Water and Environment Support
in the ENI Southern Neighbourhood region

Regional training on Water Demand Management

RW-3-REG Training Module 3: Best practice WDM measures

3 February 2022, Videoconference

Presented by:

- Andrew Tucker, Water Demand Reduction Manager, Thames Water Ltd
- Antony Gibson, Water Security and Efficiency Expert, Ramboll
- Cor Merks, Strategic Water Asset Planning Expert, Ramboll

Supported by Andreea Florea, Arthur Streller and Fantine Hureau

Coordinated by Ms. Susan Taha, Key Water Expert, WES

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RAMBOLL

Thames Water

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Welcome and explanation of today's program

Welcome by Ms. Susan Taha

Explanation of today's program: Antony Gibson

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Five Training Modules on WDM

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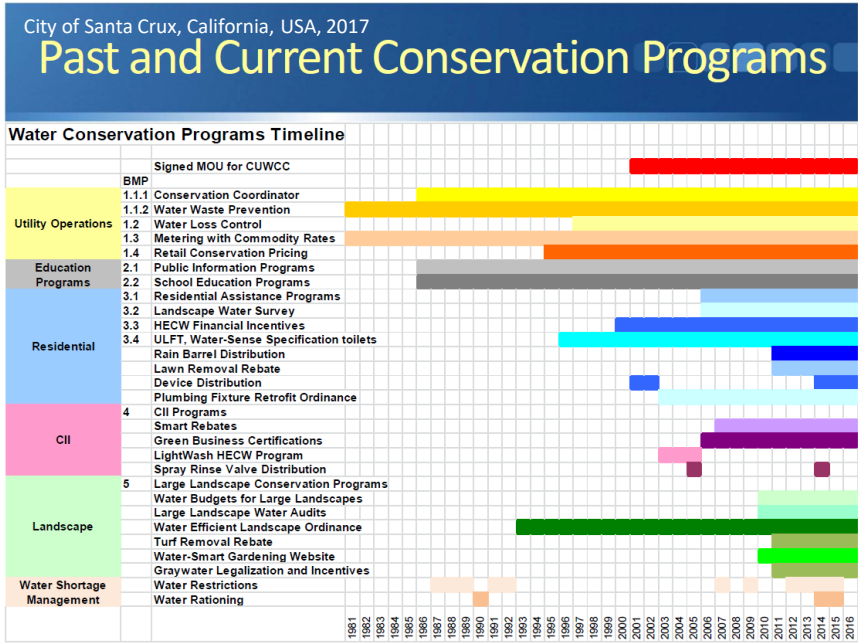
1. Jan 20: Understanding water demand
2. Jan 26: Water demand forecasting
3. **Feb 03: Best practice WDM measures**
4. Feb 10: Implementing WDM (Part I)
5. Feb 17: Implementing WDM (Part II)



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Training Module 3 program Athens time (CET+1)

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09:30-09:45	Welcome and explanation of today's program
09:45-10:00	Presentation "Forecasting methods and uncertainty modelling"
10:00-10:45	Presentation "Sectorial water demand management interventions"
10:45-11:00	Short break and accessing the breakout rooms
11:00-11:30	Breakout room presentation "CBA of WELS (AU)" and discussion
11:30-11:45	Feedback in the plenary session
11:45-12:10	Case study "WDM interventions implemented at Thames Water (UK)"
	Andrew Tucker, Water Demand Reduction Manager, Thames Water Ltd.
12:10-12:35	Presentation "Water security and efficiency planning"
12:35-13:00	Plenary Kahoot! quiz and closure of Training Module 3

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Framing the problem... using an example

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Focus on South East Queensland between 2005-2018

- Humid Sub-tropical climate, min 17°C, avg 19°C, max 26°C
- Population 4 million, growing at 3% per annum

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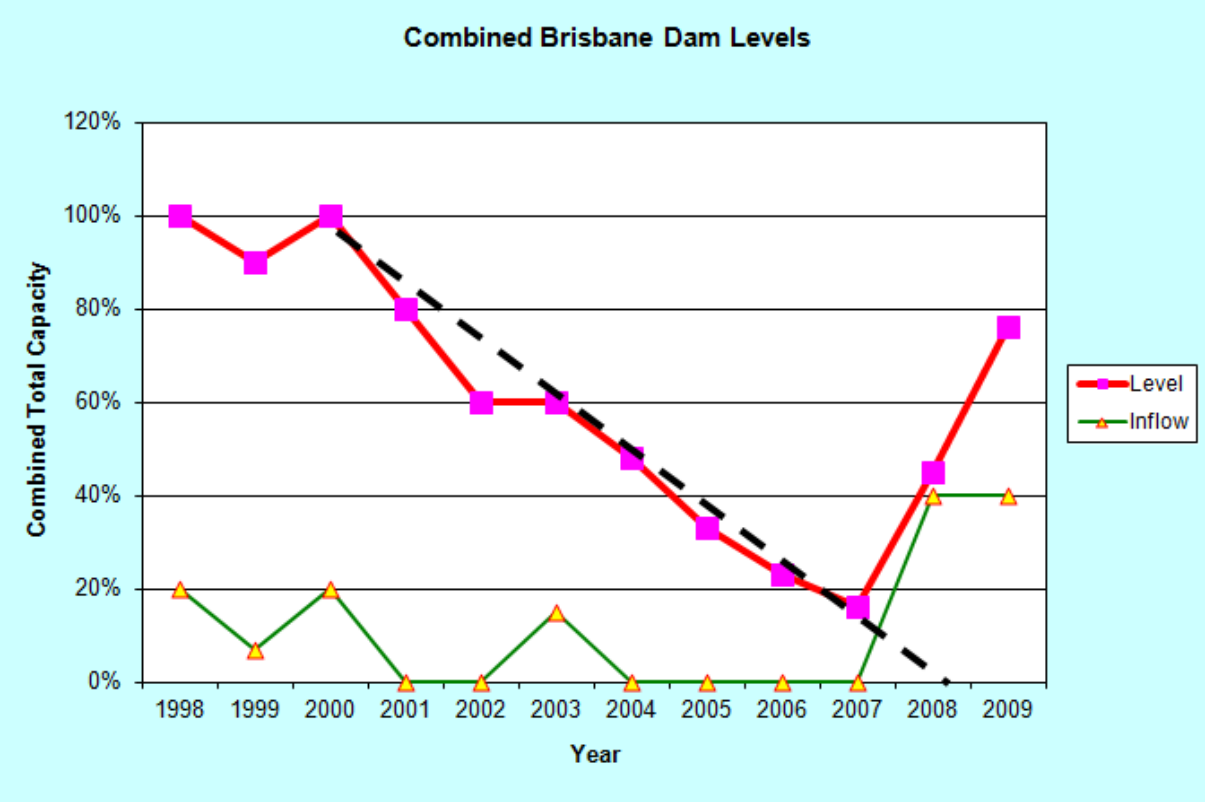
Case Study – South East Queensland (1)

- Drought from 2001-2009
- Low rainfall, storages dropped below 20%
- Considerable government investment in response
- This has been well documented and so 10+ years later we can understand what happened



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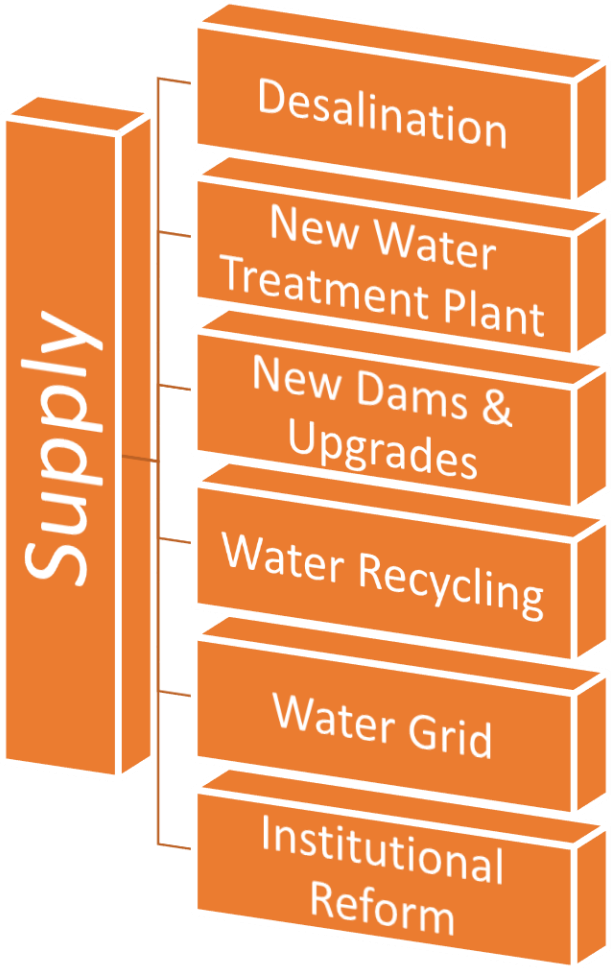
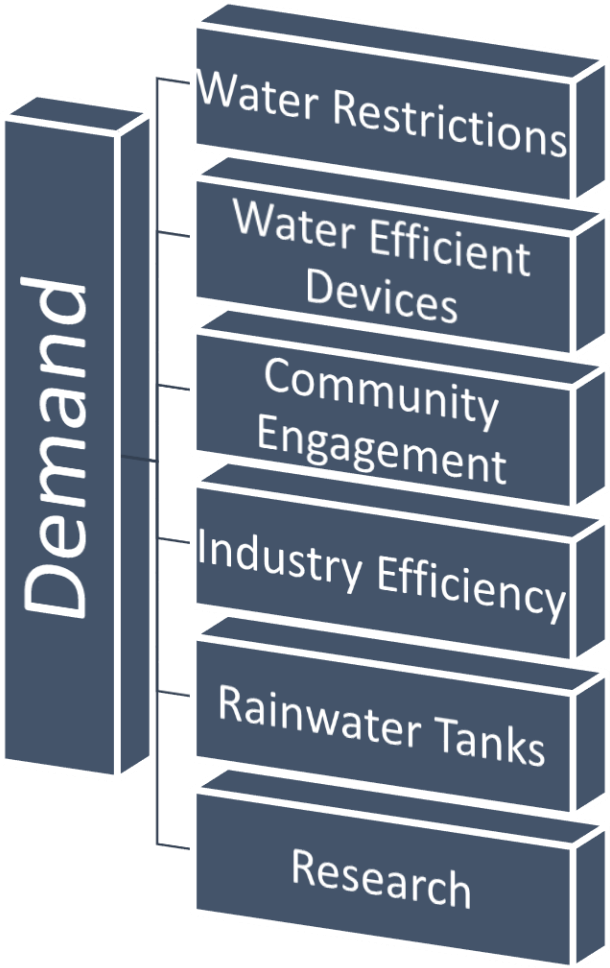
Case Study – South East Queensland (2)



The government invested to increase supply and to reduce demand



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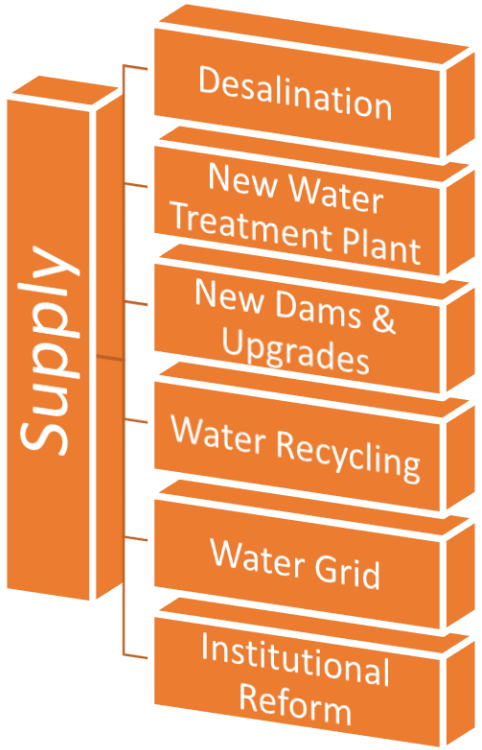
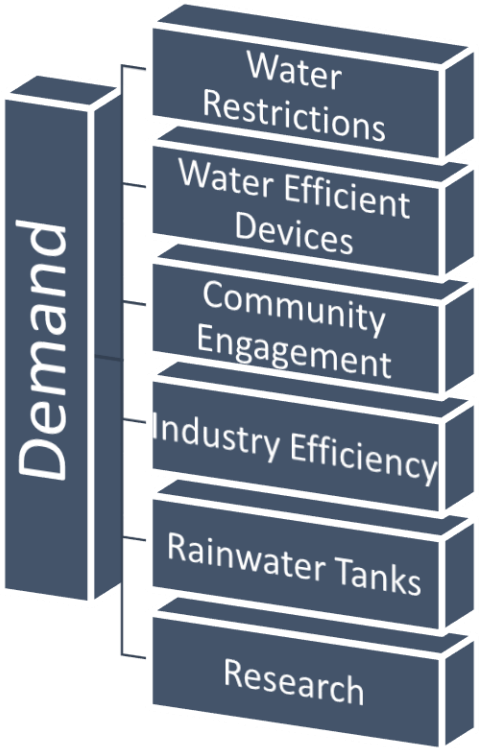
Case Study – South East Queensland (3)



Integrated water management requires consideration of both demand and supply.

But for many systems, economics will be favourable for investments in demand reduction.



Supply investment AU $10 Billion
Increased capacity by 160 million m^3/year

Demand investment < AU $1 Billion
Reduced demand by 157 million m^3/year

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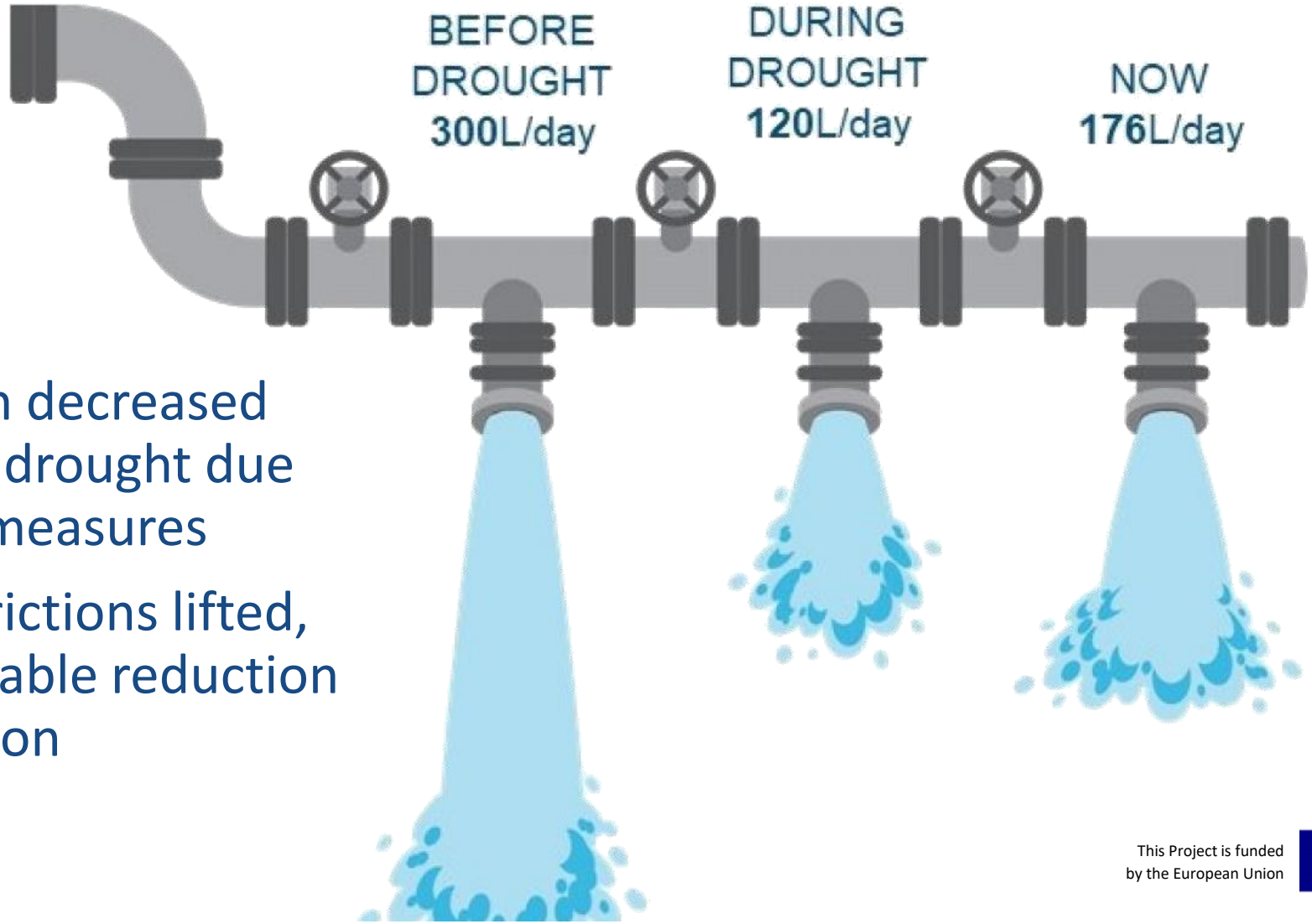
Case Study – South East Queensland (4)



- Water consumption decreased significantly during drought due to combination of measures
- But even after restrictions lifted, there was a sustainable reduction in water consumption

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Pre-training test Training Module 3 (1)

1. Is currently any WDM intervention implemented?
   - Improved water accounting?
   - Indoor water efficiency measures?
   - Outdoor water efficiency measures?
   - Financial measures?
   - Policy and regulatory measures?
   - Media campaigns and communication?
   - Awareness-raising?

2. Is any of the WMD interventions implemented as a response to:
   - COVID-19 situation?
   - Drought?
   - Extreme (weather) event?
   - Public health threat?
   - Water scarcity?
   - Another driver? (Please specify)

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Pre-training test Training Module 3 (2)

3. Is there a need to introduce/expand implementation of WDM interventions?
   - In the residential sector?
   - In the commercial/tourism sector?
   - In the industrial sector?

   - When should any of the WDM interventions be implemented at the latest?
   - What is the most important driver?

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Questions & Answers

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Presentation “Forecasting methods and uncertainty modelling”

Cor Merks and Fantine Hureau

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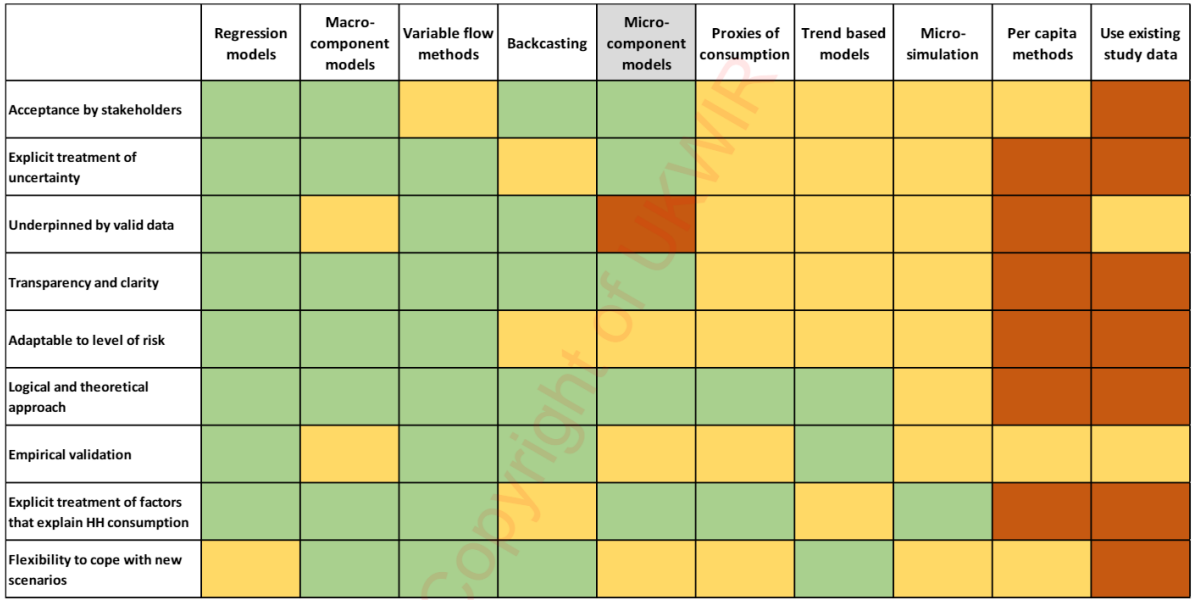
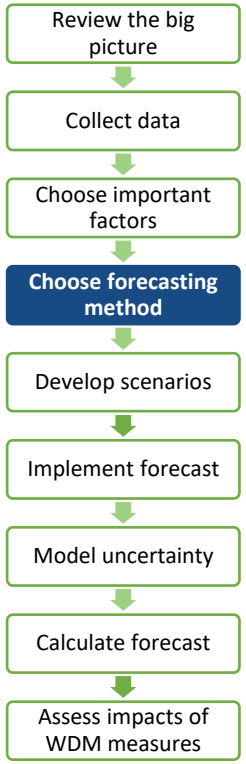
Forecasting methods (1)

- Three categories of methods:
  - Quantitative methods: regression, trend-based methods
  - Semi-quantitative methods: using household components, etc.
  - Methods using outputs of other analyses including per capita methods
- Choice of method depends on context (cf. UKWIR decision matrix)



	Regression models	Macro-component models	Variable flow methods	Backcasting	Micro-component models	Proxies of consumption	Trend based models	Micro-simulation	Per capita methods	Use existing study data
Acceptance by stakeholders										
Explicit treatment of uncertainty										
Underpinned by valid data										
Transparency and clarity										
Adaptable to level of risk										
Logical and theoretical approach										
Empirical validation										
Explicit treatment of factors that explain HH consumption										
Flexibility to cope with new scenarios										

Adapted from UKWIR - WRMP19 METHODS – HOUSEHOLD CONSUMPTION FORECASTING (2015)



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Forecasting methods (2)

