International Water Security Network

Socio-cultural Drivers of Water Demand in Student Residential Accommodation: implications for water conservation

C. Staddon, K. Simpson, D. Toher, F. Jeddere-Fisher

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EXISTING		PROPOSED		SERVICE OBJECTS	
MAINS		ABANDONED MAINS		COMM. PIPE	
RAW WATER		SLIPLINED		SUPPLY PIPE	
BW DUCT		OTHER		STOPTAP	
SLIPLINED		CABLE WITH MAIN		COMMON COMM. PIPE	
VALVES		PRIVATE MAIN		COMMON SUPPLY PIPE	
FIRE HYDRANT		METER			

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COORDINATES AT THE CENTRE OF THE PLAN ARE
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BRISTOL WATER

Initial Study Assumptions/Design (2012-13)

- Water company interest because of high usage and ENU status
- Informed by student accommodation that students were randomly allocated to blocks
- No opt-in bias (common problem with panel-type studies)
- **Mendip** (400 rooms) Court was assigned to be the control courtyard.
- Simple aerating tap inserts were installed in all hand basins in **Brecon** Court (564 rooms).
- Tap inserts and low flow showerheads were installed in **Cotswold** Court (500 rooms).
- In **Quantock** Court (468 rooms) soft measures including shower timers and paper posters promoting water conservation were installed.
- All toilets fitted with Siamp S thru the wall dual flush (2/6 lpf).
- “DMA” meter reads every 30 minutes

With the available data (since 2013), we were able to pose several research questions:

- What is baseline (personal) water use in this highly standardised context – without confounding factors of house type, modifications, gardening, car washing, etc.)?
- Are there differences in water use by gender, student origin (UK/EU versus international)?
- Does involvement in sporting activities increase/decrease showering at home? (proximity of Sport Centre)?
- Can we identify the difference that different “hard” and “soft” interventions make in water use, quantitatively, and qualitatively?
- Also of interest was the life-span of the fixtures used in the study and associated maintenance issues (became increasingly important!)

In first two annual cycles discovered a number of confounding factors, including….


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But also:

- Students NOT allocated randomly, but according to arrival dates/times, degree course (sometimes, esp. Kaplan International College), nationality/gender (for some non-EU nationals)
- Fittings being non-uniformly replaced as part of Legionella control
- Large number of internal stakeholders to engage – UWE Estates, Facilities, Accommodations, SU, Directorate, etc.

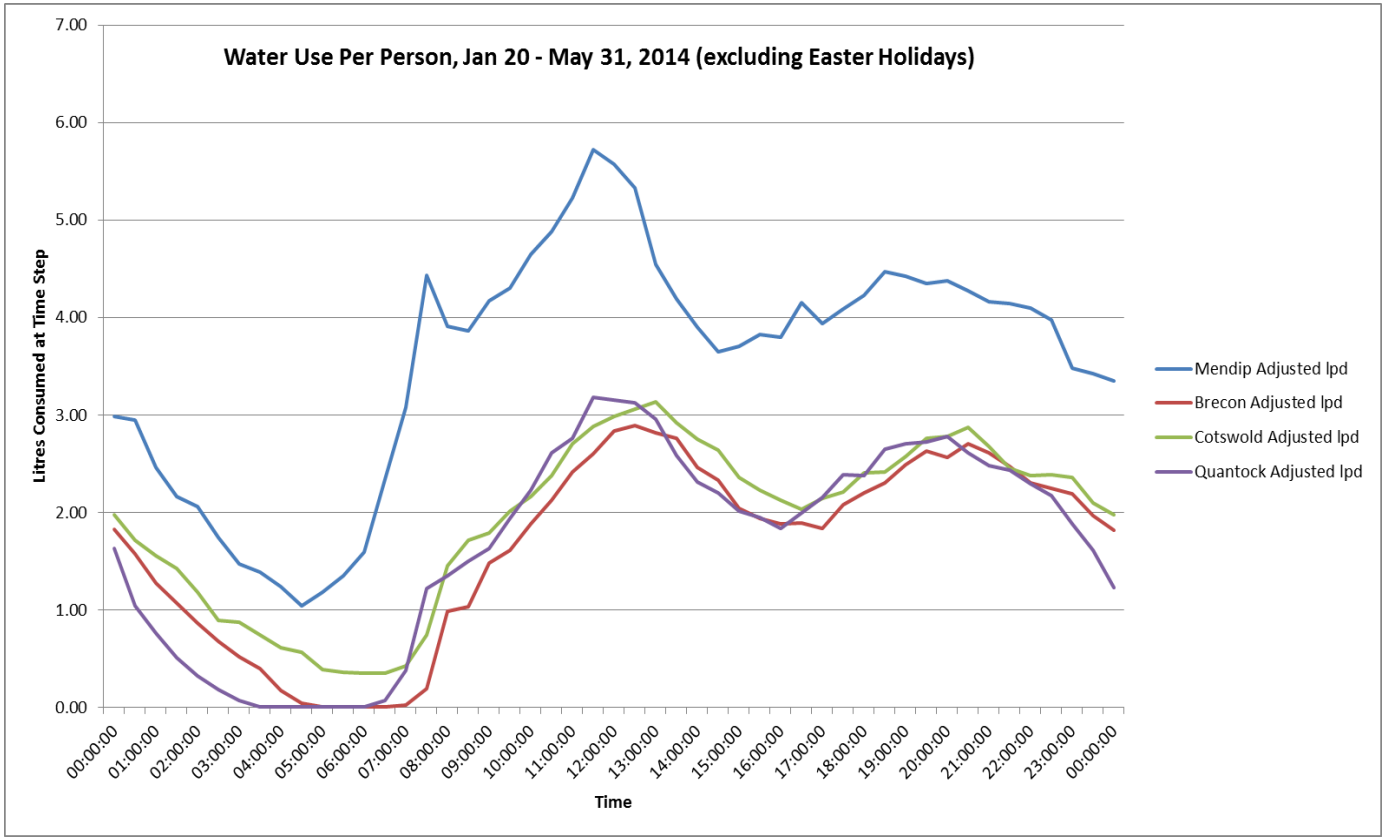
……AND several incidences of "exceptional" water use

