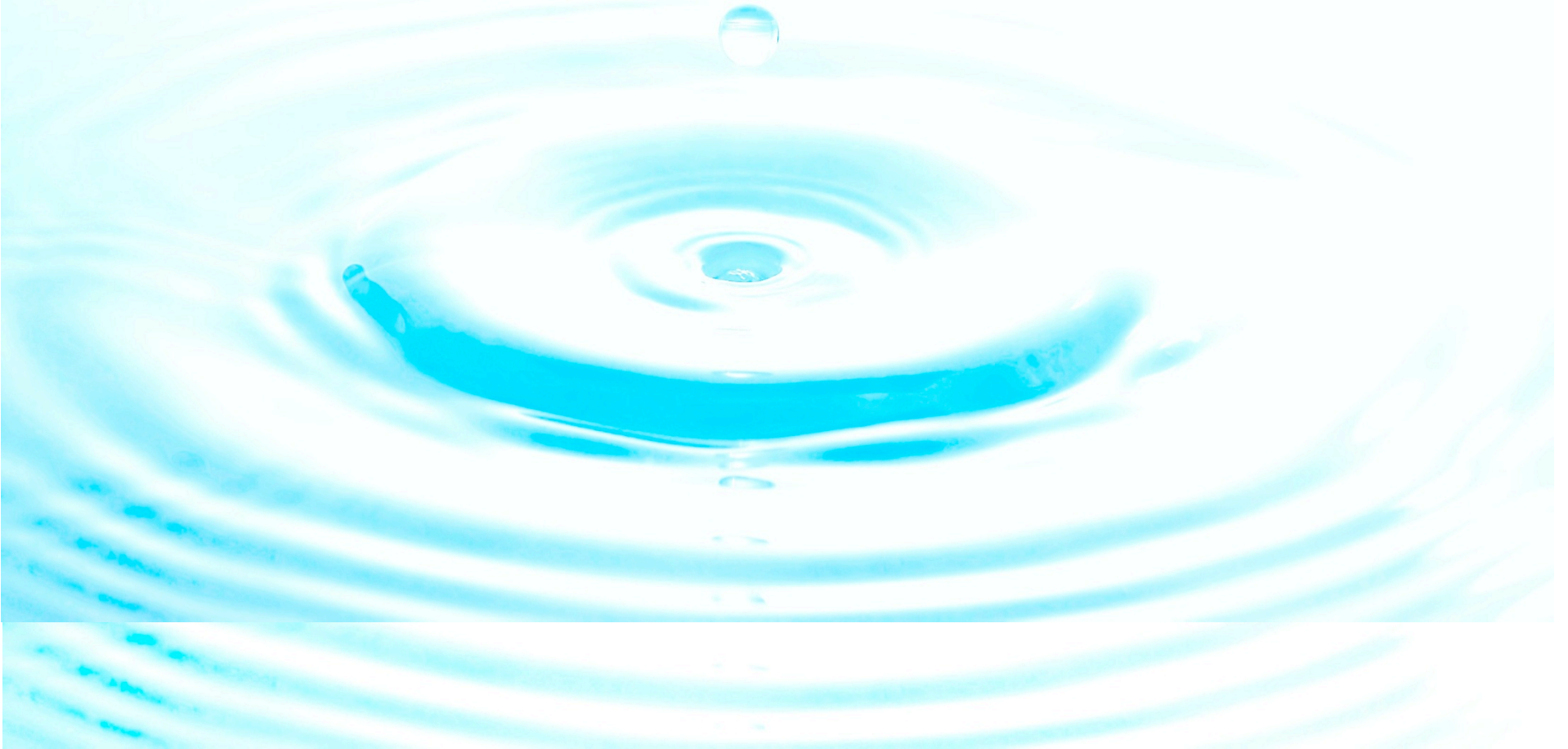


CARBON FOOTPRINT
(E.G. DISHWASHER)

The Way Forward for Malaysia?

- IS ADDITIONAL SUPPLY NECESSARY?
- CLIMATE CHANGE
- POPULATION
- LIFESTYLE (SINGLE PERSON HOUSEHOLDS)
- THINK ABOUT THE IMPACT OF FUTURE TECHNOLOGY ON DEMAND:
 - WATER EFFICIENT DEVICES
 - WATERLESS WASHING MACHINE
 - CHEAPER SOLAR DESALINATION
- EFFECTIVE REGULATION

THANK YOU



Information (Domestic Demand)

LOW FLUSH TOILET

- I WILL JUST FLUSH TWICE.....



Information

Driver	Influencing Factors
POPULATION	GROWTH, MIGRATION, DEVELOPMENT
HOUSEHOLD STRUCTURE	ETHNICITY, HOUSING, PLANNING
HOUSEHOLD AFFLUENCE	
COST OF WATER	TARIFFS, METERING
WATER USING TECHNOLOGY	CONSUMER REGULATIONS
HOUSE TYPE	BUILDING REGULATIONS
GARDEN	SIZE, HOUSE TYPE
KNOWLEDGE	EDUCATION
CLIMATE	GLOBAL WARMING

Artetch Circuits Ltd

- CIRCUIT MANUFACTURER WITH SIGNIFICANT WATER USAGE (46,000M³/YEAR).
- MONITORING AND MEASURING TECHNIQUES WERE USED TO HELP IDENTIFY NEW WATER-SAVING OPPORTUNITIES.
- ACHIEVED BY INSTALLING A NEW CONDUCTIVITY METER TO IMPROVE AND OPTIMISE WATER CONTROL
- ENABLED REDUCED FLOW TO RINSE LINES BY CLOSELY MONITORING RINSE WATER QUALITY USING CONDUCTIVITY AND PH VALUES.
- BENEFITS INCLUDE TOTAL COST SAVINGS OF AROUND £6,000/YEAR
- REDUCTION IN THE USE OF WATER BY 5,000 M³/YEAR.

Microsimulation

- MICRO
- THE F
- AGGR
- OUTPI
- VALID
- COMP
- UNCOI