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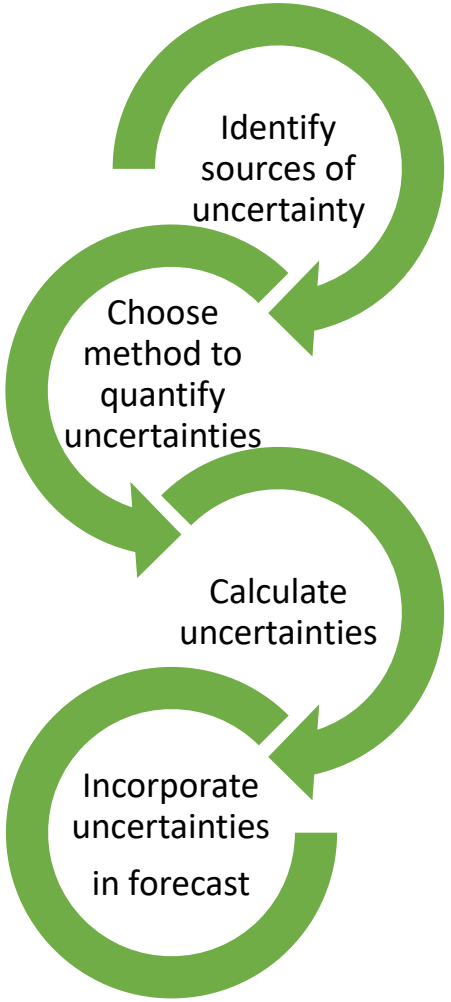
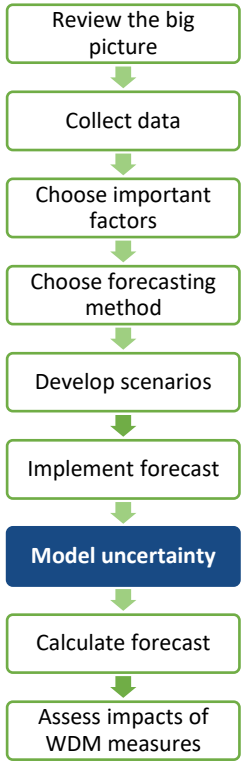
Method	Data needed	Resources needed	Advantages	Inconvenients
Regression models	• Consumption • Factors influencing cons.	• Statistical expertise	• Take influencing factors into account • Can yield more accurate results • Allows explicit sensitivity analysis	• Large amount of data required • High complexity
Macro-components / Variable flow	• Link between components and factors	• Understanding of factors influencing component cons.	• Take influencing factors into account • Room for expert judgement & assumptions • Allows explicit sensitivity analysis	• Risk of over-simplifying
Backcasting	• Estimates of effects of water efficiency and other measures	• Understanding of water efficiency savings	• Provides a framework to set future consumption targets • Room for expert judgement & assumptions	• Risk of failure to understand interactions between baseline and final plans
Micro-components / end-use models	• Data on micro-components consumption and factors influencing	• Understanding of factors influencing component cons.	• Well-established and understood method • Logical approach with transparent assumptions • Room for expert judgement & assumptions	• Likely to require a lot of data/expert judgements • Can be of high complexity
Proxies of consumption	• Data on sales & water-related products	• Other companies than water sector, academia	• Can provide a direct link between consumption and day-to-day practice	• Largely untried and untested • Current models rely on metered cons. • Need to be tested against other methods
Trend-based models	• Time series of consumption data	• Statistical expertise	• No need to analyze influencing factors, focus is on consumption	• Historic trends are likely to be valid only for a short time
Micro-simulation	• Data on household attributes	• Expert input	• Provides full variation in consumption: more than just averages	• Not yet widely tested • Need specialist modelling and software • Need to be tested against other methods
Per capita methods	• Base year consumption data only	• No specialist ressource requirement	• Simple, assuming constant cons. per segment • Modelling segment changes can be used to forecast changes	• Not considering factors which influence consumption • Need to be tested against other methods
Use exising study data	• Consumption data from other sources	• No specialist ressource requirement	• Siimple method which relies on other studies • Modelling segment changes can be used to forecast changes	• Not considering factors which influence consumption

Adapted from UKWIR - WRMP19 METHODS – HOUSEHOLD CONSUMPTION FORECASTING (2015)

Uncertainty modelling (1)

- Significant uncertainty in water demand forecast values
  - Base year uncertainties
  - Forecast uncertainties
  - Random uncertainties in the model
  - Systematic uncertainties
- Four steps approach:
  - Identify
  - Choose method to quantify
  - Calculate
  - Incorporate in forecast





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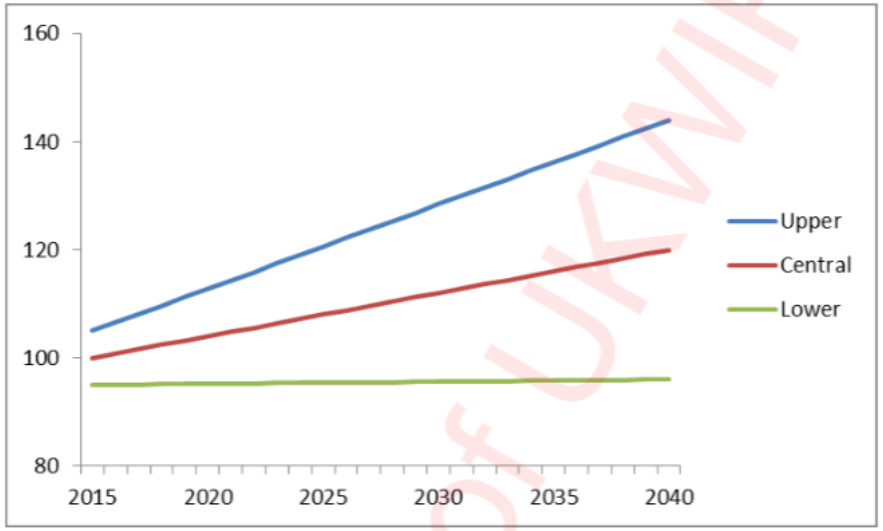
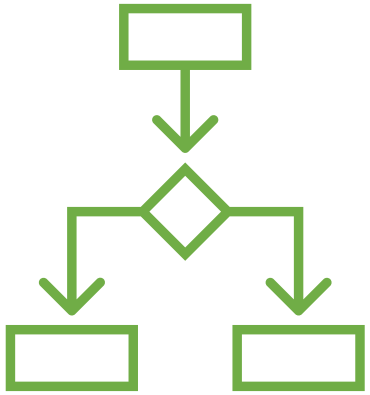
Uncertainty modelling (2)



- Method 1: Deterministic ranges
  - Establish a range in which it is very likely that the actual demand value is
  - E.g., +/- 5% of central forecast
  - Ranges often defined by expert judgement or scenarios



- Method 2: Scenarios
  - Range of ”What-if” scenarios to calculate alternative demand

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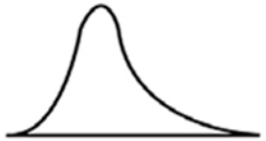
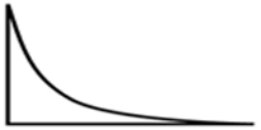
Uncertainty modelling (3)

Type	Basic Shape	Description	Application
Triangular		Most easily defined continuous distribution. Defined by a least likely, most likely and maximum likely value. Can be skewed either way	Forecasting situations where the supply or demand value can be any value within a range and the most likely value can be estimated. May not be appropriate if highly skewed
Normal		Symmetrical continuous distribution defined by a mean and standard deviation	Most commonly applied to random uncertainties (known unknowns)
Log-Normal		Skewed continuous distribution defined by a mean and standard deviation	Forecasting situations where there is a large difference between the maximum and the most likely values such that a triangular distribution is considered unsuitable
Exponential		Continuous distribution defined by rate. Minimum value always equals 0	Forecasting situations where the most likely and minimum values are zero, but there is a possibility of a large positive value
Discrete/ Custom		Non-continuous distribution defined by values and probabilities	Forecasting situations where specific values apply and values between do not. For example, chance events where the outcome is a particular value or zero

- Method 3: Probability density functions
  - Represents the range and shape of distribution of feasible values
  - Can be defined for the whole demand or for its components separately
  - Often defined by expert judgement

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Uncertainty modelling (4)

Method	Where to apply?	Advantages	Inconvenients
Deterministic ranges	Low or intermediate level of concern, or inadequate evidence to quantify probabilities or make scenarios	• Low data requirements • Transparent & pragmatic • Easy to carry out sensitivity testing	• Needs expert judgement • Does not involve the likelihood of individual values within the range
Probability density functions	Any level of concern	• Estimates likelihood of individual values within the range • Can be used in probabilistic modelling	• Complex data requirements • Needs expert judgement • Risk of over-interpreting uncertainties
Scenarios	Any level of concern	• Modest data requirements • Variability is accounted for without having probabilistic calculations	• Needs expert judgement • Challenge to prioritize scenarios

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Questions & Answers

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Presentation “Sectorial water demand management interventions”

Andreea Florea, Arthur Streller, and Cor Merks

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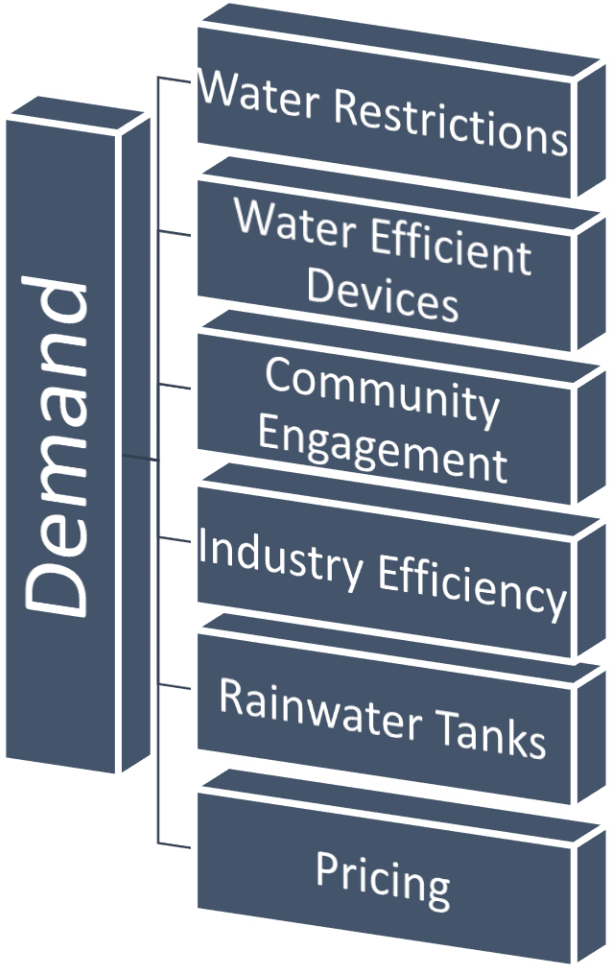
Water demand management interventions



1. Water Restrictions (drought response)
2. Water Efficient Devices
   - Follow up in the breakout room sessions
3. Community Engagement
4. Industry Efficiency
5. Rainwater Tanks
6. Pricing / Economic Tools

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Water Restrictions (drought response)

- Temporary use bans
- Hands-off flow limits
- Partial or full restriction on landscaping
- Ordinary or emergency drought order

- Legal tools per sector

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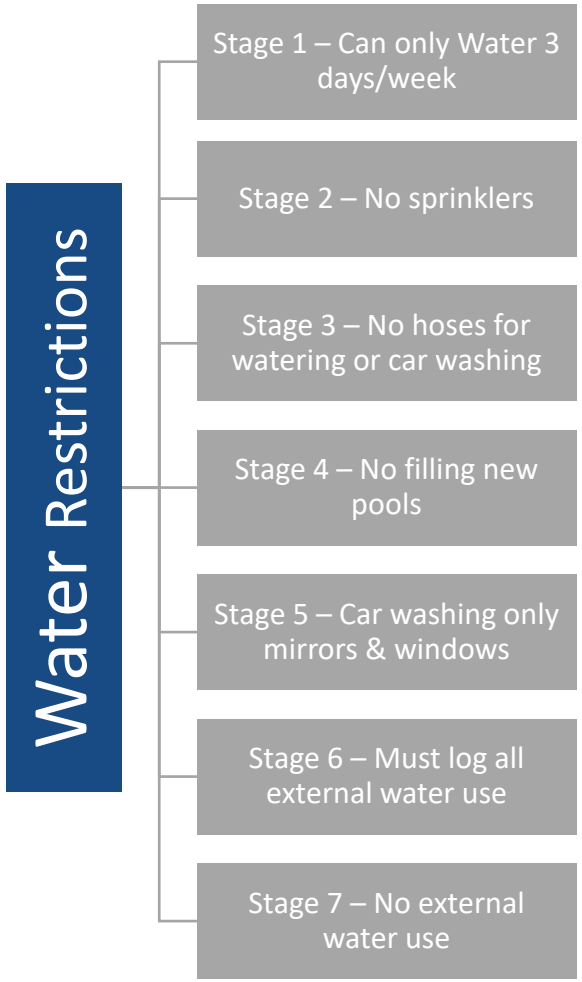
Water Restrictions – Example



Water restrictions introduced progressively through the drought

Issues:

1. Compliance / Enforcement
2. Generally limited to external water consumption
3. Low cost to implement
4. But some externalities: economic & social

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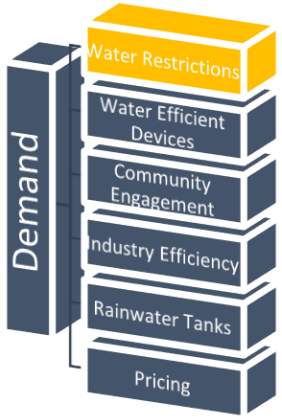
Water Restrictions – Legal tools (example)



Sector of water use	WDM policies and measures
Domestic and tourism	1. Compulsory metering on users' premises; 2. Water utilities fully accountable for water losses over 8% during distribution; 3. Installation of automatic, remote-controlled meters (N*); 4. A major wastewater treatment programme (existing, with new extensions planned); 5. A significant tariff increase (N*); 6. An incremental tariff system to impose higher charges on larger consumers of water. Addition of supplementary increments planned (existing and N*); 7. A multimedia campaign to raise awareness of water saving (existing measure and N*); 8. Monitoring and specific quotas for municipal green spaces (N*); 9. Treating a larger volume of domestic wastewater for agricultural reuse; 10. Installation of high-capacity desalination units (N*).
Agriculture	1. Compulsory metering on agricultural users' premises; 2. Water utilities fully accountable for water losses over 8% during distribution; 3. Distributed water subject to annual quota (cannot be exceeded); 4. Many policies to encourage research and development, farmer training, water conservancy practices and technology (existing and N*); 5. Policies encouraging the use of brackish water and treated wastewater for irrigation; 6. Tariff increase with a view to full coverage of costs (N* and future).
Industry	1. Compulsory metering of water volume consumed; 2. Water utilities fully accountable for water losses over 8% during distribution; 3. Policies encouraging the use of brackish water and recycled process water (N*); 4. Tariff increase with a view to full coverage of costs (N* and future).

*Recent changes/innovations (initiated in the past few years) are marked 'N'.

WDM policies and measures implemented or planned in Israel (2010–2020)
Source: GWP (2012), Israel Water Authority (2011)

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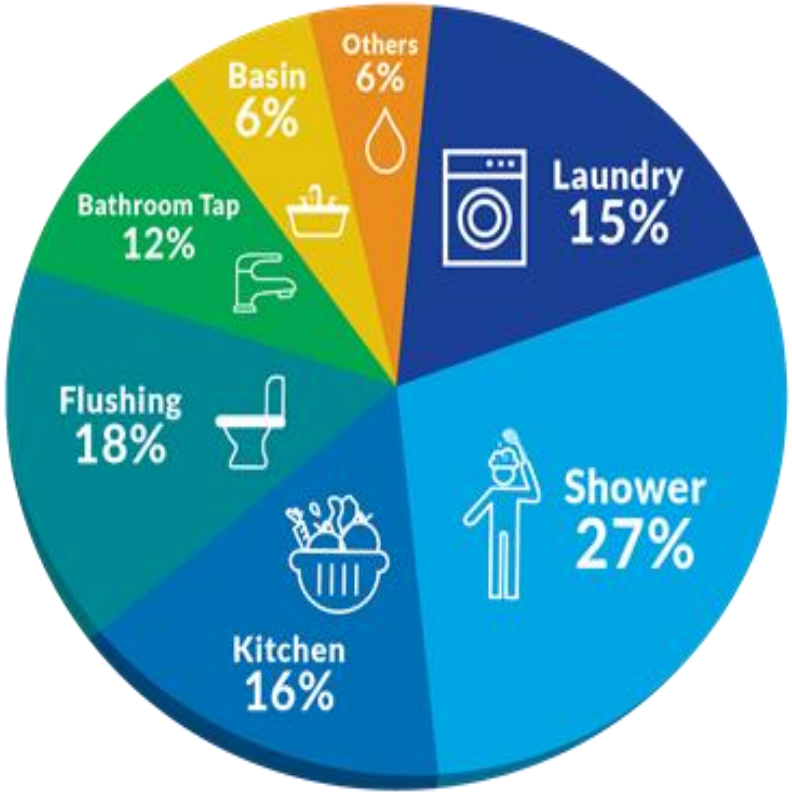
Water Efficient Fittings and Appliances (1)



Washing machines

Dishwasher

Shower taps and mixers

Sink/bib taps and mixers

Low-capacity flushing cisterns

Urinals and urinal flush valves

Wong Wai Cheng, Chief Engineer, PUB Water Supply Network Department (2019)

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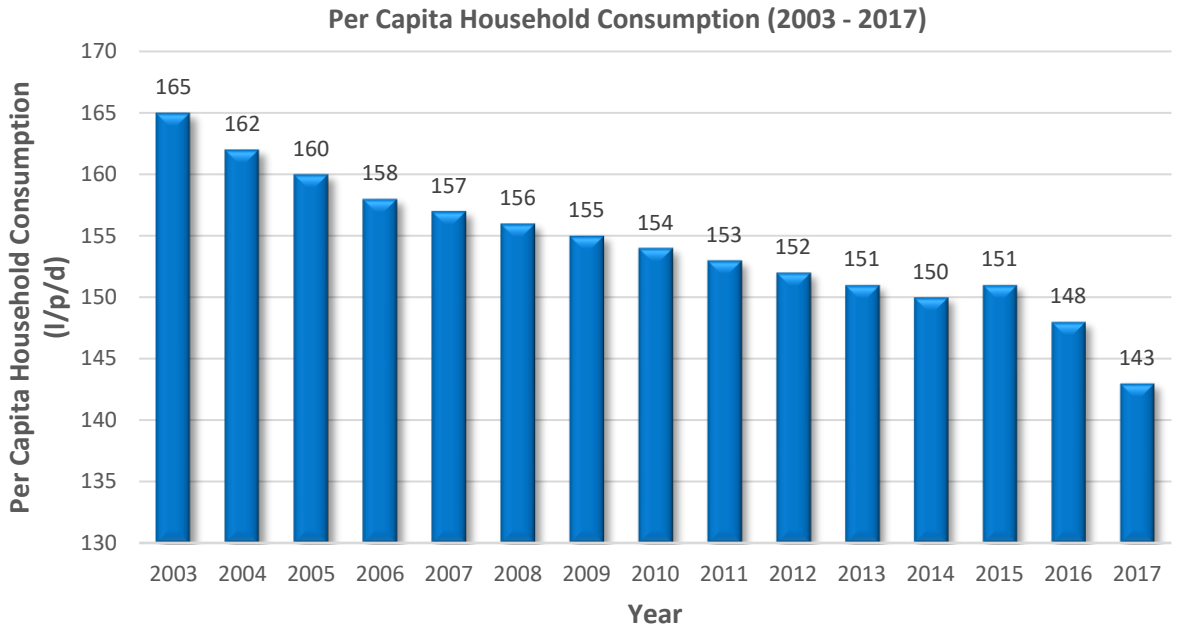
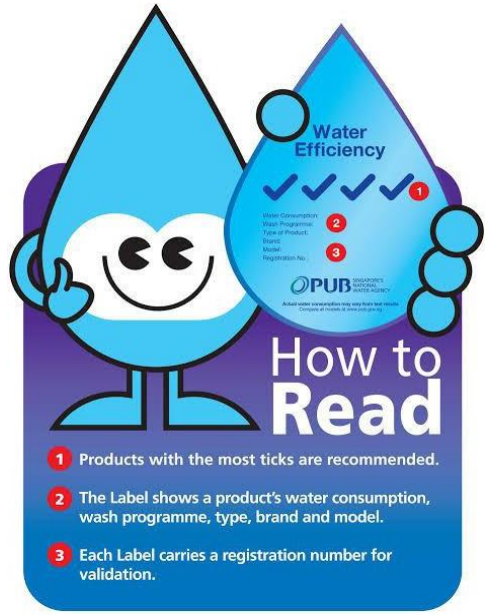
Water Efficient Fittings and Appliances (2)





- Water Efficiency Labelling implemented at PUB
- Target 2030: 130 Liters per person per day
- Targeting shower: 27% of one's daily water demand; other interventions limited

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Water Efficient Fittings and Appliances (3)

- PUB experience: “Saving effects are large if:
  - Target a specific behaviour
  - Person specific behaviour
  - Feedback provided when person engaged in behaviour
  - Make the feedback seen prominently”
- Implementation of Water Efficiency Labelling results in a gradual change of per capita household consumption
- Rebates or other programmes drive fast change
  - Example: City of Santa Crux, California, USA, 2017

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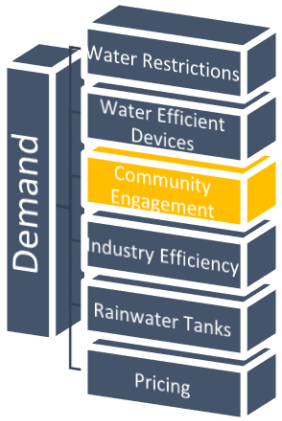
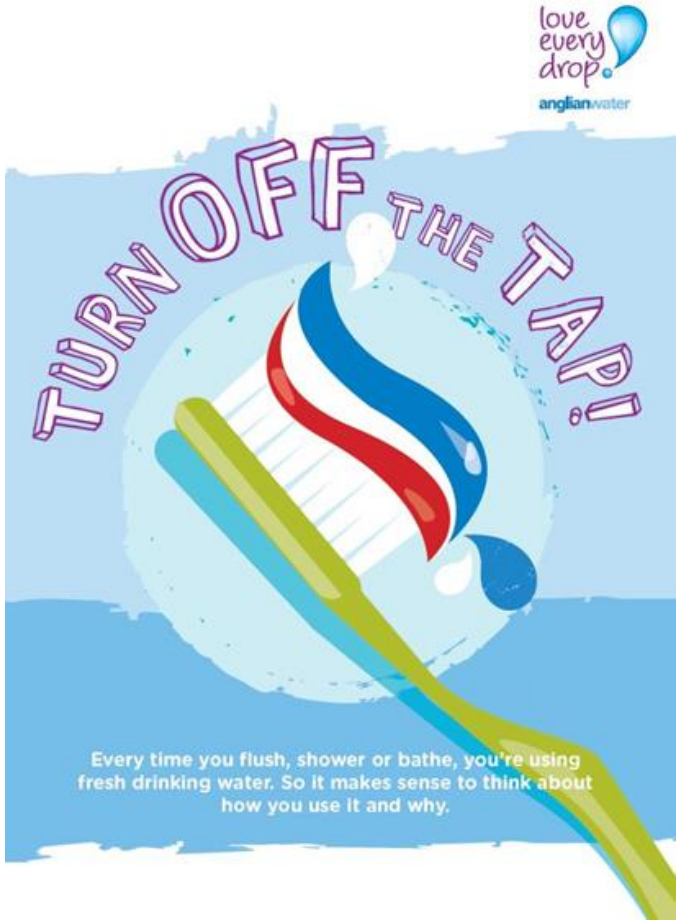
Community Engagement



- Awareness-raising
- Media campaigns
- Public information programs
- School education programmes
- Water-wise landscaping website
- Communication
- Attitude and behavioural change



Dual-branding Anglian Water with Aquafresh, 2019

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Awareness raising – addressing policy makers

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- Communication and participation to the projects
- Involve the Local Government Administrators and policy makers right from the beginning of the projects,
- Achieve visibility in the mass media by communicating the projects' validity in a disseminated and original way
- Create the most active local participation in order to involve the administration and the public opinion in the projects' finalities.
- Involve the national and international organisms that work in inherent sectors to the projects
- Involve the economic sectors that may be interested in the projects' scientific results and encourage them to finance the implementation phases.
- Involve greater society sectors through associations and pressure groups and by divulgating the projects' scientific results in collateral events

Tools of training and awareness raising

- Campaigns to raise awareness of farmers and the general public.
- Agricultural advisory service,
- Training of agricultural professionals, technicians and engineers

Raising awareness and training for WDM in Cyprus and Israel

In Cyprus, public awareness campaigns are conducted by advertising, press articles, brochure handouts and posters. Weekly radio and television broadcasts by the Ministry of Agriculture address farmers and announcements about water saving have had positive results. Courses arranged by the Agriculture Department on irrigation control and planning have led to better WDM.