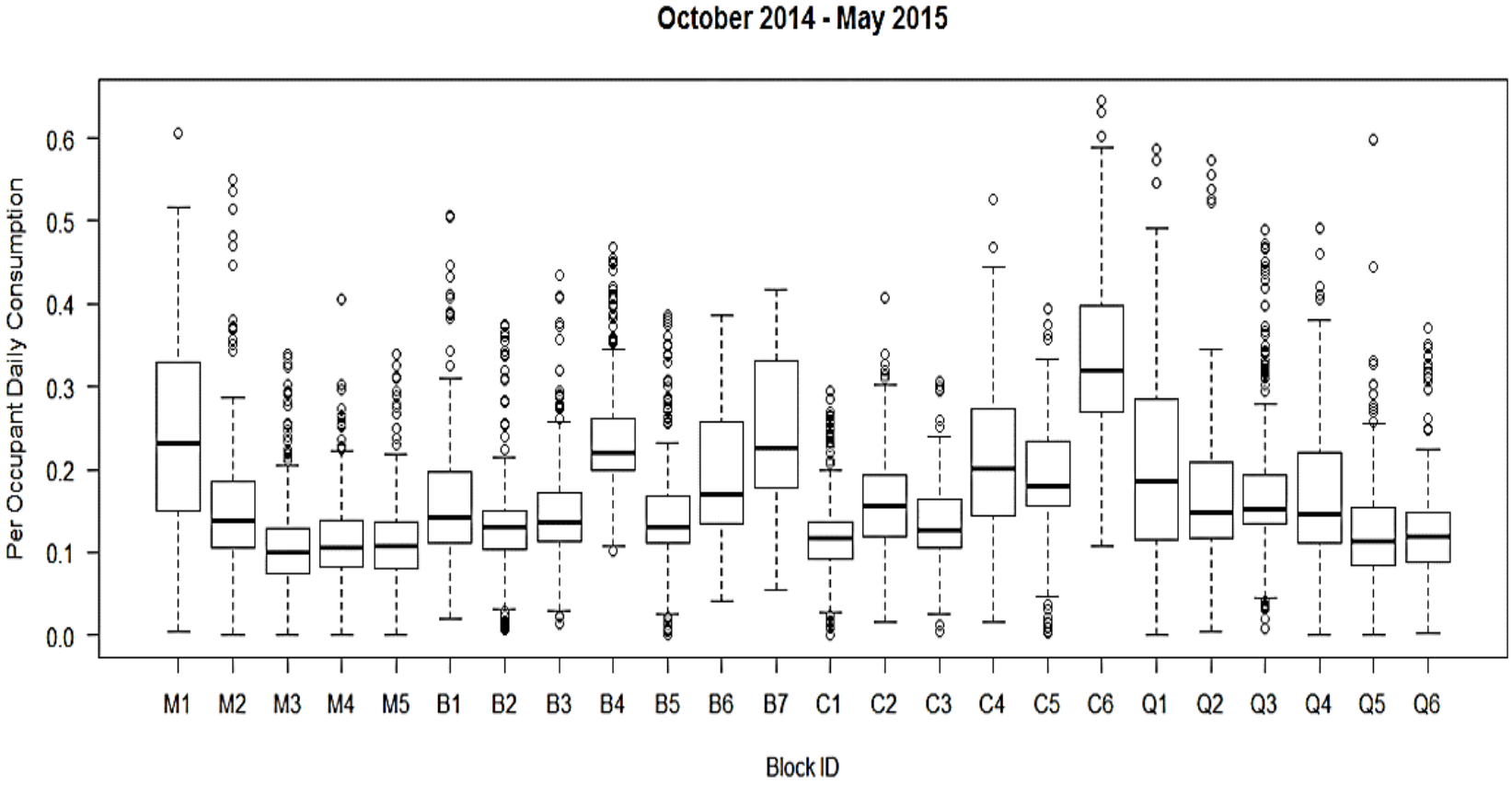
LIFE • 11 months ago

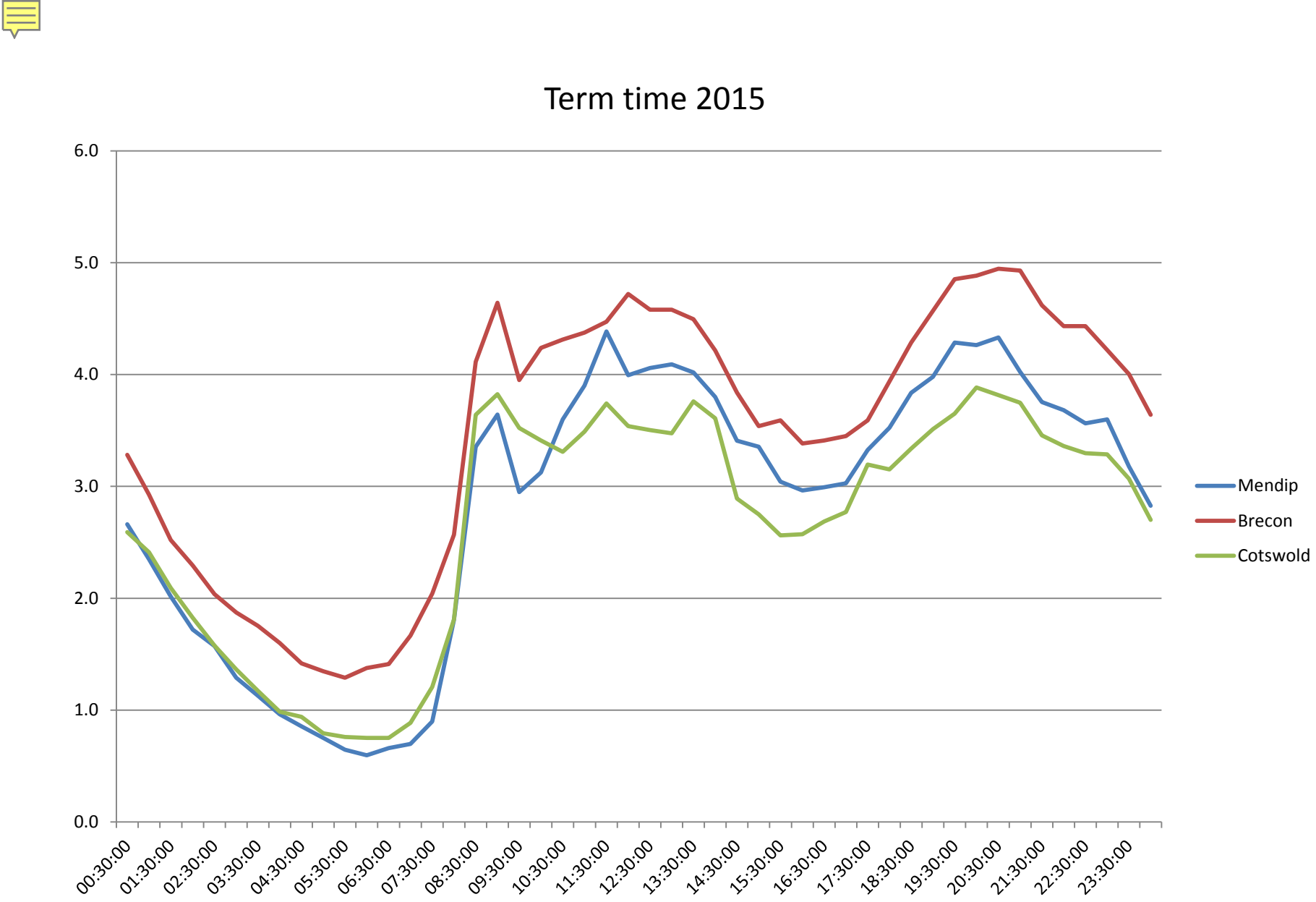
Fresher throws pool party in Brecon Court and floods his bathroom

What to analyse? What data selection/extraction?

