



## Per capita consumption (PCC)

**Purpose:** This performance commitment is designed to incentivise the company to help customers reduce their consumption.

**Benefits:** The benefits of reduced per capita consumption (PCC) are to improve the long-term water resources supply-demand balance and reduce the need for water abstraction.

### Version control

Version	Date of issue	Performance commitment changes
0.1	22 December 2022	Published at final methodology
0.2	17 May 2023	Removal of red text.

# Performance commitment definition and parameters

## 1.1 Detailed definition of performance measure

The percentage reduction of three-year average PCC in litres per person per day (l/person/d) from the 2019–20 baseline. Three-year average values are calculated from annual average values for the reporting year and two preceding years expressed in l/person/d

Annual average PCC means the sum of measured household consumption and unmeasured household consumption delivered by the total household population.<sup>1</sup>

$$\frac{\textit{Measured household consumption} + \textit{Unmeasured household consumption}}{\textit{Total household population}}$$

The measure uses post MLE (maximum likelihood estimation) data for measured household consumption and unmeasured household consumption.<sup>2</sup>

The company shall quantify and clearly explain any differences with reports made to the Environment Agency or Natural Resources Wales in the annual review of Water Resources Management Plans (WRMP).

The company shall explain in its annual performance report submission any differences in its 2019–20 baseline three-year average PCC expressed in l/person/d in comparison with its business plan. Reasons for any differences should be clearly explained and their volumetric impacts on the baseline quantified.

Outcome delivery incentives will be applied on a l/person/d basis. The performance commitment levels expressed as a percentage reduction will be applied to the 2019–20 baseline. The difference between this value to one decimal place and actual three-year average per capita consumption will be used to calculate outcome delivery incentives.

The company is required to report against this definition and:

- set out where its methodology does not comply, using the compliance checklist below;

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<sup>1</sup> 'Household consumption' means consumption at "household premises", as defined in section 17C (meaning of household premises), Water Industry Act 1991.

<sup>2</sup> MLE is a technique used in the estimation of leakage and is described under the definition for reporting the leakage performance commitment for PR24.

- explain the reasons for any non-compliance;
- set out its plans and programme to comply;
- set out any other factors which have an impact on the methodology for reporting per capita consumption;
- set out if there is any difference in its 2019–20 baseline three-year average PCC in comparison with its business plan; and
- set out any differences with the PCC figures it reports in the annual review of the WRMP.

## 1.2 Additional detail on measurement units

### Relevant premises

The company must identify measured household premises to derive measured household metered volumes from its billing system. It must identify unmeasured household premises so that it can extrapolate the unmeasured household consumption monitor calculations to the company area. The company is expected to:

- ensure the classification of premises as either household or non-household is consistent with our guidance on establishing the principal use of premises;<sup>3</sup>
- update data on premises at least annually;
- exclude premises that are defined as void unless a company can evidence any use or losses from illegal occupation; and
- justify the number of void premises each year and how this is derived.

### Population

Total household population is the denominator in the equation. The company is expected to:

- produce a total household population estimate every year consistent with the WRMP definition of household population that refers to the UKWIR methodology for estimation of population;<sup>4</sup>

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<sup>3</sup> See Eligibility guidance on whether business customers in England and Wales are eligible to switch their retailer, Ofwat, July 2022. To establish the principal use of premises served by the supply system of a company whose area is mainly in England, see Part A: Guidance for England, section 2.3; to establish the principal use of premises served by the supply system of a company whose area is mainly in Wales, see Part B: Guidance for Wales, section 3.4.

<sup>4</sup> WRMP19 – Methods – population, household property and occupancy forecasting, 15/WR/02/8, UKWIR 2015.

- provide evidence to justify any adjustments made to population estimates for unaccounted for population (clandestine population such as migrant workers, tourists, holiday home owners); and
- demonstrate that the estimate is for household population only (non-household population is either estimated separately or deducted if the estimate obtained is total population for the area of supply). The company shall set out its approach to excluding non-household population.

## Occupancy

It is not necessary to disaggregate the total household population between measured and unmeasured households and there is no requirement for occupancy data for this measure.

## Measured household consumption

The volume of measured household consumption should include water used by each measured household including meter under-registration but excluding supply pipe leakage. Measured data shall be derived from the meter readings within the company's billing system including estimated reads and an adjustment for meter under-registration should be applied.

For externally metered households an allowance for supply pipe leakage should be deducted from the metered volumes.