In Israel, the Israel Water Authority launched a national multimedia awareness campaign to inform citizens of the need to reduce their water consumption and the benefits this would have in the context of the country's water shortage. Various media were used - television, radio, newspapers and the Internet - reaching most of the population. By the end of 2009. a 10% drop in water consumption was recorded, amounting to over 75 Mm.

Sources: GWP (2012), Iacovides in UNEP/MAP/Plan Bleu (2007), Rejwan (2011)

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Values in public awareness building

- Perception of scarcity
- Modifications of water cycle by the human impact: The mobilization of water resources (dams, groundwater aquifers, etc) and tis effects.
- Sharing of scarce resources by different actors
- Recovery of water, no wastewater
- Make use of the cultural and ethical values
- Public awareness programs need to be holistic and multidisciplinary

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Communicative and educative tools

Tool	Description
Advertising campaign	Uses various media such as radio, newspapers and television (when required).
Regular media releases	Ensures up-to-date information by the demand management team reaches the media and public so data is accurately reported.
Print information	For example, booklets/pamphlets/stickers covering the specific programs being offered.
Detailed informative material	Fact sheets on general subjects or specific program initiatives, for example: • appropriate garden watering and plants for your area • best practice guidelines for efficiency in hotels • how to manage cooling tower water usage more effectively
Face to face communications	For example, public presentations, seminars and stalls at local events where the programs on offer can be advertised and easily offered to the public.
Workshops and training	For example, gardening workshops for the public or training sessions for managers of hotels at a site that illustrates the costs and benefits of best practice water efficiency.
Publications	For example, regular magazines or links to magazines produced by other areas that illustrate best practice water efficiency such as Sydney Water in NSW and Water Corporation in WA on the non-residential sector.
Competitions and awards	Can target the both the residential and non-residential sectors.
Direct marketing	Mail out and point-of-sale vouchers and information for general and target groups.
Billing information	A redesign of bills can show how a customer is tracking compared to a standard house in each season
Phone hotline	A general enquiry telephone number for information on promotions, booking audits and where to get further advice
Training materials	To provide to trade allies, auditors and specialists.
Web site	Can be a clearinghouse for all the information produced for various sectors of the community. It needs to be informative, easy to navigate and up-to-date

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Industry Efficiency

Industries use water:

- For many water is critical – without water they cannot produce, e.g., breweries, dairies, steel, power stations, meat packers, etc.
- But for most industries, the cost of water is minor or insignificant fraction of their production costs

Therefore, operational managers will usually focus on other things such as labour efficiency, raw material cost, energy cost, ...until the water supply fails or runs short.

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Industry Efficiency

There are many potential measures that can be implemented, but WDM need to work to drive implementation:

- Build awareness of what is possible: benchmarking, case studies, industry engagement
- Put in place regulatory measures to drive compliance: e.g., compulsory water audits, capped water allocations, water efficiency regulations
- Consider incentive schemes or co-funding to help subsidise industries to invest in water efficiency, particularly for adoption of new technology

Examples Measures

Housekeeping	Process Changes	Reuse/Recycling
• Repair leaks, faulty valves, etc. • Turning off taps and hoses • Turn off water when machines are not running	• Using water efficient processes and equipment • Mechanical pre-cleaning and collecting waste in dry form • Reduce the number of process steps (i.e., fewer rinsing) • Non-evaporate cooling water and/or refrigeration type cooling processes	• Reuse of treated effluent • Reuse water from auxiliary processes • Recycle cooling water • Closed loop design

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Industry Efficiency – Examples

- In the industrial sector, action to encourage better control of water demand may focus on **improving the management and control of systems, improving process control, modifying equipment, changing technologies, and on-site water recycling and reuse**. The need to **raise staff awareness** should not be overlooked. Such action must be targeted according to the water management diagnostic at the industrial site.
- **Defining and prioritising WDM measures can be supported by using environmental management tools and toolkits** for operational management on a voluntary basis, such as company environmental plans or Environmental Management Systems such as the standard ISO 14001 and the EU environmental management and auditing system.

Industrial sector	Examples of technologies which facilitate water saving
Paper mills	Recycling some of the process water (alkaline) from the bleaching unit; Collection and recycling of clean cooling water; Operating certain cooling circuits as closed circuits; Recycling water in the ground wood pulping unit; Partial recycling of water after biological processing, etc.
Steelworks	Recycling as much process and cooling water as possible; Operating a closed circuit for wash water.
Agri-foods and dairy industry	Use of analytical measurement and control methods to limit water wastage; Use flow-rate limiters for cleaning operations; Limiting contact between water and food/dairy matter.

Examples of technologies and water saving in the industrial sector in France
Source: GWP (2012), Faby et al. in UNEP/MAP/Plan Bleu (2007)

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Industry Efficiency – Case Cape Town

Proposed policies to facilitate the objectives to the right:

- Industrial users who require a licence to use water (that is, users who draw their water direct from a water resource) will be required, by February 2006, to develop and submit to the responsible authority a WMP in accordance with guidelines that will be developed and made available by the Department in due course;
- For those users who must submit a WMP as part of their Environmental Management Plan (EMP), the Department may choose to exercise its right to waive this requirement if the provisions of the EMP in this regard are satisfactory
- Large industrial or commercial users who draw their water from a municipal supply system and do not have to obtain a water use licence from any water management institution will not have to submit a WMP unless required to do so by the relevant water service authority or water services provider

Output	Description of output
1	Carry out ongoing water audit and water balance
2	Benchmark water use for various processes and industries as far as possible and practical
3	Performance monitoring against benchmarks
4	Implement water conservation program
5	Marketing and publicizing water conservation

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Industry Efficiency – Case Tourism

Action	Tools and resources deployed	Validation
Set consumption control targets and follow them up		
Fit flow regulators to taps and showers	Fit new equipment, more economical with water	Taps/showers fitted with 6 and 12 l/min regulators
Install lean-flush toilets		Cistern volumes < 7 l
Phase out refrigeration systems which discharge water		Replace all refrigeration systems which discharge water
Develop lean-wash laundries	Improve practices (laundry sorting, cycle selection, run fully loaded, etc.)	Water consumption reduced to less than 6 l/kg of laundry
Wash towels and sheets less	Communicate with clients, train chambermaids	Good customer communications, effective reuse of sheets and towels
Use rainwater	Collect and treat	System set up for treating and using rainwater
Treat used water		Individual processing units set up; checked for working order. Individual processing units set up; checked for working order. If municipal systems are used: obtain documentary evidence from local authority of processing of used water. System set up for recycling grey-water for use in toilets and gardens
Recycle grey-water		Taps/showers fitted with 6 and 12 l/min regulators

Accor Hotels Environment Charter: action on water management
Source: GWP (2012), Faby et al. in UNEP/MAP/Plan Bleu (2007)

Timescale	Short term (2010)	Medium term (2015)	Long term (after 2015)
Water-saving solutions	Water system audit Training and awareness Water consumption monitoring Installation of water-saving equipment Leak detection Water system upgrading Subcontracting of laundry Swimming pool water recycling Trickle watering, etc.	Computer-aided maintenance management Subcontracting of vegetable washing Grey-water recovery and recycling Continued awareness-raising Creation of a water saving label Reinforcement of legal framework System for controlling water consumption, etc.	Use of unconventional resources (desalination, reuse of treated wastewater)
Expected results of water saving	346 l/bed-night (–39% on 2005)	201 l/bed-night (buying from SONEDE) (–25% on 2010) Actual consumption including recycled: 336 l/bed-night Water saved: 48m3/bed/year	
Cost per m3 water recovered		TND 0.736 to TND 5.353	

WDM measures proposed for the tourism sector Tunisia (2005 study)
Source: GWP (2012), Lahache Gafrej in UNEP/MAP/Plan Bleu (2007)

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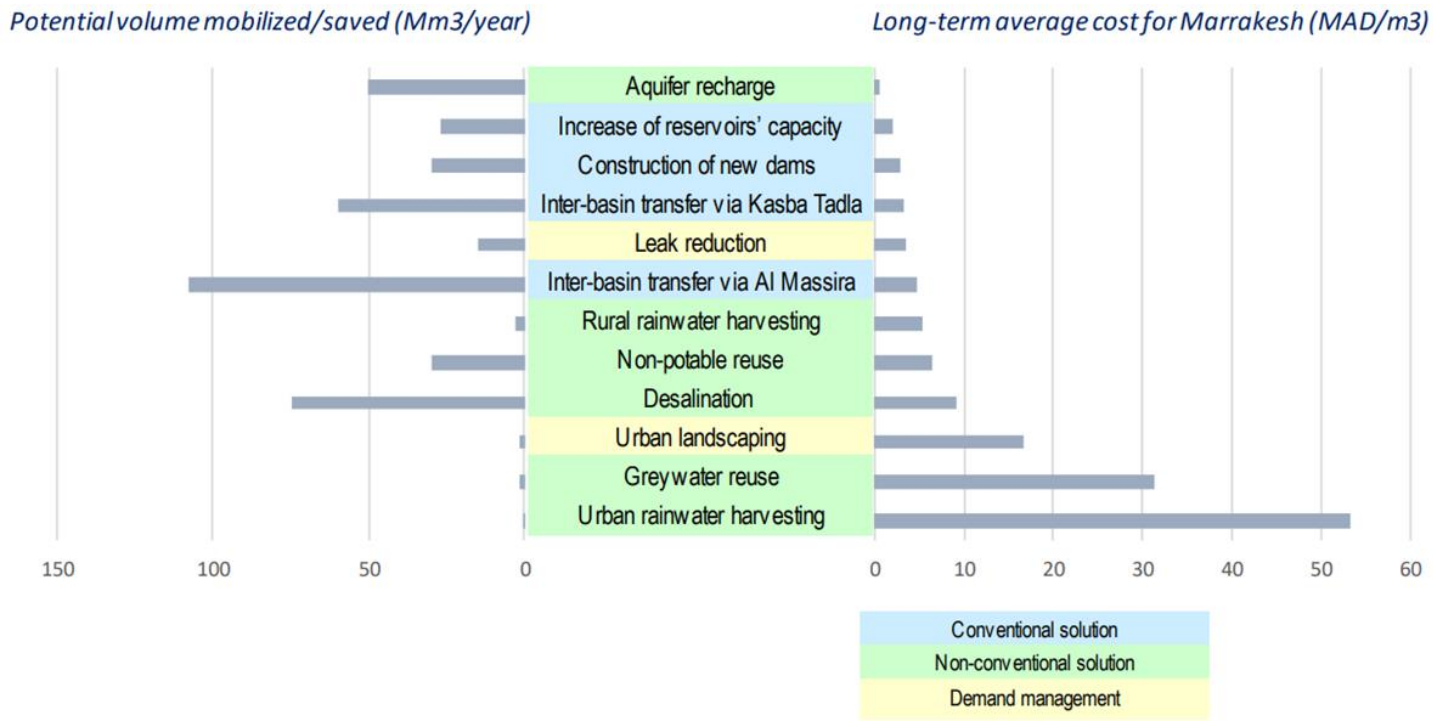
Rainwater Tanks

- Many water conservation programmes include the distribution of rainwater tanks (rain barrels)
  - What are the site specific cost of savings per unit volume?



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Rainwater Tanks – Examples

- Different sizes and systems
- Reuse of stored rainwater
  - Toilet flushing
  - Washing
  - Car washing
  - Irrigation

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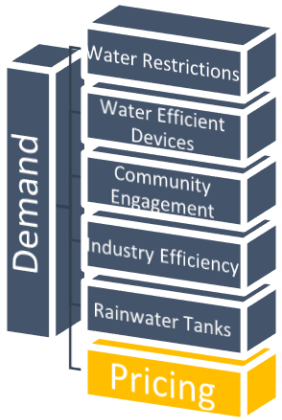
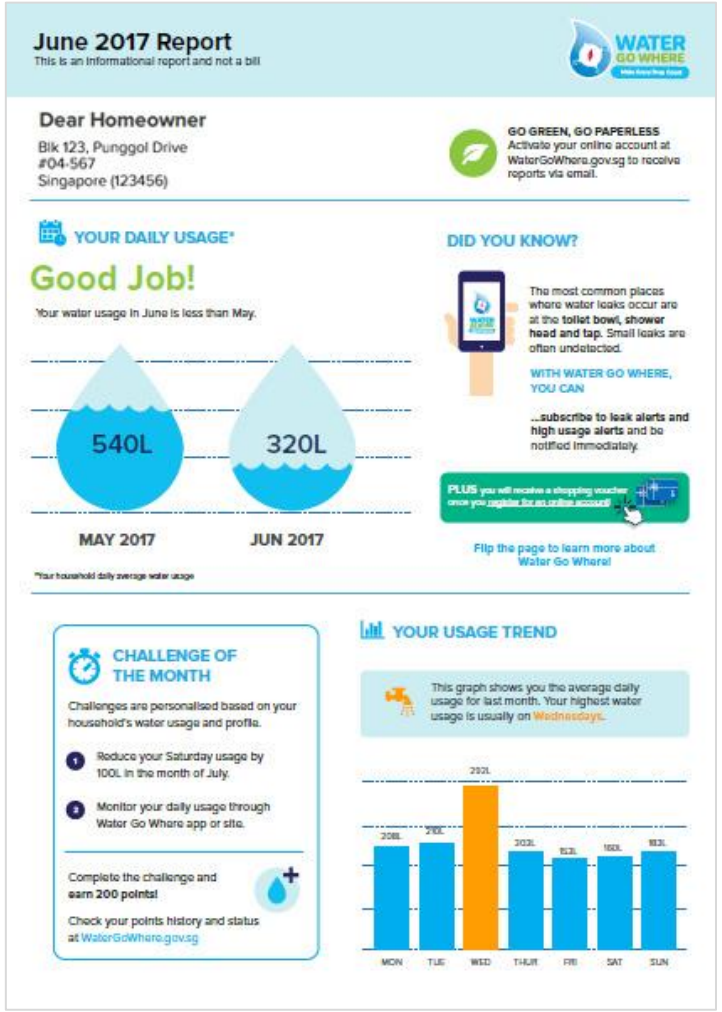
Pricing / Economic Tools



- Tariffs
- Rate structure with i.e., block rates, seasonal rates, water budget-based rates, and/or drought surcharges
- Monthly utility bills with information as outreach tool for educating customers



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Drinking water pricing in Morocco – Example

Water and Environment Support
in the ENI Southern Neighbourhood region

- Progressive charge for domestic water
- Price bands based on volume

  → **Led to stabilizing demand**
- Industrial tariff moved from preferential rate to increased tariff to incentivize recycling and introduction of new technologies
- Overall, more than **15 increases** between 1980-2000. Larger increase in the upper bands
  - In 1995 the ration between the highest band and the social price band reach 3
- 2006: New pricing structure
- Lowered the upper limit of the first price band from 8 to 6 m3
- Increase of the annual standing charge
- Price rise for certain public corporations and concession holders
- Gradual **reclassification of hotels** – classed **as industrial users** – granted the benefit of single volumetric rate instead of price band charging

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Economic tools (1)

- Price structures are being modified to create water saving incentives
- Positive general trend is towards increasing the price of water to the user in order to recover a growing proportion of the real costs of supplying drinking water and sewage services
- Increasingly, environmental factors are being priced in (the scarcity of the resource, purification)
- Some countries are introducing pollution or resource fees.
  - Provide funding for decontamination measures or to develop new resources

→ In Spain, a seasonal rate is charged. This is an additional factor which can encourage water saving at the time of year when it is most needed.

Caution when using economic tools –

- Take account of other national interests or policies
- Be compatible with user incomes
- Costs must not exceed benefits, especially in terms of water saving
- Not a single, bespoke solution

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Economic tools (2)

- Pricing does not have significant effects as industrial water demand seems to be inflexible. Thus the only constraint on tariff adjustment is the issue of industrial competitiveness. This question arises especially for industries which use a lot of water.
- As for use in tourism, estimates indicate that drinking water demand is very inflexible in response to price, but there is also quite a large degree of flexibility in income.

Sector	Domestic						Industrial	Tourism
Water use band (m3/quarter)	0–20	21–40	41–70	71–150	151+	Total	Not significant	-0,22
Price flexibility	–0.4	–0.006	–0.38	–0.15	–1.47	–0.54		

Flexibility of pricing varies according to the domestic water consumption band in Tunisia
Source: GWP (2012), Hamdane in UNEP/MAP/Plan Bleu (2007)

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Economic tools (3)

- Often seen as the tools of choice for integrated water management
- Relatively little use is made of economic tools in the Mediterranean
- Water pricing should play a significant role in the recovery of costs
- Other tools, are much less widespread, or are used jointly with pricing
- In some countries the pricing system includes incentives. These seek balanced management of the resource

Type of tool	Examples of countries concerned	Degree of incentive to save water
Pricing	Nearly all Mediterranean countries	Tool prioritises recovery of water utility costs, but may lend an incentive to water saving. Incentive varies according to tariff structure and price level (see Table 5).
Quotas	Cyprus, France, Israel	Set a consumption limit which cannot be exceeded, without encouraging water saving within the quota limit, unless some special arrangement exists.
Financial aid (subsidies, loans on easy terms)	Cyprus, Spain, France, Israel, Morocco, Syria, Tunisia	Incentives to save water and prevent wastage, through aid in acquiring modern irrigation systems, which save more water, and planting drought-tolerant crops, etc.

Economic tools and water saving incentives for irrigation
Source: GWP (2012), Thivet in CIHEAM-Plan Bleu (2009)

Economic incentives	
• Water pricing and rate-making policies • Tradable water rights • Regional water markets and water banks • Subsidies and rebates to water users	• Cross-subsidization of agricultural conservation • Tax credits and incentives • Penalties for excessive use (quotas) • Privatization of water supply sector

Source: Dziegielewski and Baumann (1992), Dziegielewski et al (1993)

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Questions & Answers

Water and Environment Support
in the ENI Southern Neighbourhood region

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Short break and accessing the breakout rooms

Presenter and facilitator Group 1&2: Arthur Streller

Presenter and facilitator Group 3: Andreea Florea

Presenter and facilitator Group 4: Fantine Hureau

Presenter and facilitator Group 5: Cor Merks

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Water and Environment Support
in the ENI Southern Neighbourhood region

Breakout room presentation and facilitated discussion

Systematic look at the Cost-Benefit Analysis for the Water Efficiency Labelling Scheme (WELS) in Australia

LDK CONSULTANTS
LDK Consultants Global EEIG

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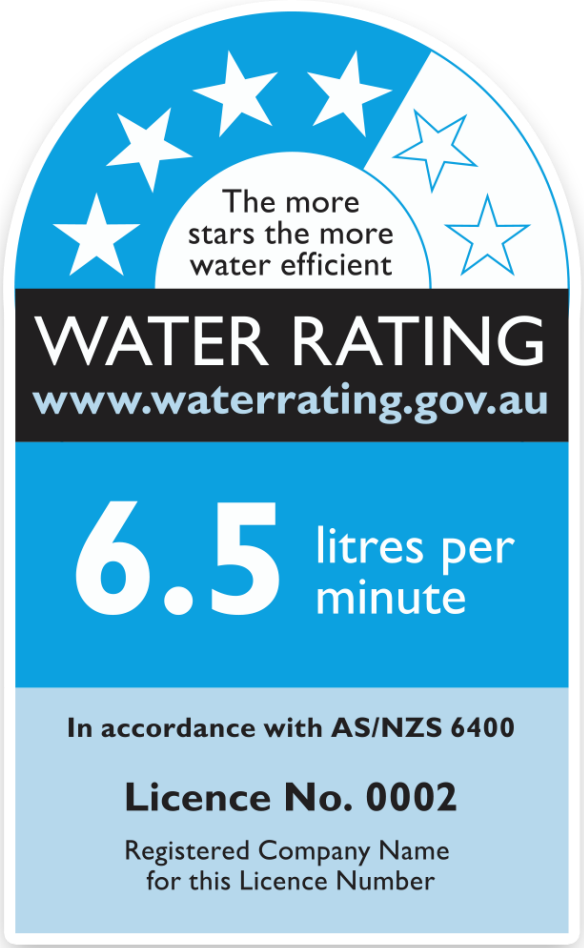
Water Efficient Labelling Scheme (WELS)



Australian scheme that provides compulsory testing and labelling scheme for:

- Washing Machines
- Dishwashers
- Showerheads
- Toilets
- Taps
- Urinals

In these slides we will step through a simplified model to explain how to evaluate the costs/benefits.