- Mid-week (Tuesday to Thursday) to ensure a like-for-like comparison
- Who goes for the weekend?
- From weeks 2-11 of term time (omitting first and last weeks)
- Also look at reading week / field trips effect


Water Use Per Person, Jan 20 - May 31, 2014 (excluding Easter Holidays)
Litres Consumed at Time Step
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
00:00:00
Time
Mendip Adjusted lpd
Brecon Adjusted lpd
Cotswold Adjusted lpd
Quantock Adjusted lpd


October 2014 - May 2015
Per Occupant Daily Consumption
0.0
0.1
0.2
0.3
0.4
0.5
0.6
M1
M2
M3
M4
M5
B1
B2
B3
B4
B5
B6
B7
C1
C2
C3
C4
C5
C6
Q1
Q2
Q3
Q4
Q5
Q6
Block ID


Term time 2015
6.0
5.0
4.0
3.0
2.0
1.0
0.0
00:30:00
01:30:00
02:30:00
03:30:00
04:30:00
05:30:00
06:30:00
07:30:00
08:30:00
09:30:00
10:30:00
11:30:00
12:30:00
13:30:00
14:30:00
15:30:00
16:30:00
17:30:00
18:30:00
19:30:00
20:30:00
21:30:00
22:30:00
23:30:00
Mendip
Brecon
Cotswold

	Per Capita Daily Water Consumption by Month (m^3)			
	Mendip	Brecon	Cotswold	Quantock
September	--	0.152	0.176	--
October	--	0.170	0.152	--
November	0.232	0.176	0.145	0.150
December	0.118	0.148	0.101	0.155
January	0.157	0.154	0.118	0.132
February	0.219	0.159	0.137	0.141
March	0.215	0.161	0.101	0.112
AVERAGE	0.188	0.160	0.133	0.138

July 2015 Fixtures Audit

Average flow rates in different Courts (litres/minute)			
	Kitchen Mixer Tap	WHB Mixer	Shower Mixer/thermostatic
Mendip	12	10.9	11
Brecon	11.5	11	11.4
Cotswold	10.3	10.8	8
Quantock	14.3	11.4	8.2
Average	***12.0***	***11.0***	***9.7***

A Relatively Efficient Installation

Fixture	Volume Used (pmin or p.use)	Times(mins)/Day	Total Use	% Use
Toilet	3	4	12	11.21%
Hand Basin	4	2	8	7.48%
Kitchen Tap	4	3	12	11.21%
Shower	7.5	10	75	70.09%
			107	100.00%

Using Flow Rates From Summer 2015 Audit

Fixture	Volume Used (pmin or p.use)	Times(mins)/Day	Total Use	% Use
Toilet	5	4	20	11.56%
Hand Basin	10	2	20	11.56%
Kitchen Tap	11	3	33	19.08%
Shower	10	10	100	57.80%
			173	100.00%

What have we learned?

- Huge benefits of the experimental design….but it has taken considerable time to get there.
- Our study has become as interested/involved with facilities management as water behaviour/conservation
- “hard” interventions often easily cancelled out by behaviour modification (e.g. showerheads)
- Pressure matters as much as flow for users
- Demographics are quite important, but in complex interacting ways
- Expect the unexpected (pool parties, holiday-time leaks, student obliviousness)

The plan for 2016-2017:

1. A limited number of blocks targeted with 100% fixtures change as follows:
   a) New Neoperl tap inserts
   b) Audit/standardisation of shower fixtures
   c) Messaging (social media messaging, timers, Freshers event; Big Green Week, work with RAs, UWE Green Leaders)

2. New guidance to Accoms/Grahams on regular inspection and rectification with respect to water fittings

3. Qualitative element to study – "behaviours" and "practices" as well as measured consumption – link with UWE Estates Sustainability Engagement Programme (see 1 (c) above

4. Near-real time data feed into R-based statistical environment

5. Paid for out of possible modelled water savings of £1000/block/year

www.watersecuritynetwork.org
www.twitter.com/water_network

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For more information, see: www.lrfoundation.org.uk