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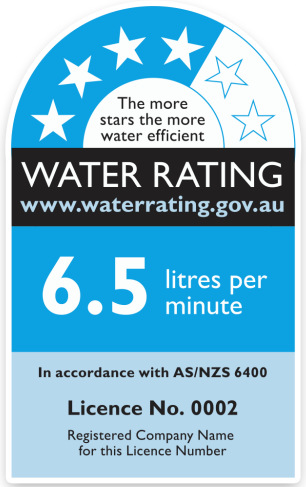
Water Efficiency Criteria

Water and Environment Support
in the ENI Southern Neighbourhood region



WELS requires all water using products covered by the scheme that are imported or manufactured in Australia since 1 July 2006 to be registered and labelled when they are supplied or offered for supply, for example through advertising. The scheme is administered by a dedicated team in the National Government.

Following table illustrates some of the rating criteria.

Product	Unit	0 Star	1 Star	2 Stars	3 Stars	4 Stars	5 Stars	6 Stars
Taps	L/min	>16	>12-16	>9-12	>7.5-9	>6-7.5	>4.5-6	>1.1-4.5
Toilets	L/flush	N/A	≤5.5	≤4.5	≤4.0	≤3.5	≤3.0	≤2.5
Showers	L/min	>16	>12-16	>9-12	>7.5-9	>6-7.5	>4.5-6	
Dishwasher	Star rating = 1 + $\log_e$ (Water Consumption / (2.5 + # of Place Settings x 1.6) / $\log_e$ (0.825)							
Washing Machine	Star rating = 1 + $\log_e$ (Water Consumption / (30 x Capacity of washer in kg) / $\log_e$ (0.7)							

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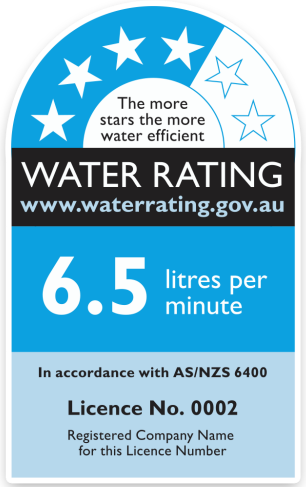
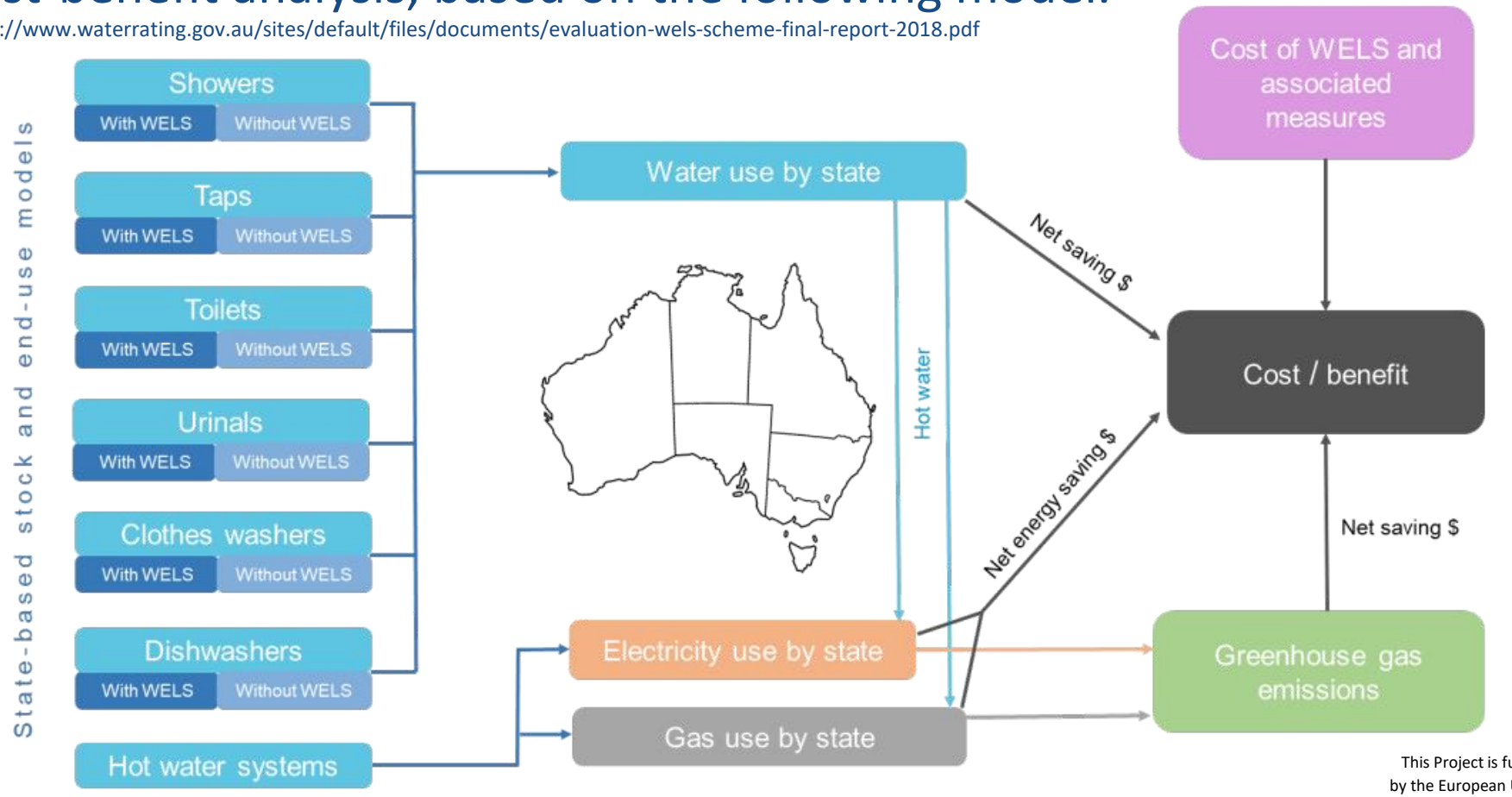
Cost-Benefit Analysis Model

Water and Environment Support
in the ENI Southern Neighbourhood region



The scheme is rigorously reviewed on regular basis. This includes a detailed cost-benefit analysis, based on the following model.

https://www.waterrating.gov.au/sites/default/files/documents/evaluation-wels-scheme-final-report-2018.pdf



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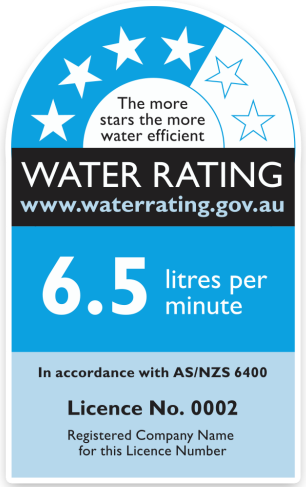
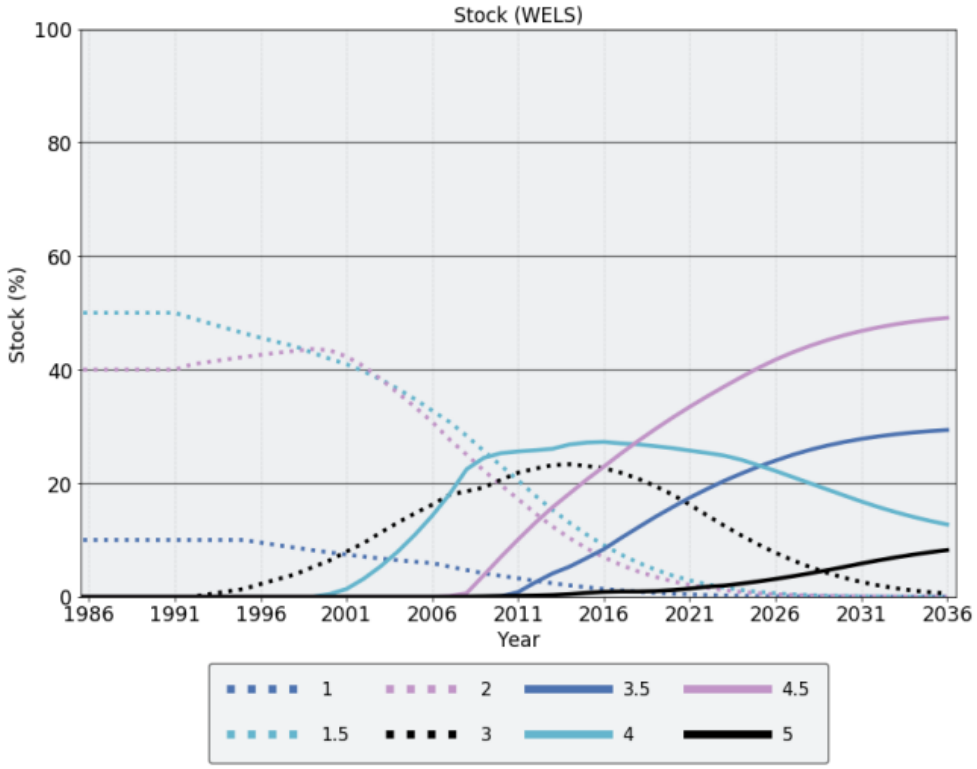
Stock – What is in use?



Requires detailed surveys with citizens, plumbers, suppliers to determine sales, longevity, and market dynamics to estimate the stock of each product category over time. The modelling also needs to estimate what would have happened if the WELS scheme had not been in place.

This dynamics can be influenced by other factors, for example by government schemes to encourage people to replace older less-efficient showerheads.

For example, the graph shows the modelled change in stock in different star rating clothes washers.



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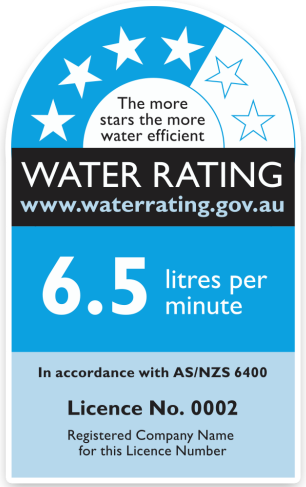
Usage – How much is it used?



Requires detailed residential water use studies, considering demographics and other variables. Modern studies can use smart water meters and other digital tools to get high level of insight into real water usage.

Table below shows values used for one region in 2017.

Product	Frequency	Duration
Taps	6.8 / person / day	22.55 seconds
Toilets	3.92 flush / person / day	
Showers	0.845 / person / day	6.31 minutes
Dishwasher	3.62 / house / week 2.89 / unit / week	
Washing Machine	4.44 / house / week 3.46 / unit / week	

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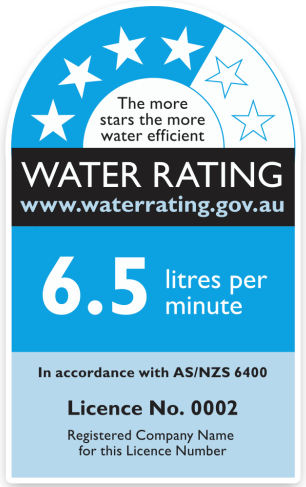
How much water is saved per person?



The average per capita impact of WELS can be graphed, where the savings as a result of WELS are broken down by fixture/appliance. The analysis predicts that by 2036, WELS will be saving 19.5 litres per person per day across Australia.

Note average water consumption was already reducing.

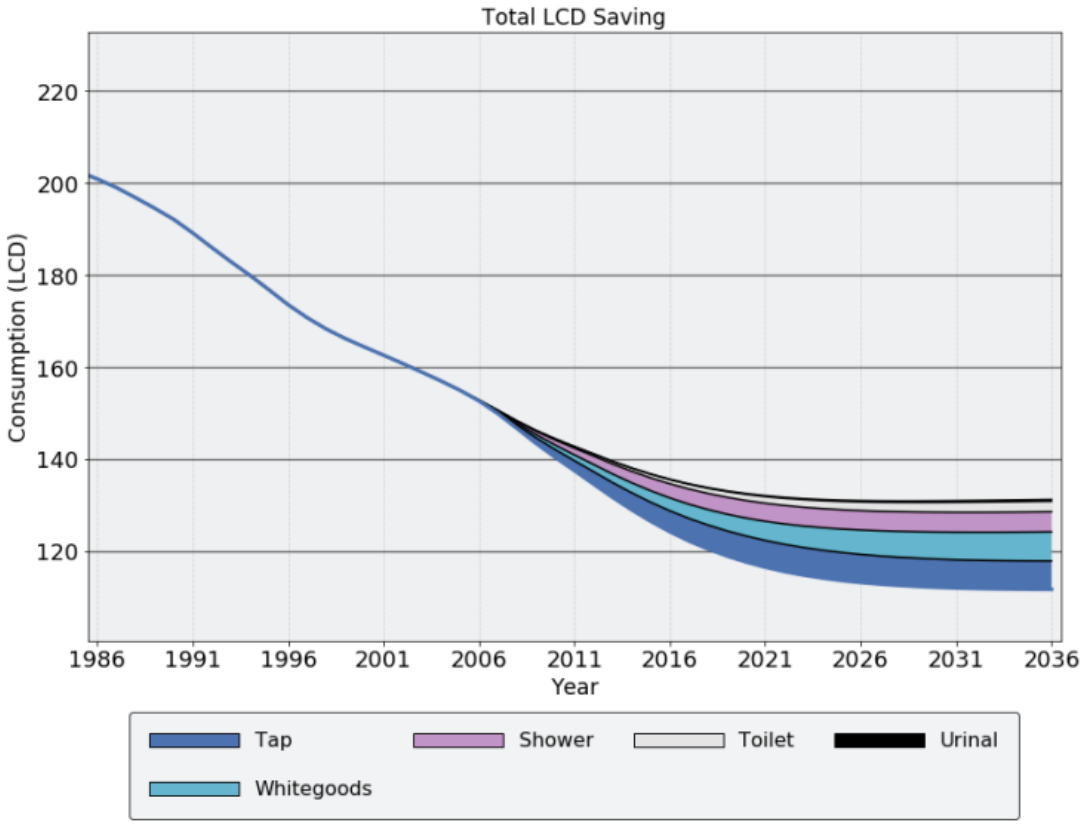


Figure 31 Total per capita water use for WELS rated fixtures and appliances

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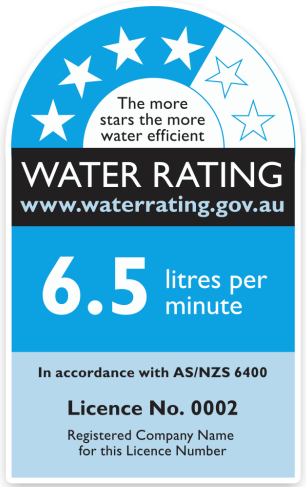
How much water is saved nationally?



This analysis can then be used to estimate total water savings across Australia (population 22 million).

At time of analysis, the scheme was estimated to be saving 112 million m^3/year. By 2026 this is anticipated to rise to 185 Mm^3/y.

Savings attributable to taps are initially the highest component of total savings but as time passes, the savings arising from whitegoods take over.

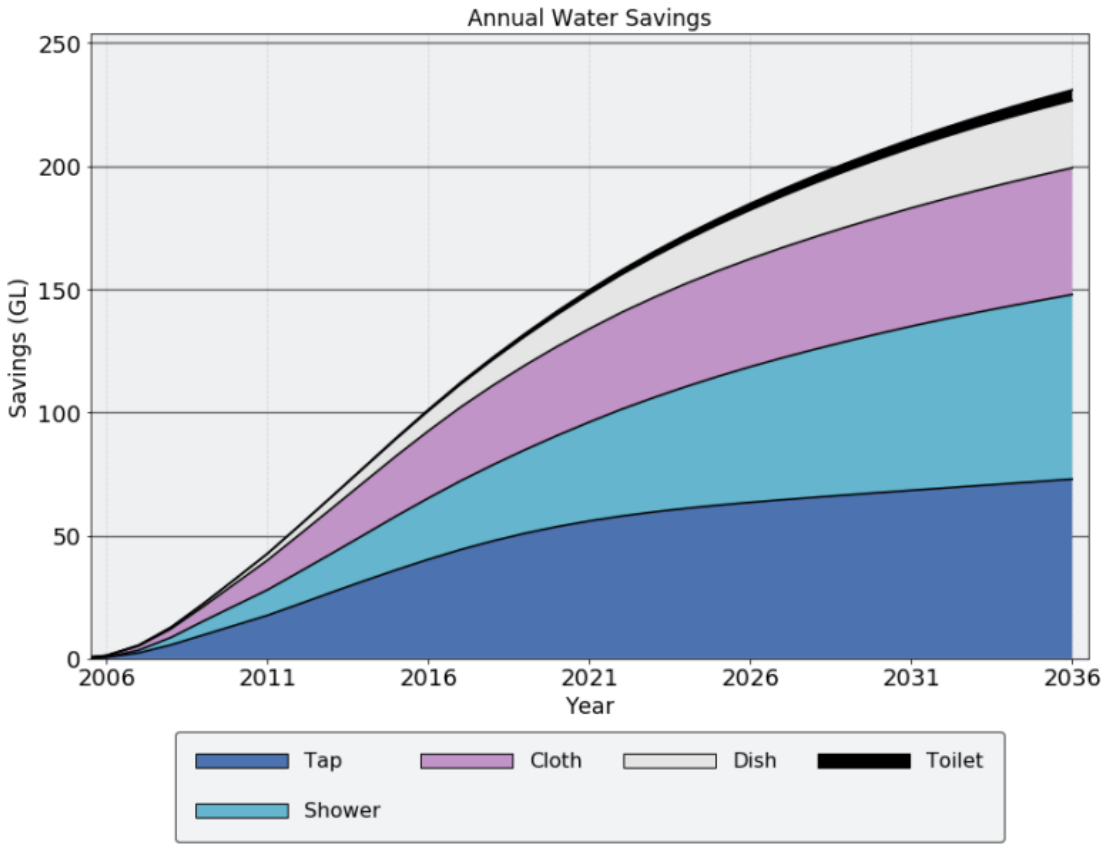


Figure 32 Yearly water savings due to WELS, all Australia

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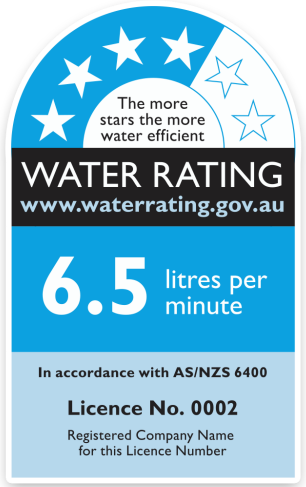
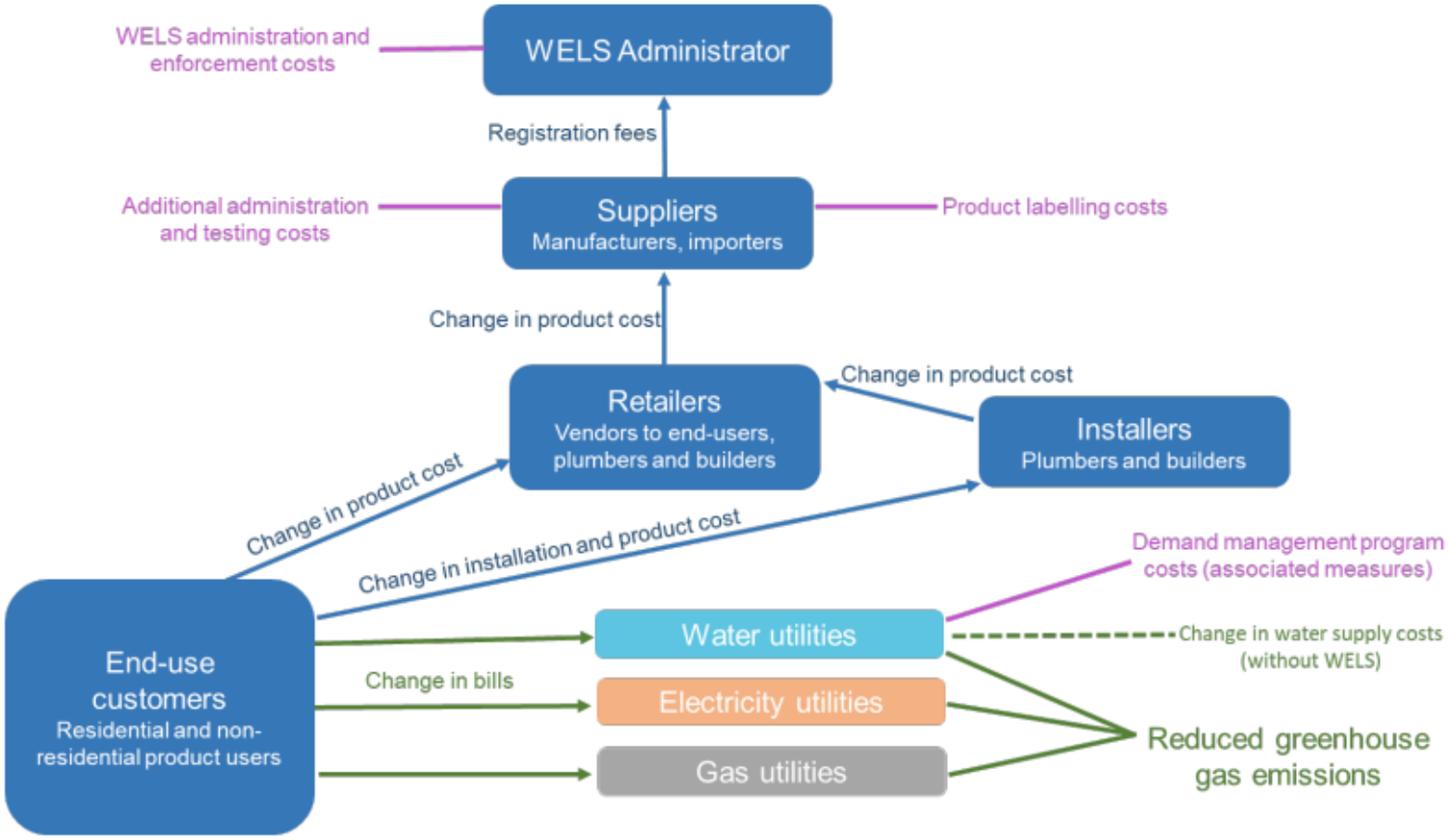
What are the costs of the scheme?



Scheme costs (and benefits) are evaluated. It is non-trivial to evaluate these costs and needs careful economic analysis.



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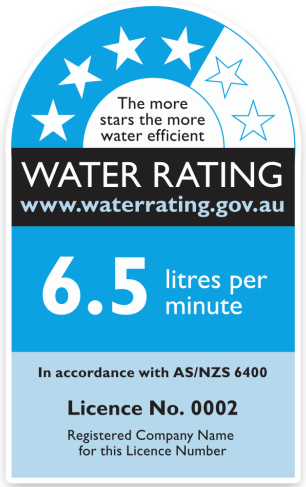
What is the cost/benefit outcome?



The scheme reviewer calculated a benefit / cost ratio of 29, which is highly favourable. The table on the right shows the net present value, based on 7% discount rate and 30 year window from 2006-2036.

The energy savings are also particularly important... **Savings in hot water consumption also bring savings in energy costs** and reduced greenhouse gas emissions.

This case study is region-specific, and of course is sensitive to discount rate, duration, and other variables.

But the **methodology is transferrable**, and makes a strong case for mandatory labelling to reduce water demands. There are other similar national schemes globally, but as at 2017, only schemes in Singapore, New Zealand and UAE were mandatory.

	Total $17-18 ($M)
Costs	
Scheme cost	$57
Supplier costs per reg.	$307
Labelling cost	$12
Program Costs	$463
Total Costs	$838
Benefits	
Water Savings	$6,545
Electricity Savings	$9,437
Gas Savings	$7,016
GHG Savings	$1,266
Total Benefits	**$24,264**
Net Benefit	**$23,426**
B/C ratio	**29**

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Facilitated discussion

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Water and Environment Support
in the ENI Southern Neighbourhood region

Feedback in the plenary session

Facilitator: Arthur Streller

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Breakout room session summary

Water and Environment Support
in the ENI Southern Neighbourhood region

- What are the main findings from the discussion?

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Case study “WDM interventions implemented at Thames Water (UK)”

Andrew Tucker, Water Demand Reduction Manager, Thames Water Ltd.

LDK Consultants Global EEIG

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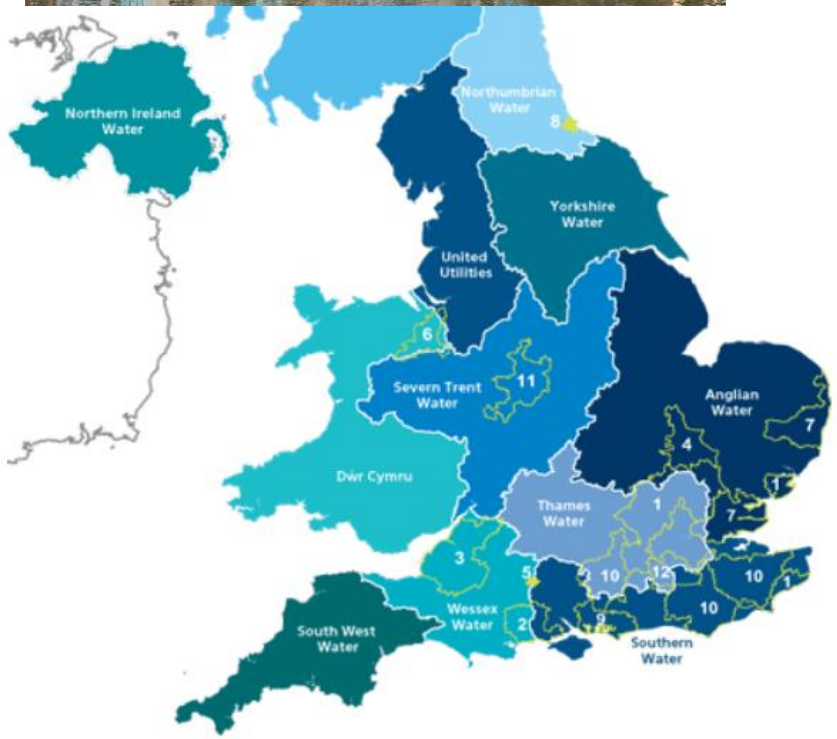
Water Demand Management interventions implemented at Thames Water (UK)

February 3rd 2022

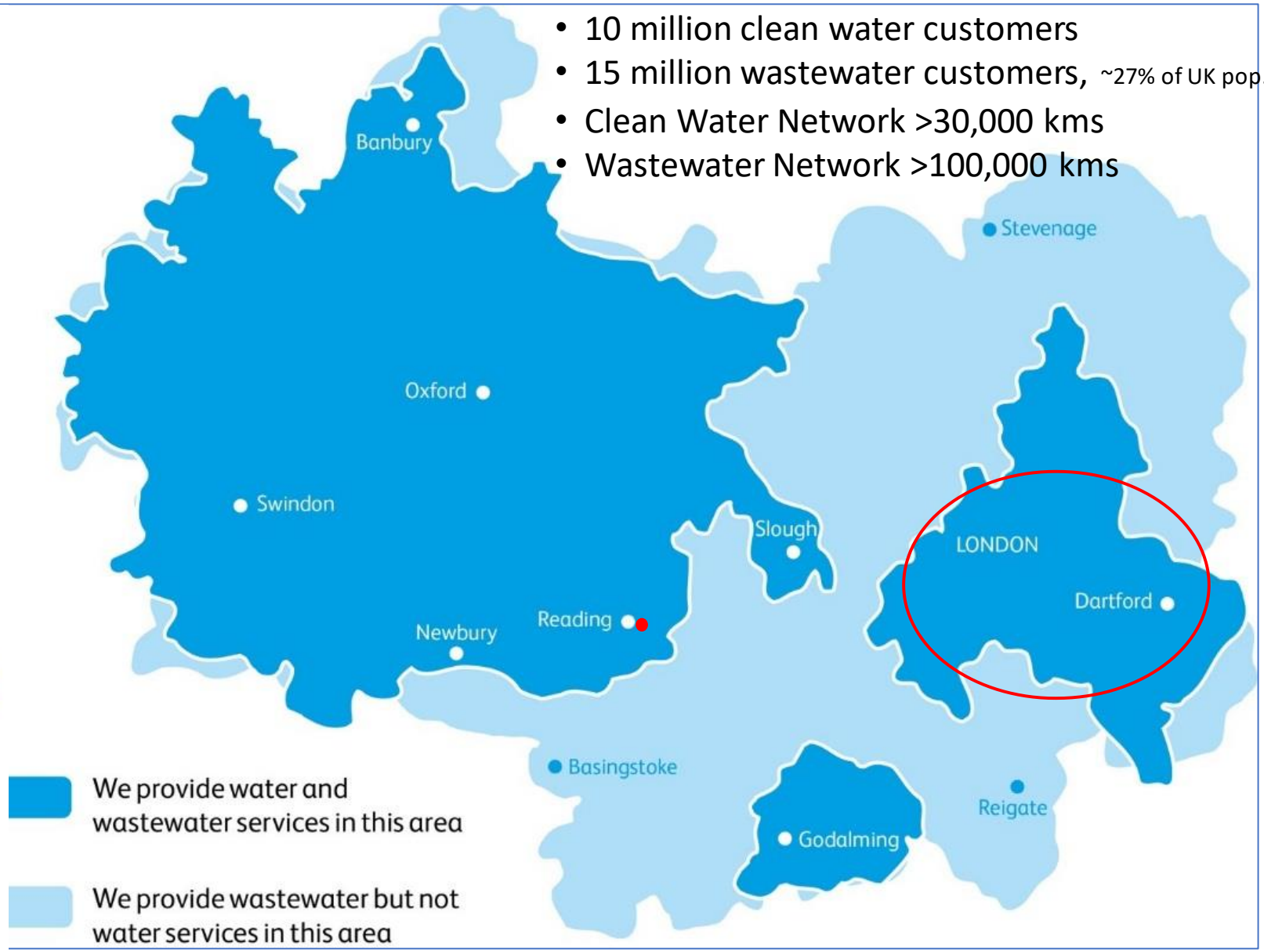
Andrew Tucker

Water Demand Reduction Manager

Thames Water – our supply and service areas



- 10 million clean water customers
- 15 million wastewater customers, ~27% of UK pop.
- Clean Water Network >30,000 kms
- Wastewater Network >100,000 kms

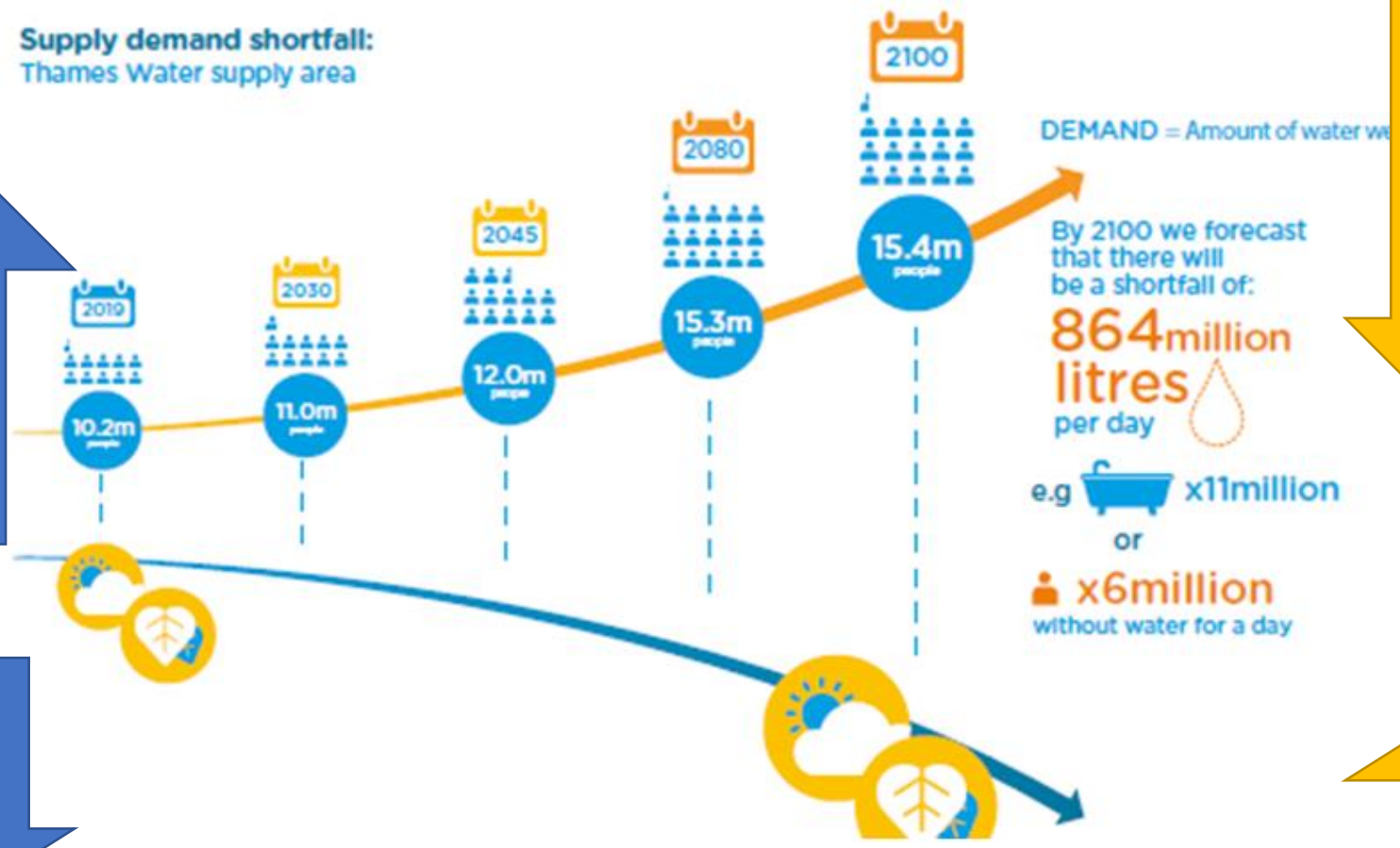


Why save water?

Supply & Demand

Population growth, new homes & businesses

Environmental need, climate change



Metering, reduce leakage, water efficiency, customer engagement

New water resources

Let’s set the scene ….water resources and water efficiency are tough topics

What are we doing on managing water demand?

Smart Meter Rollout - London

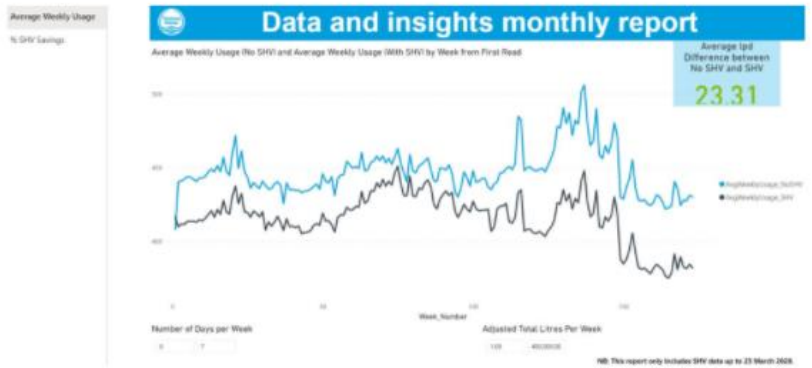
- Sample set of **>560k smart metered homes in London** (54% terraced, 20% semi-detached, 20% flats, 6% detached)
- **'Continuous Flow'** = flow >1 litre/hr measured for at least 14 days in the row (genuine usage, customer-side leakage and/or internal wastage)

PowerBI – Turning data into Insight into Action

Actual Savings Prototype 12 Months

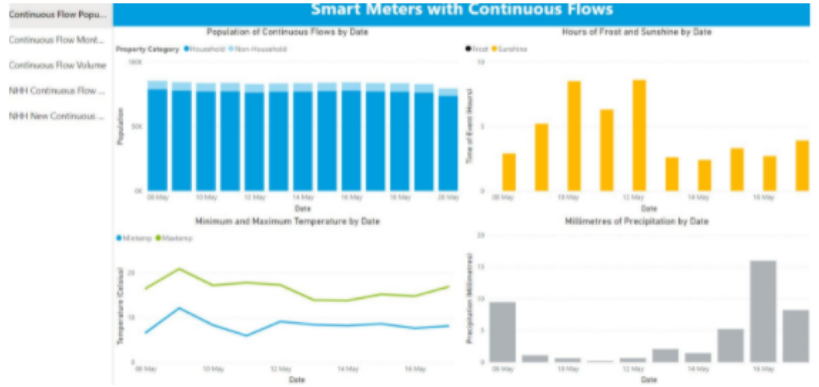
Actual Savings Prototype 12 Months- Ad hoc updated report comparing PCC baseline from as of July 2020 against 12 month date of

Average Weekly Usage



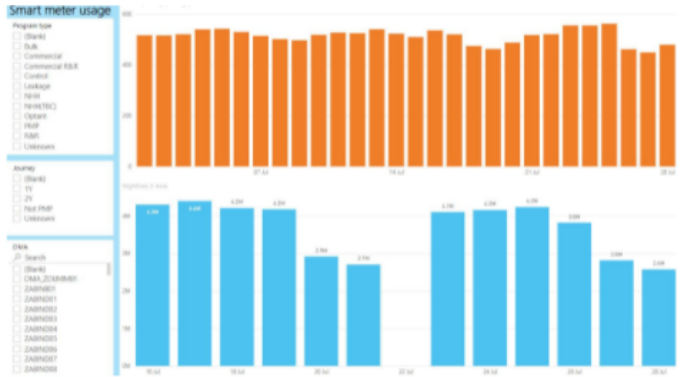
Average Weekly Usage- Ad hoc updated report comparing the weekly average usage between those smart meters' usage without an SHV and those smart meters' usage with an SHV. Percentage and volumetric lpd

Cold Weather Impacts Continuous Flow



Cold Weather Impacts Continuous Flow- Daily continuous flow report showing all meters with a continuous flow (usage greater than 0) by date. This report splits the meters into household and non-household property

Smart Meter Usage and Nightline



Smart Meter Usage and Nightline -Average total usage and total nightline of all smart meters across all programme types for July 2019

Smart Continuous Flow & Customer Side Leakage

Smart Continuous Flow & Customer Side Leakage - Providing data from TWM and MDMS giving more insight into continuous flows per prop and jobs raised in TWM -

WEFF AMP 6

WEFF AMP 6 - Rolls up to monthly report

Smart Metering – headline findings

Industry leading insight must be used to maximise our smart meter investment

Water Savings:

Smart metering reduces household water use by

12-17%

Continuous Flow:

8% of homes have Leaks / Wastage.

Avg continuous flow is **280 l/day**

Non-Household:

26% of water delivered is continuous flow (Leaks/wastage)

Bulk Meters:

30-35% of water delivered to blocks of flats is continuous flow (**Leaks/Wastage**)

Water Efficiency Visits:

Visits on high-usage homes reduces water use by approx. **10%**

Per Capita Consumption:

High-usage homes skew PCC

Avg = **169** l/p/d.

Mode = **115 l/p/d**

High-Usage:

c.**25%** of households use **more than 500 l/day**

New Homes:

Actual usage (**119-179 l/p/d**) exceeds Building Regs levels (110-125 l/p/d)

Covid:

Increased household usage by

4-10%

Affordability:

Water Efficiency can reduce bills and benefit '**water poverty**' and **bad debt**

Water Efficiency Action

Water Efficiency Activities

Smarter Home Visits

25k SHVs

Housing Associations

Greenredeem Incentives

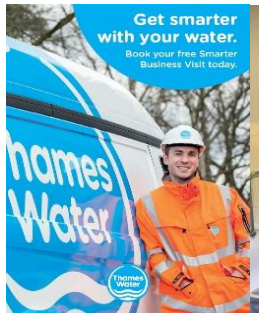
Wastage fixes

3-4k fixes

Communities & Stakeholders (ARK)

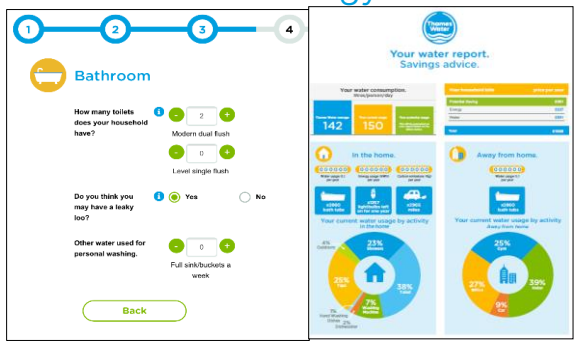
Discretionary Water Users

Smarter Business Visits



3-4k SBVs

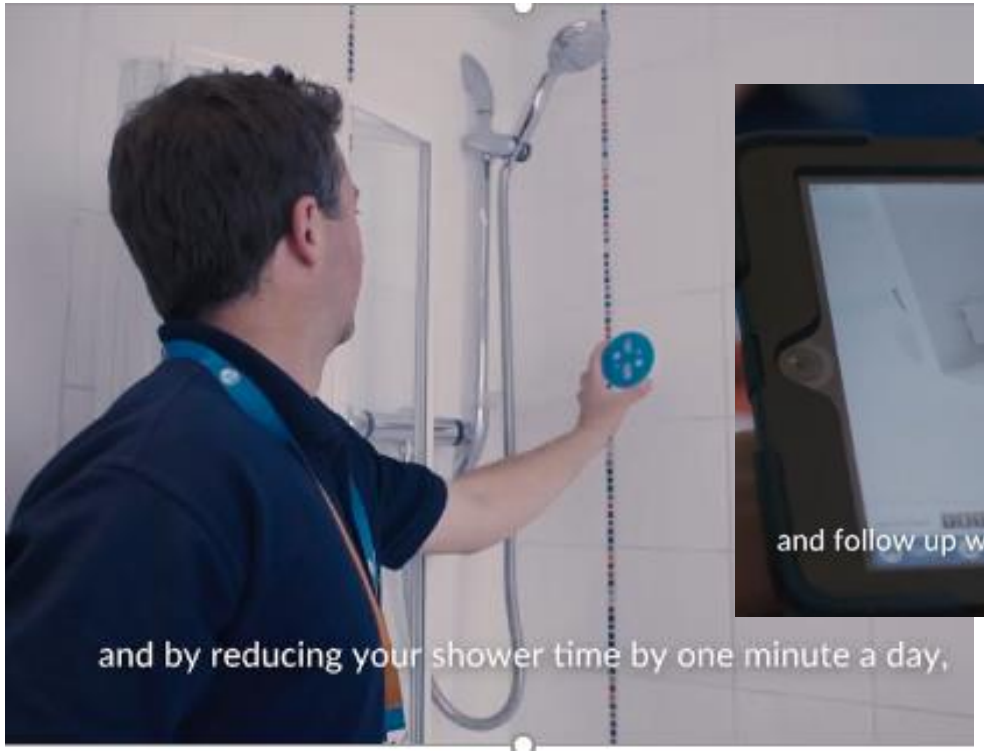
Online Water Energy Calculator

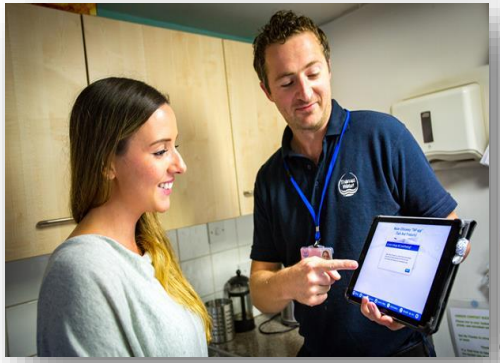


Smart Meter Rollout

Smarter Home Visits

Retrofitting water saving devices and fixing ‘wastage’ leaks

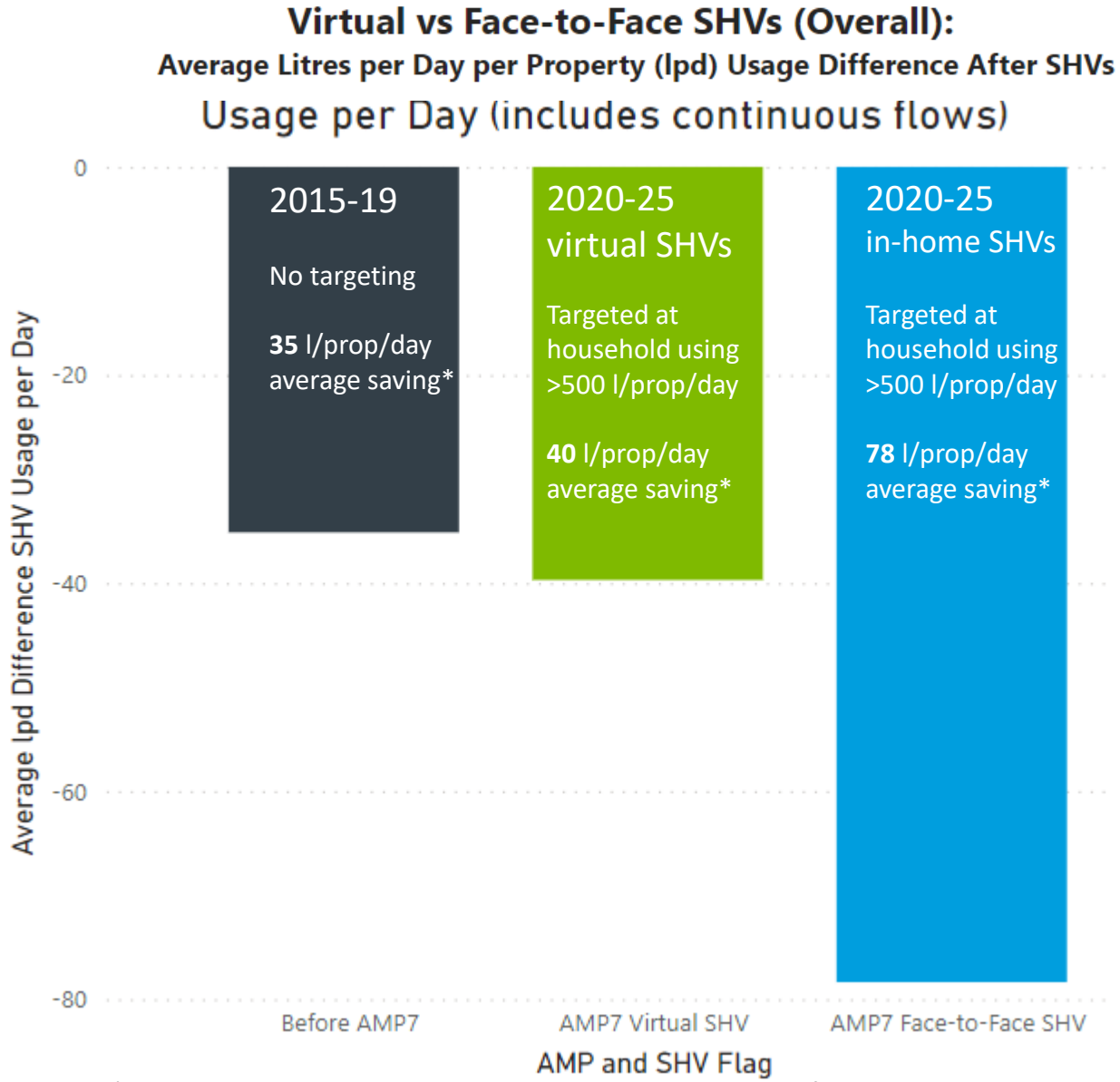




Action - Targeting water efficiency visits

Using smart meter data

- **2015-19** - measured water savings of AMP6 Smarter Home Visits found high water users saved ~3 times the average
- **2020-25** - targeting all Smarter Home Visits at high users
- **2020** - adapted to covid with a virtual visit and covid safe face to face visits when appropriate
- Smart meter data shows water savings per visit have more than doubled by targeting high use households

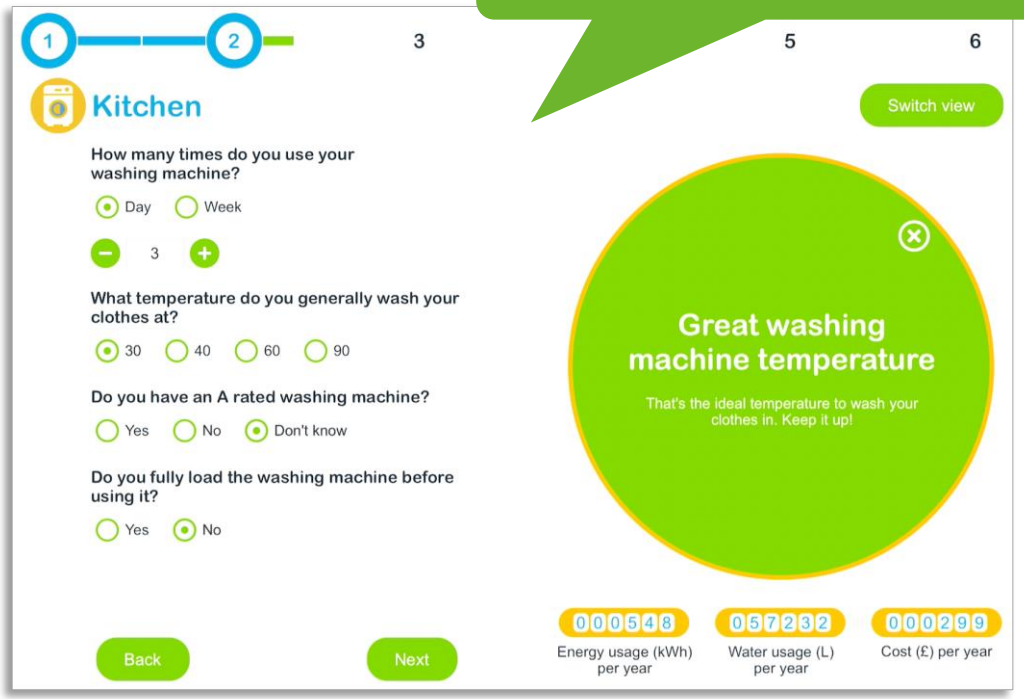


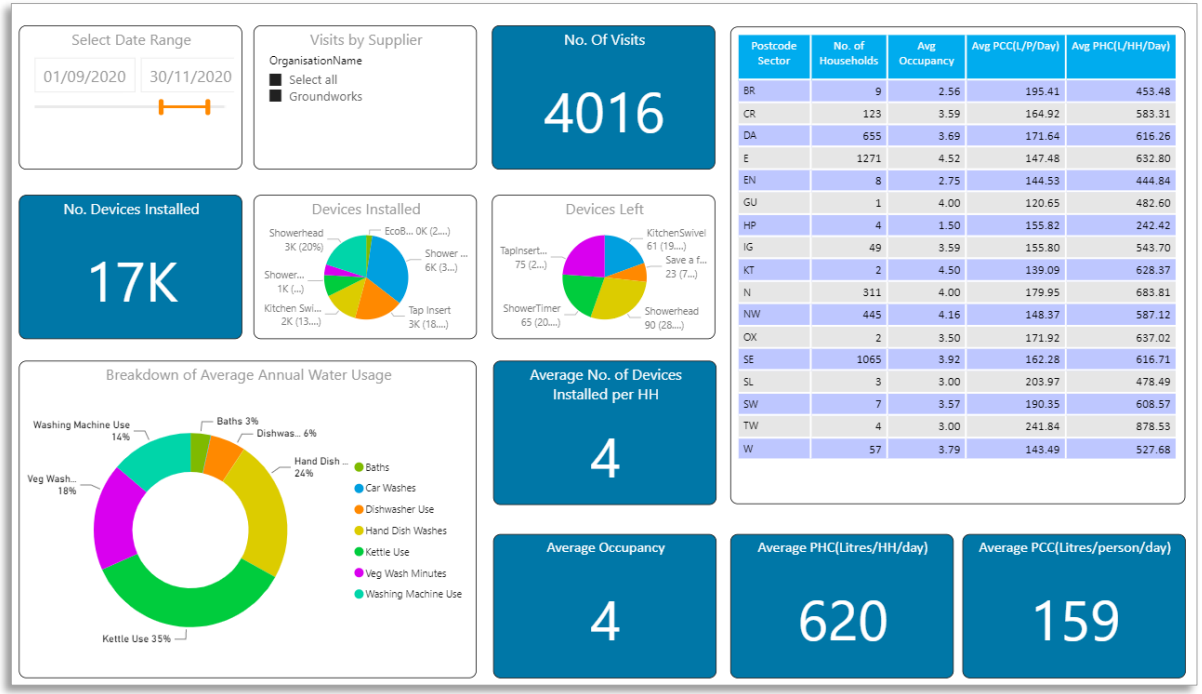
**Savings values as at start-April 2021. Savings may change with future monitoring*

Household water efficiency

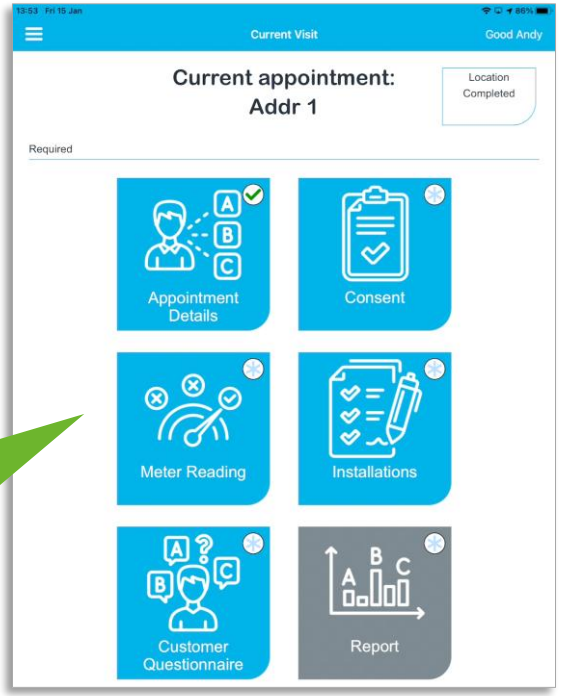
Using data, technology and innovation

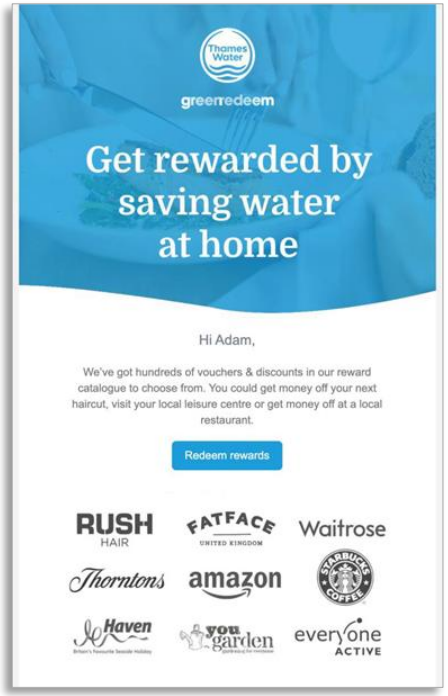
Introduced a new mobile app





Live dashboards





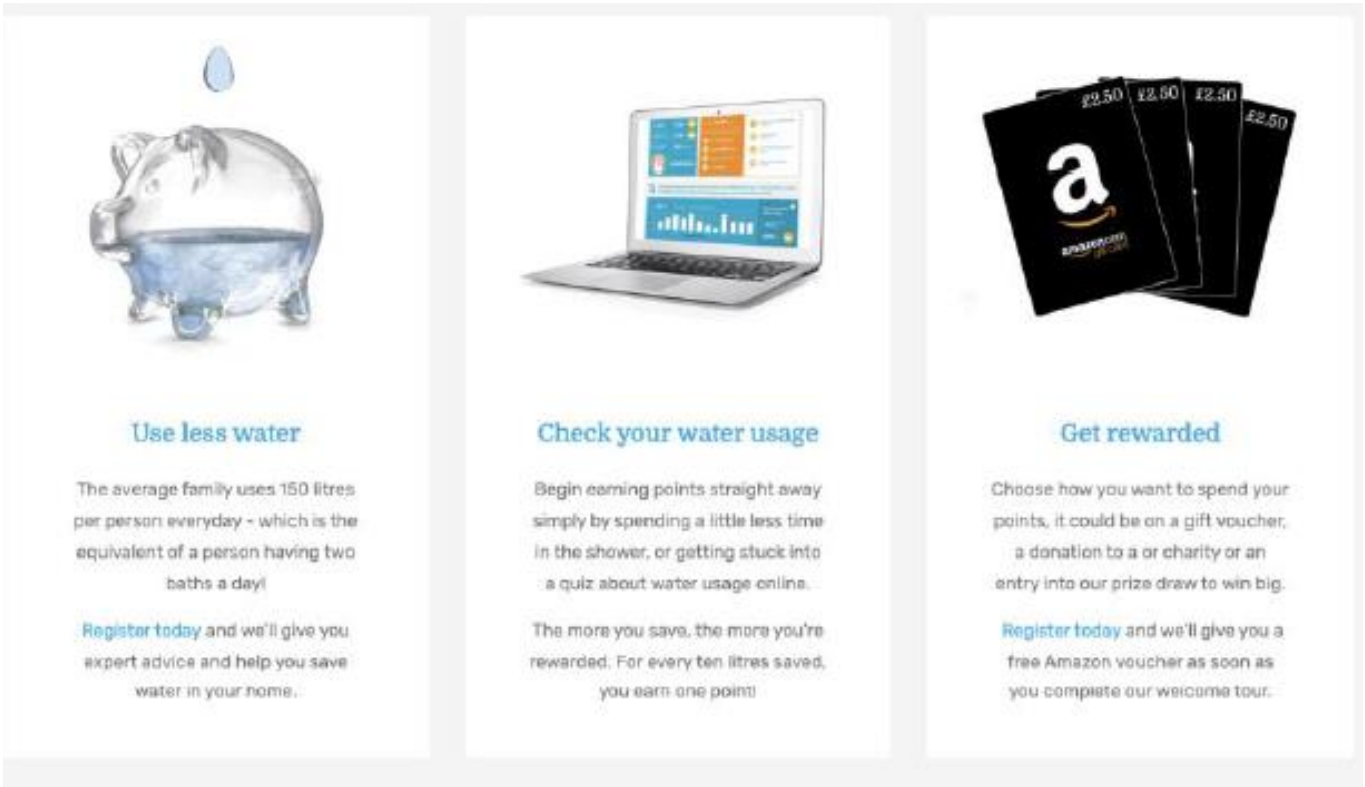
Automated sign up to:

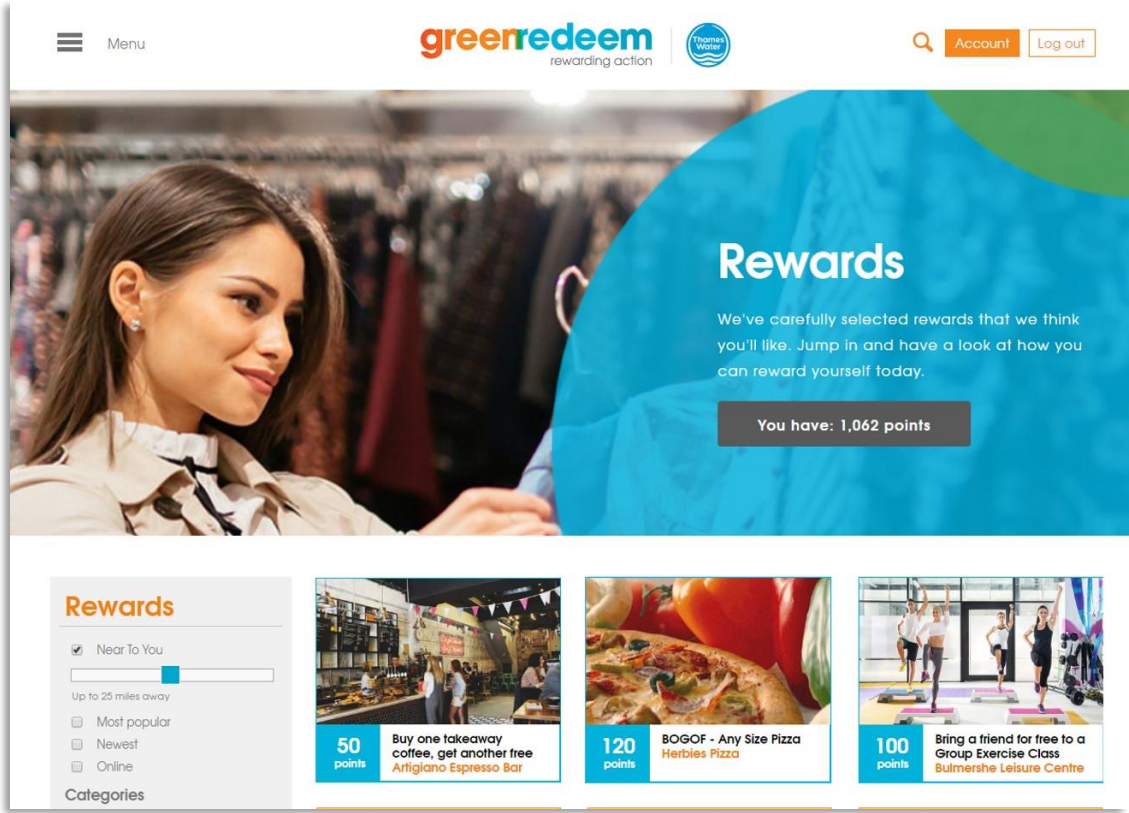
- Priority service register
- Financial assistance referral
- Incentive scheme registration

Smart Data – Gamifying and Incentivising

greenredeem
rewarding action

- Rewarding smart meter customers with points
- Points used on shopping / activity discounts, prizes draws and charity donations
- Proactive regular email updates – water use status, points, offers, quiz, pledge, videos, etc

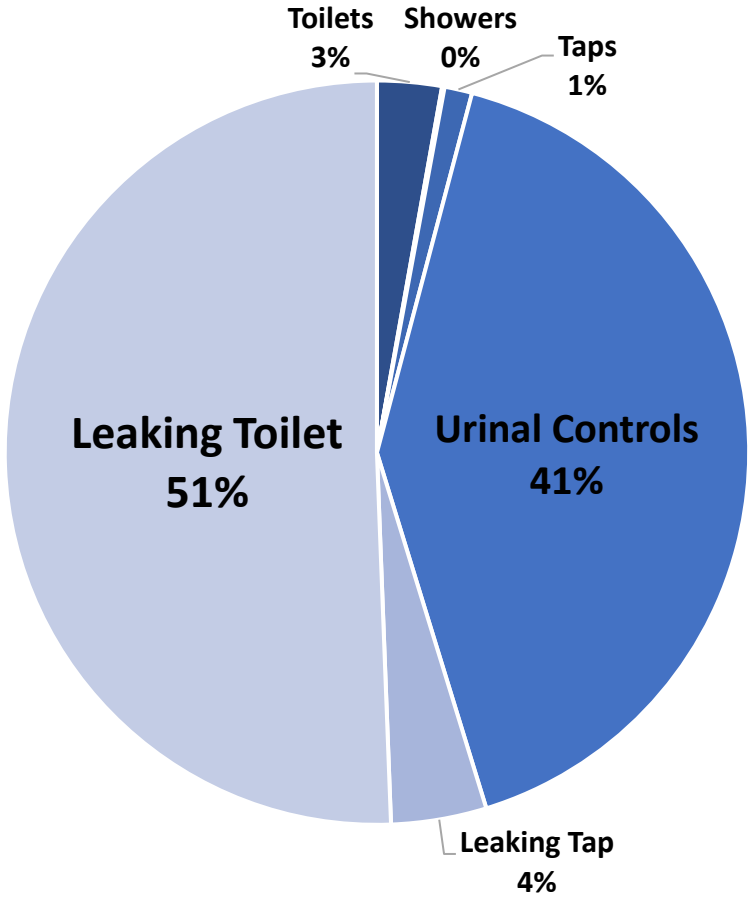




Water Efficiency in Businesses

Smarter Business Visits

What saves the most water in businesses?



Discretionary Water Use

Retailer-Wholesaler Group – Water Efficiency Steering Group

Water Efficiency Sub Group

Group	Representing
Wholesale account mgrs	Wholesalers
Retail account managers	Retailers
UKWRC	Retailers
WaterUK	Wholesalers
Defra	Government
Ofwat	Regulators
EA	Regulators
CCW	Customers
MOSL	Market Operator
MEUC	Customers
RWG Main Group	Wholesalers/ Retailers
NRW	Regulators
Welsh Government	Government

SES Water	Conservaqua
CCW	Wave Utilities
Thames Water	Wessex Water
Waterscan	Three Sixty
Southern Water	Business Stream
MOSL	Yorkshire Water
Switchsupplier.com	Northumbrian Water
Bristol Water	Castle Water
Anglian Water	Everflow Water
South West Water	Severn Trent Water
United Utilities	Dwr Cymru
De-Meter Ltd	Affinity Water
Pennon Water Services	Waterwise

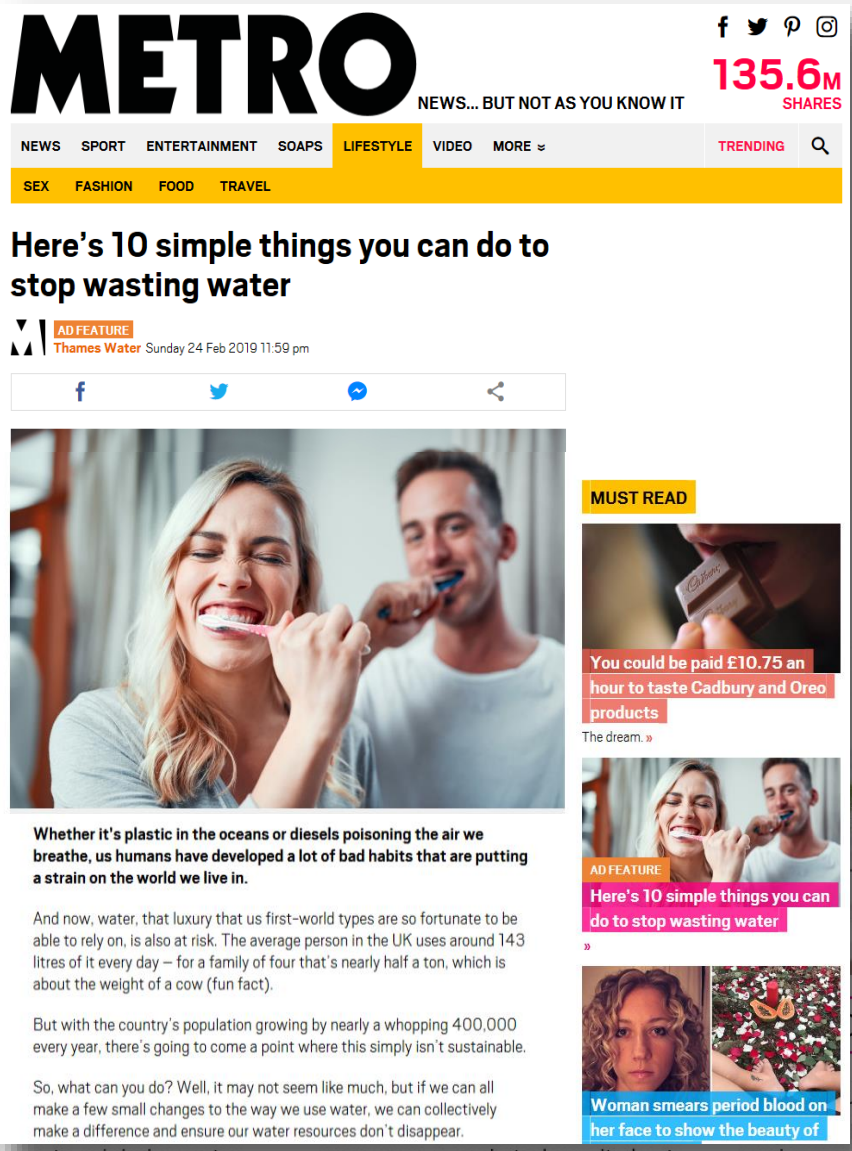
Print / Online articles and Social Influencers

PARENTING

From bath time and brushing your teeth, to playtime and the inevitable cleaning up that follows, parents are responsible for both their own water usage and educating their children about good water efficiency

GARD

Keepin
growing
love a
obvious ways to minimise water usage in both the garden and around the house (e.g. by fixing those dripping taps)

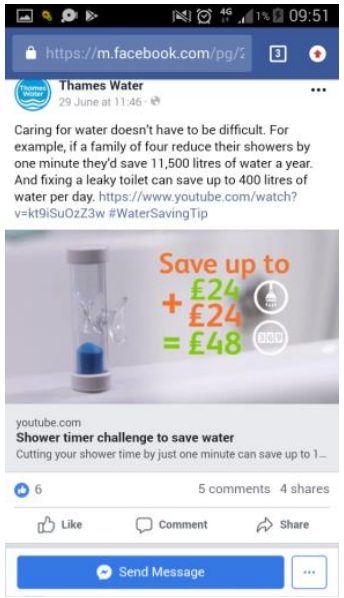


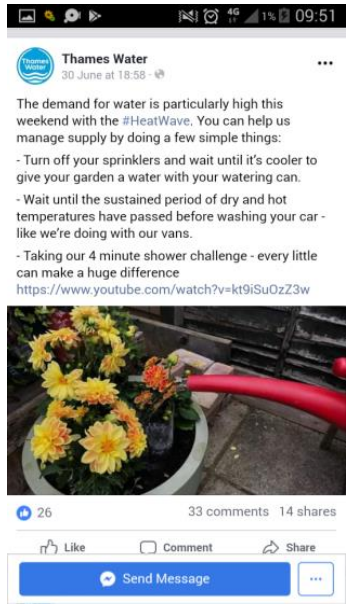
COOKING

a lot of water in the
of food – we clean our
he pasta, and wash up
copious pots and pans. The water we use in the process, can be minimised or reused for other purposes (e.g., watering the herbs)

encourage people to keep it short and sweet. And for those who brave the ice bath, there are ways in which that water can be reused

Social Media



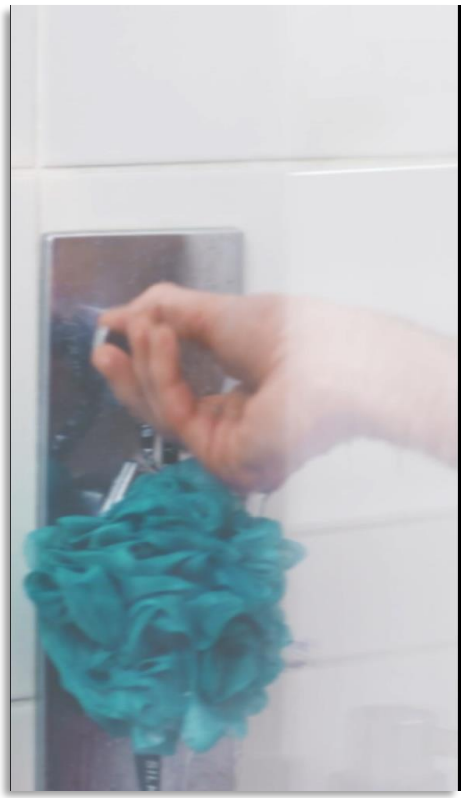


New Water Efficiency Videos!!

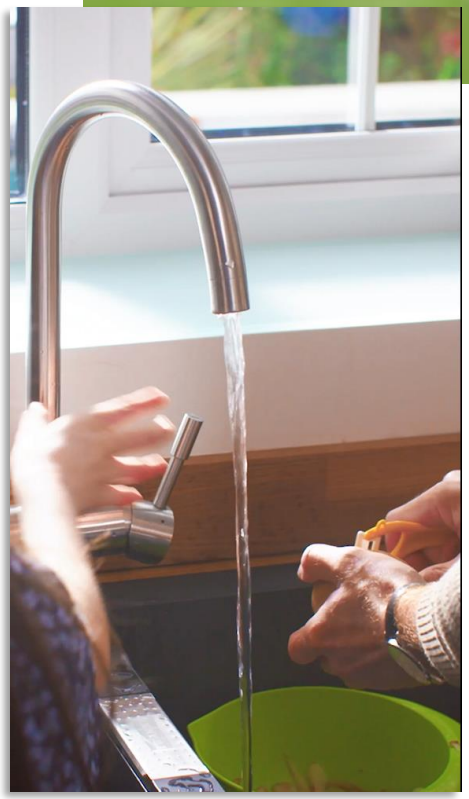
Covers the major household water use areas

Dual-Flush Buttons

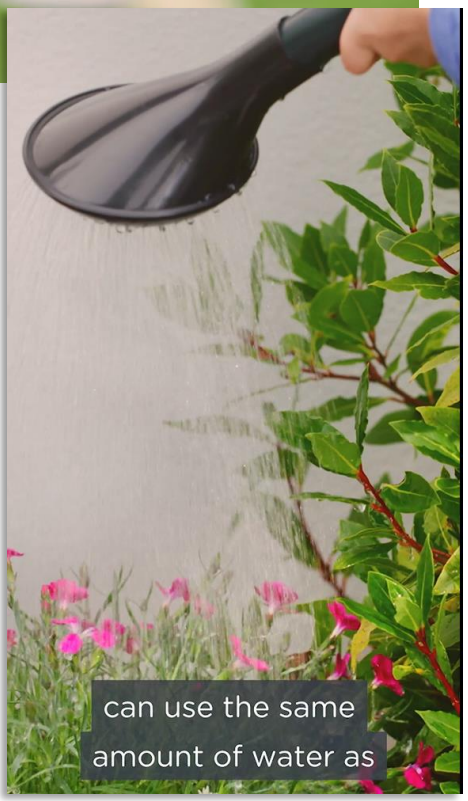
Leaky-loos



Shorter showers



Kitchen tap



Garden water use

Online Water Calculator

1 2 3 4 5 6

Your home

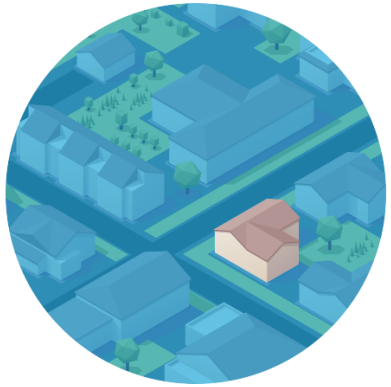
Do you have a water meter?
- Yes
- No
- Don't know

How do you heat your water?
- Electricity
- Gas
- Solid fuel
- Oil
- Biomass
- LPG

Do you have an A rated boiler?
- Yes
- No
- Don't know

Does your home have any dripping taps?
- Yes
- No

Back | Next



000000
Energy usage (kWh) per year

001898
Water usage (L) per year

1 2 3 4 5 6

Bathroom

How many baths does your household take?
- per week
- per month

- 0 +

Do you leave the tap running when you clean your teeth?
- Yes
- No

Do you leave the tap running when shaving?
- Yes
- No
- N/A

Back | Next

000596
Energy usage (kWh) per year

020249
Water usage (L) per year

1 2 3 4 5 6

Kitchen

How many times does your household wash up by hand each week?

- 6 +

Do you use a bowl or sink with a plug for washing up?
- Yes
- No

What is the flow rate of your taps?
- Fast
- Medium
- Slow
- Don't know

Back | Next

Use a washing bowl

A running tap uses six litres of water per minute. If you fill a washing-up bowl instead of running the tap, you can reduce the amount of water you use.

000559
Energy usage (kWh) per year

018278
Water usage (L) per year

1 2 3 4 5 6

Bathroom

How many showers are in your household?

- Power: 0 +
- Electric: 0 +
- Standard mixer: 1 +

Is your shower mains fed or loft tank fed?
- Mains fed
- Loft tank fed
- Don't know

Do you have a low flow or eco shower head?
- Yes
- No

How many times per week does your household use these showers?

- Standard mixer: 10 +

How many minutes, on average, does one shower last?

- 5 +

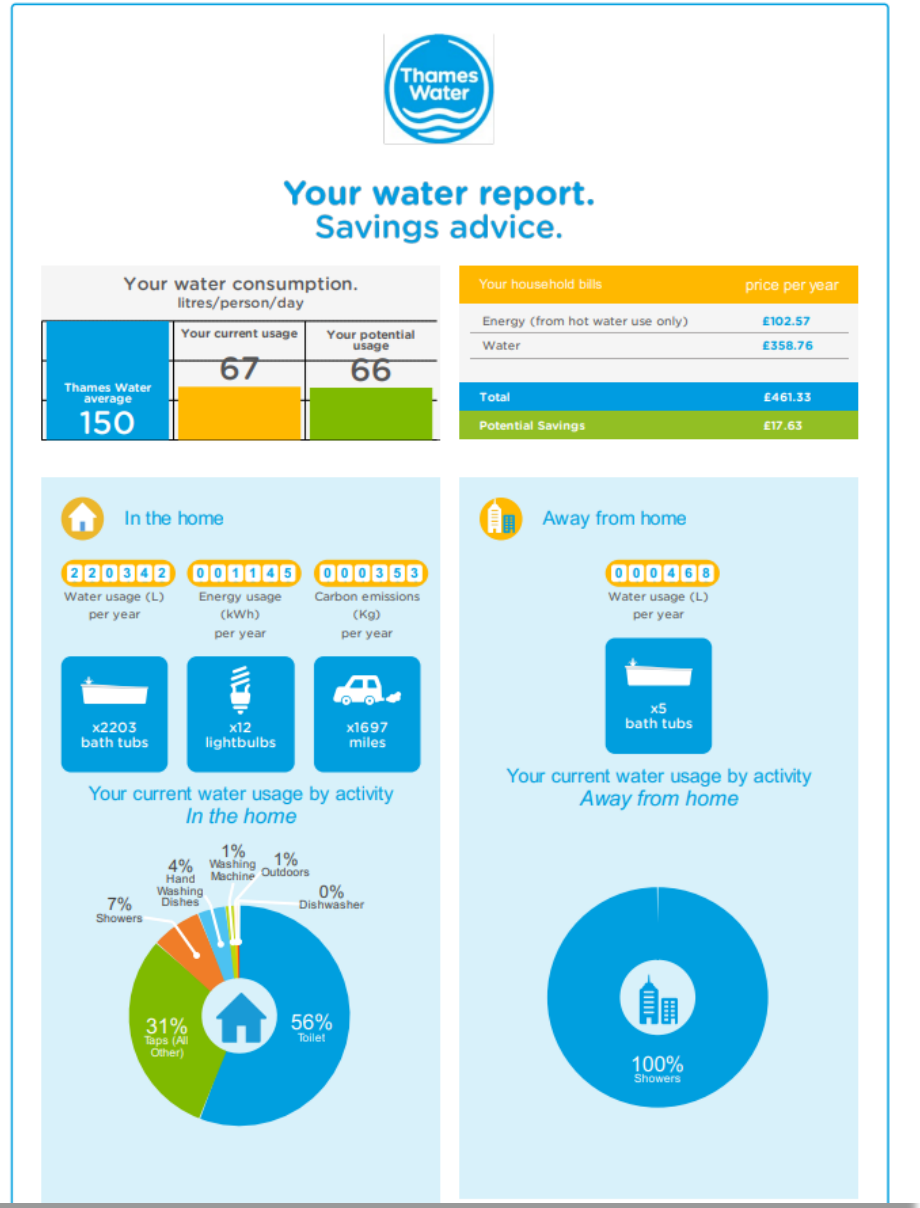
Take our four minute shower challenge with this handy timer.

Add to basket

001151
Energy usage (kWh) per year

035849
Water usage (L) per year

Online Water Calculator



Thames Water

Your water report.
Savings advice.

Your water consumption.
litres/person/day

Thames Water average	Your current usage	Your potential usage
150	67	66

Your household bills	price per year
Energy (from hot water use only)	£102.57
Water	£358.76
Total	£461.33
Potential Savings	£17.63

In the home

Water usage (L) per year	Energy usage (kWh) per year	Carbon emissions (Kg) per year
220342	001145	000353

x2203 bath tubs

x12 lightbulbs

x1697 miles

Your current water usage by activity
In the home

Away from home

Water usage (L) per year
000468

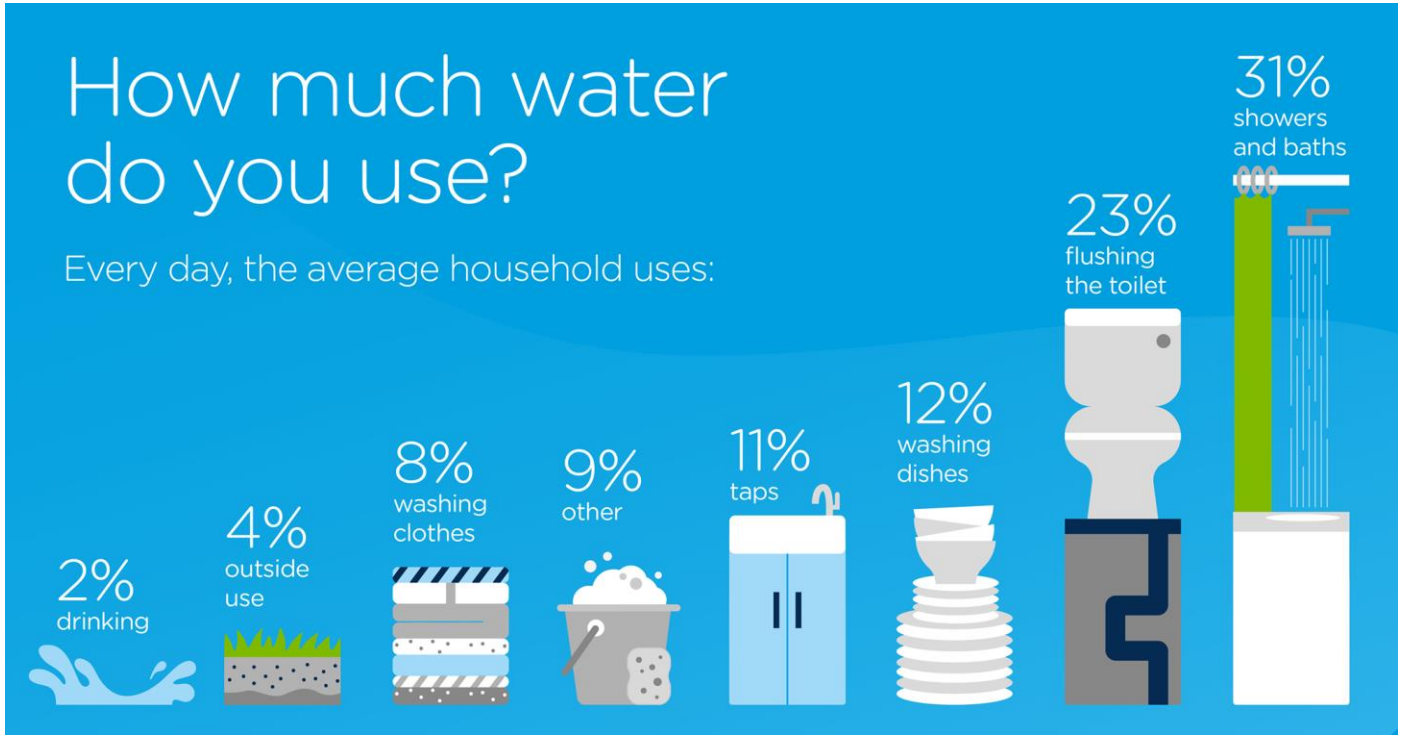
x5 bath tubs

Your current water usage by activity
Away from home

	Current spend (water costs)	Potential saving	Water saving advice
	Per year	Per year	
Kitchen	**£71**	**£28**	**Quick wins**
Washing Machine	£9	£1	**Use a bowl to wash your dishes/food.** If you are washing your food/dishes under the tap, this can be wasteful - anywhere between 8-15 litres of water used per minute.
Dishwasher	£8	£0	
Sink	£51	£30	
Kettle	£3	£-3	**Fully load your dishwasher.** Using a dishwasher can add as much as £60 to your energy bill each year, so fully loading it ensures you can get the most out of it.
Bathroom	**£374**	**£125**	**Quick wins**
Shower	£79	£12	**Turn your tap off when brushing your teeth.** A running tap can use anywhere between 8-15 litres per minute. By only using your tap before and after brushing, you could save up 30 litres of water each time you brush.
Bath	£0	£0	
Sink	£95	£86	
Toilet	£201	£27	**Reduce the time spent in the shower.** By reducing your shower times to 4 minutes or less, a family of four could save more than 3,640 litres per person and £59 per year.
Outdoor	**£2**	**£0**	**Quick wins**
Garden	£0	£0	**Use a watering can in your garden.** An average garden hose can use anywhere between 25-110 litres of water per minute.
Car	£1	£0	
Other	£1	£0	
Total	**£461** Current spend	**-£152** Potential savings	**£309** Potential spend

Tips for reducing your water use

- Use the water and energy calculator
- Short showers
- Find and fix leaks e.g. leaky-loos
- Small changes such as turning tap off when washing up/shaving/brushing teeth and filling the washing machine and dishwasher
- Reuse water for plants
- Outdoor water use
  - Gardening – RHS tips
  - Use rainwater / install water butts
  - Use a watering can
  - Be mindful with paddling pools and reuse water



Thank You

Questions & Answers

Water and Environment Support
in the ENI Southern Neighbourhood region

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Water and Environment Support
in the ENI Southern Neighbourhood region

Presentation “Water security and efficiency planning”

Andreea Florea, Arthur Streller, and Cor Merks

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Water security

The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustainable livelihoods, human wellbeing and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters and for preserving ecosystems of peace and political stability.

(UN-Water, 2013)

Availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies.

(Grey and Sadoff, 2007)

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Water Security and Efficiency Planning

Water and Environment Support
in the ENI Southern Neighbourhood region

Water security is essential to humankind as it supports public health, economic growth, environmental sustainability, political stability and disaster risk reduction.

Water security is the adaptive capacity to safeguard the sustainable availability of, access to, and safe use of an adequate, reliable, and resilient quantity and quality of water for health, livelihoods, ecosystems, and productive economies.

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GDP and Water Security

Water and Environment Support
in the ENI Southern Neighbourhood region

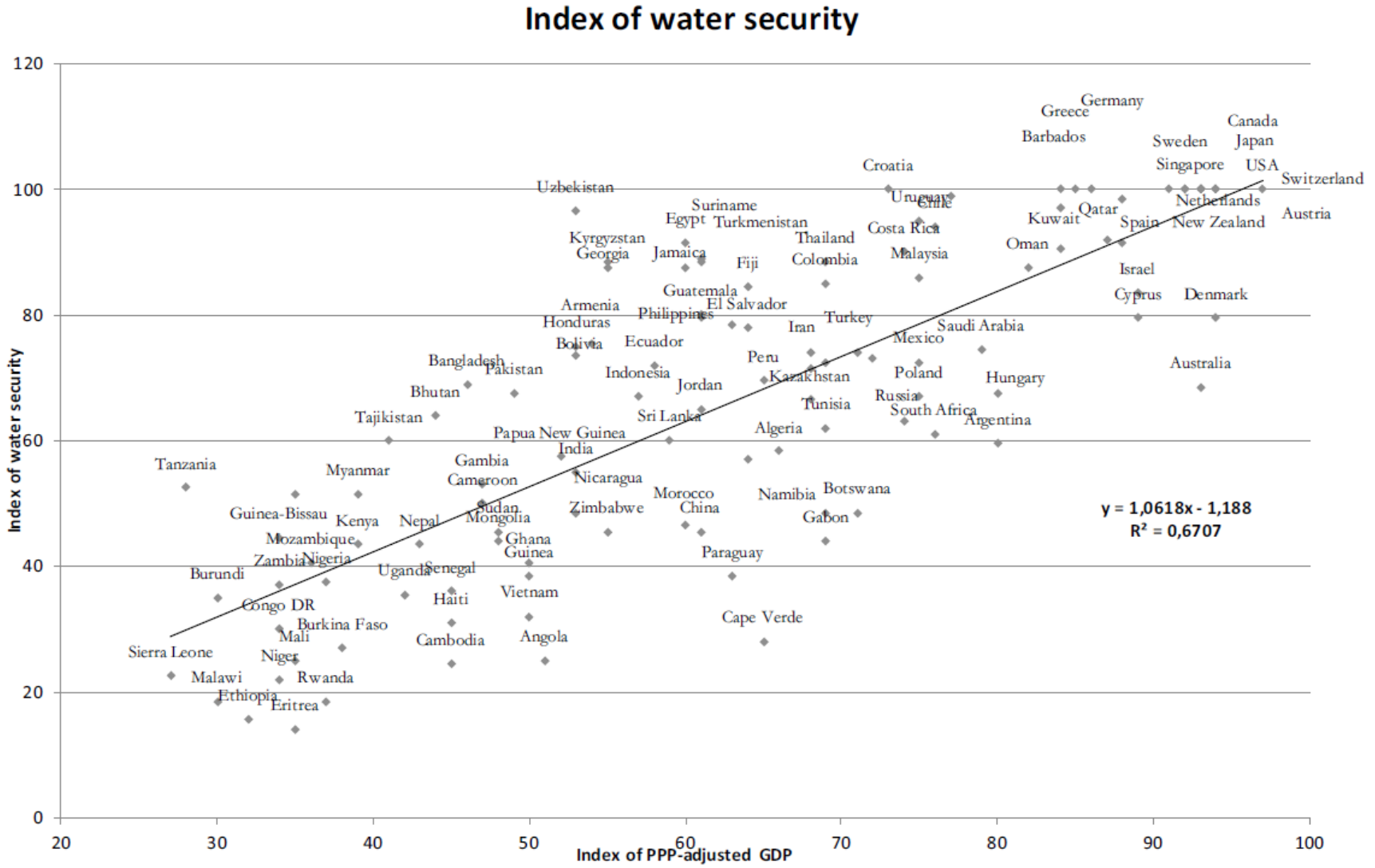

Figure 2. Index of water security

Strong positive relationship between water security and PPP-adjusted GDP (purchasing power parity-adjusted gross domestic product) per person for 147 countries.

Water security is a stronger function of economic development of a country than many other variables such as water availability. In other words – water security grows as GDP grows.

High-income countries: formal water economy

Low-income countries: informal water economy

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GDP and Water Security

The three pillars of IWRM:

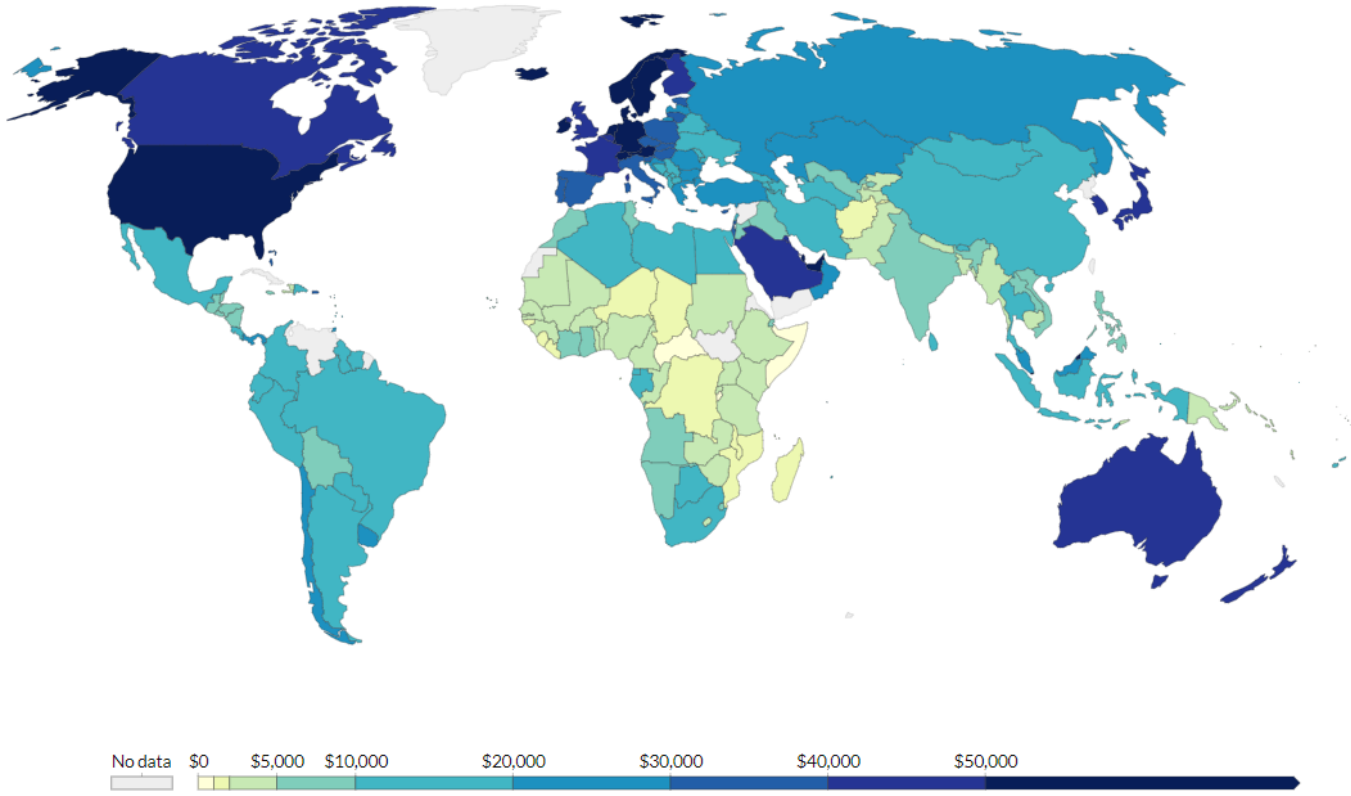
- Law
- Policy
- Administration

Countries in the New World – Australia, Brazil, Canada, New Zealand, and the US – have used **water law and property rights** to introduce **effective water governance**.

In **fragile economies**, where formal water infrastructure and institutions are mostly non-existent and **people rely on local and informal water supplies**, as opposed to emerging economies.

The most **powerful driver** is the overall stage of a nation's **economic development**.

Simplistic but true - **rich countries are water secure, no matter how limited their water resources endowment**; and poor countries are water insecure, no matter how abundant their water resources.



GDP per capita, 2020
Source: ourworldindata.org, World Bank

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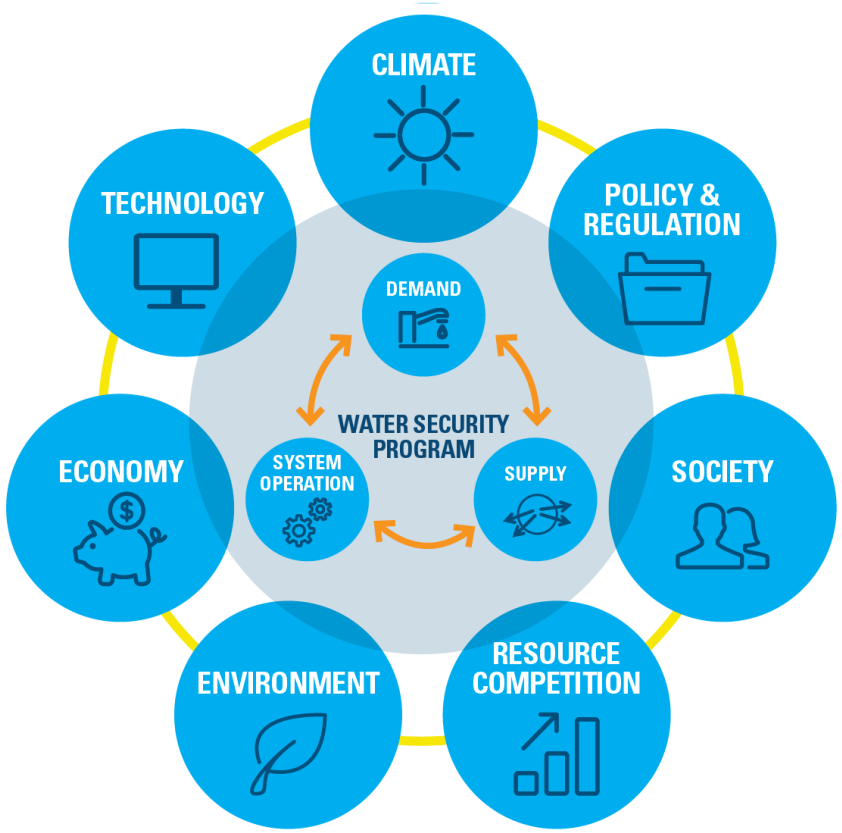
Water Security Planning

- Understand the System
- Engage with Stakeholders
- Determine Objectives (consider backcasting, defining a desirable future vision and mapping the steps required to achieve that vision)
- Build Scenarios (explore perspectives on potential risks, especially climate)
- Document a System Plan
- Implement, Monitor and Review



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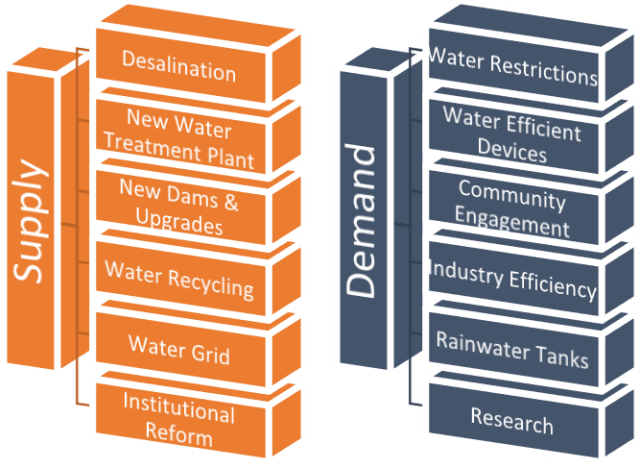
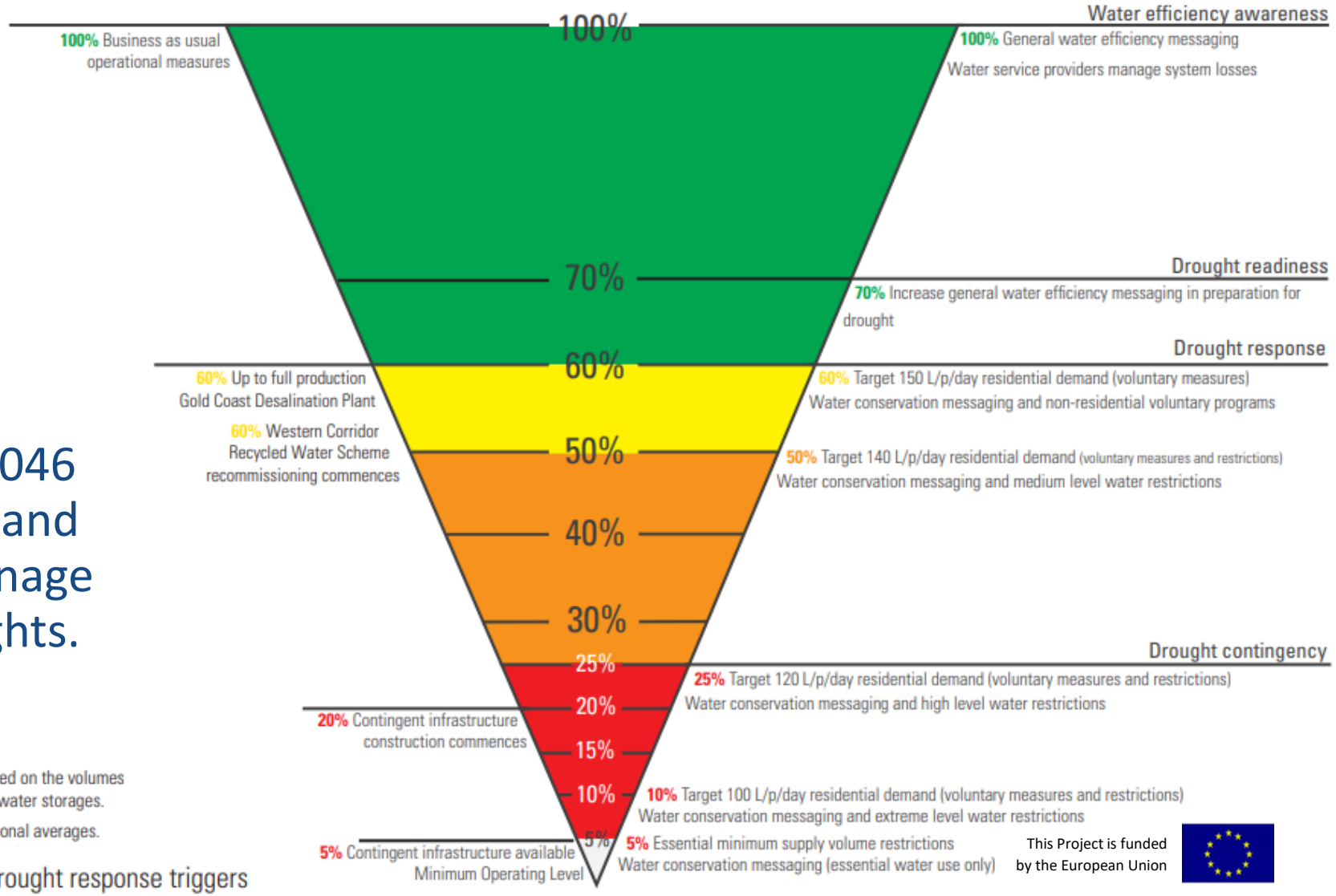
Case Study – South East Queensland



Water Security Plan for 2016-2046 contains details of supply, demand and operational triggers to manage water security for future droughts.



Notes:

1. Percentages are based on the volumes of the SEQ key bulk water storages.
2. Targets are SEQ regional averages.

Figure ES-4 Drought response triggers

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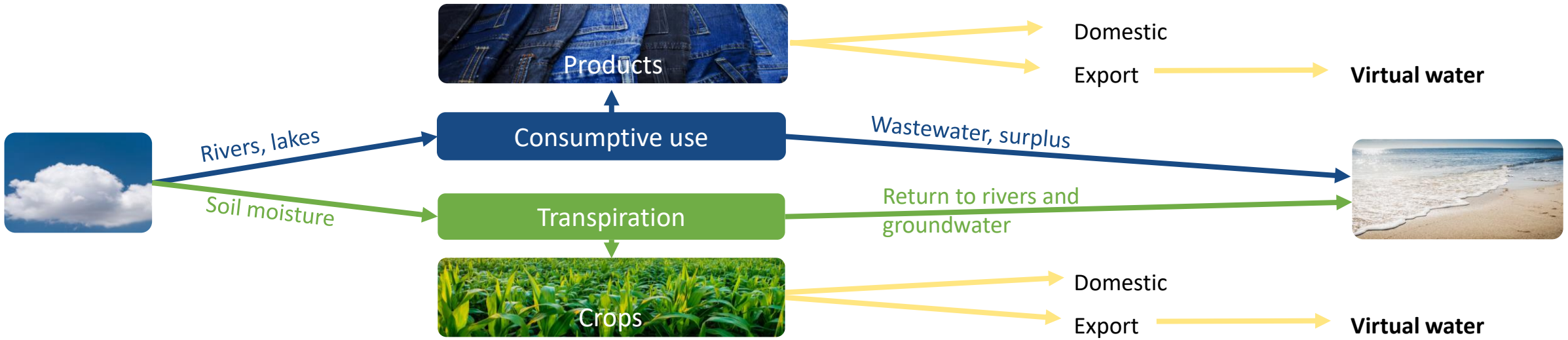
Virtual Water



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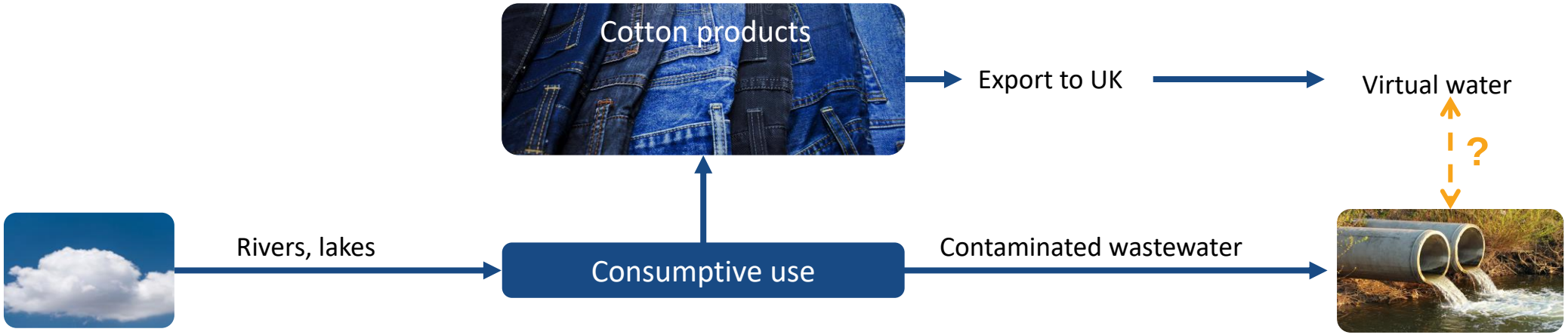
Virtual Water - UK case



- UK is one of the biggest importers of virtual water. UK produces no cotton crops internally, so almost all of its cotton water footprint is external.
- The World Bank estimates that 17%–20% of industrial water pollution comes from textile dyeing and treatment.
- Many cotton producers either do not treat water, or apply minimal treatment before discharging the wastewater back into rivers.
- Pricing of water in the UK includes the collection and delivery of water to households, but does not include the cost of virtual water treatment.

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Role and responsibility as a WDM planner

- Define roles and regulations early
- Briefing of newly involved stakeholders
- Involve and inform individual and relevant stakeholders adequately and ensure their engagement in the development of the WDM → the contribution is crucial in making the response happen, also as it might require modified regulations/legislation at national, state or local level
- Define the actions to be undertaken and at what level
- Information is key – through all stake- and shareholder levels it is essential do disseminate the necessary knowledge, also on an ongoing basis

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Roles and responsibilities?

Water and Environment Support
in the ENI Southern Neighbourhood region

Smarter Home Visits

Housing Associations

Greenredeem Incentives

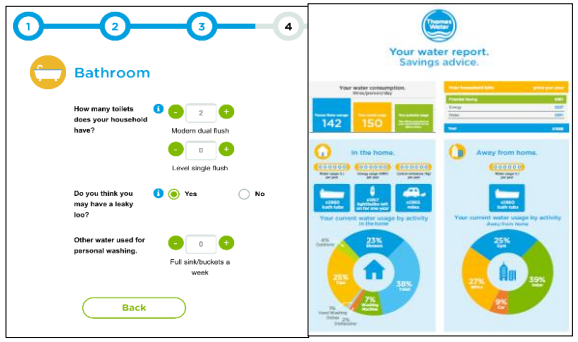
Wastage fixes

Communities & Stakeholders (ARK)

Discretionary Water Users

Smarter Business Visits

Online Water Energy Calculator



Smart Meter Rollout

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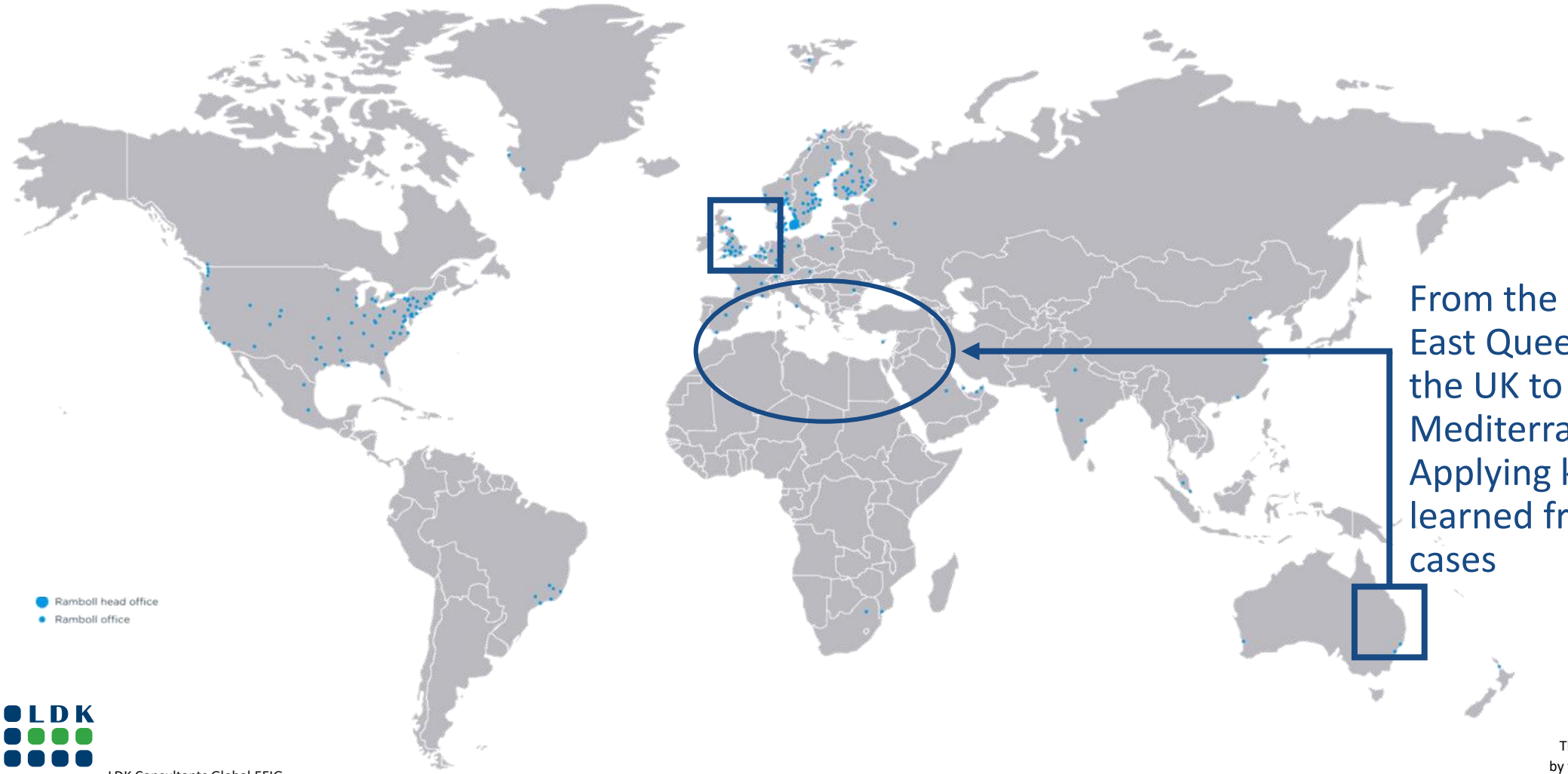
Adapting to the problem…

Water and Environment Support
in the ENI Southern Neighbourhood region



From the case South East Queensland and the UK to the Mediterranean – Applying knowledge learned from other cases

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Questions & Answers

Water and Environment Support
in the ENI Southern Neighbourhood region

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Water and Environment Support
in the ENI Southern Neighbourhood region

Plenary Kahoot! quiz

Facilitator: Andreea Florea

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Thank you for your attention!

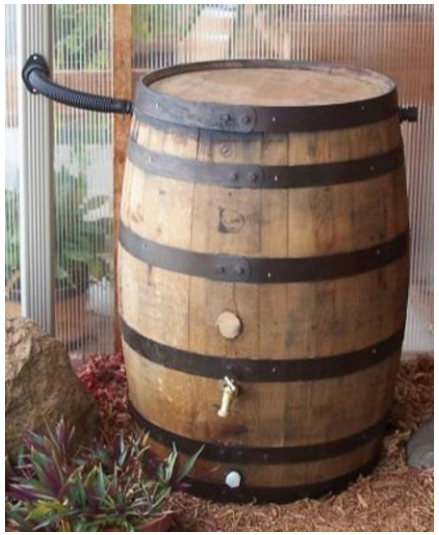
Water and Environment Support
in the ENI Southern Neighbourhood region

Training Module 4: Thursday, February 10, 2022, start at 9:30 AM Athens time (CET+1)

Rainwater Tanks – Examples

- 200 L tank
- Mesh for insects and plants
- Overflow hose can be linked to other tanks or directed away from buildings
- Can connect to downspouts

- Rain collecting planter
- Self draining
- Mount adjacent to drainpipes
- Can be provided with overflow
- Drained water can flow into a garden through a pipe



- DIY
- Upscale large containers (garbage bins or wine barrels)
- Collect from gutters
- Fit with tap or diverter
- Seal it

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