The company must undertake a process of accruing consumption at year end to account for meter reading frequency cycles. The company shall justify its approach to accruals and estimated reads and obtain external assurance that its accruals are appropriate. Water must always be recognised and any demand relating to a previous year which has not been reported must either be restated in relation to that year or included in the reported demand for the next reporting year.

Guidance on the estimation of unmeasured household consumption<sup>5,6</sup> proposes a measured household monitor to enable the nature of consumption patterns to be better understood. If the company uses a measured household consumption monitor it must set out its approach and justify its use.

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<sup>5</sup> Future Estimation of Unmeasured Household Consumption, UKWIR, 17/WR/01/16, published 13/07/2017.

<sup>6</sup> Improved Understanding of Current and Future Household Consumption, 21/WR/01/17, UKWIR 2021.

The company shall derive measured household consumption using the following criteria:

- take metered data from its own billing system, including actual reads and estimated reads;
- deduct supply pipe losses for externally metered premises consistent with its own current assessment of supply pipe losses;
- adjust metered data for leakage allowances applied to individual customers where a rebate has been applied to a customer's bill; and
- adjust for meter under-registration consistent with its own estimates.

### **Unmeasured Household Consumption**

The volume of unmeasured household consumption includes water used by each unmeasured household excluding supply pipe leakage. Dependent on the level of meter penetration a company has this can be a significant component of the water balance and therefore needs continual focus to maintain and improve the estimate. For the purposes of this performance commitment unmeasured household consumption should be derived from per household consumption (PHC).

The company shall be expected to use company specific data for unmeasured household consumption except for companies with high meter penetration where it may be impractical to establish and maintain a sufficiently robust sample of unmeasured premises. In this case sharing of unmeasured data with neighbouring companies or companies with similar demographics may be appropriate. If the company has a high meter penetration and does not use company specific data for unmeasured household consumption, it must set out its approach to estimating unmeasured household consumption.

In most cases (except where the company's meter penetration is high and there are insufficient unmeasured households remaining) it is expected that unmeasured household consumption shall be estimated from a company's own consumption monitor following good practice as defined in the UKWIR Report Best Practice for Unmeasured per Capita Consumption Monitors (1999 Report).<sup>7</sup> Good practice has improved since this report with innovation and new technologies now available although the basic principles of the monitors is unchanged. Companies can use individual household monitors (IHMs) or Small Area Monitors (SAMs).

The company shall continue to base its approach on a sample of at least 1000 for IHMs. Representation may be by demographic group, property type or other recognised

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<sup>7</sup> UKWIR reference 99/WM/08/25, published 17/04/2002.

statistical group. The company must set out the evidence to demonstrate its sample is representative of its area.

Individual monitors shall have a high resolution meter and associated logger to transmit data to a control centre. Data is expected to be collected more frequently than hourly intervals and the company shall use 'fast logging' or similar. The IHM needs continual monitoring to limit the level of any supply pipe losses or other continuous flows. Any other continuous flows are attributable to customer use or plumbing losses and shall be included in estimates for consumption at household level.

While the company shall consider making a small allowance for meter under-registration, this must be in line with company evidence for the meters used in the consumption monitor. Meters used for these consumption monitors will have an enhanced specification compared with normal domestic meters and as they are continually monitored for meter failures and drift will be identified earlier than for normal domestic meters. Meters are expected to be selected and maintained to minimise meter under-registration, including a phased meter replacement programme.

The company shall continue to base SAMs on a representative sample of areas of DMAs (District Meter Area) or smaller whole DMAs which are specifically designed with one meter and permanent data loggers. The company should include minimal numbers of non-household premises and have minimal measured households (no more than 50% where practical).

- Consumption for non-household premises within SAMs should be deducted from the area total consumption based on metered data or where unmeasured non-households are included using the appropriate unmeasured non-household consumption allowance. The company shall set out how it has deducted non-household consumption.
- Consumption for measured households within SAMs should be deducted from the area total consumption based on metered data. The company shall set out how it has deducted household consumption.

The company shall set out its evidence to demonstrate the representativeness of its sample for SAMs. The IHM monitoring requirements for continual monitoring and meter under-registration shall be equally applied to SAMs.

The company is expected to derive unmeasured household consumption using the following criteria:

- it will calculate unmeasured household consumption (Ml/d) for the whole company from average unmeasured per household consumption (PHC expressed in litres/household/day) multiplied by the number of unmeasured households;
- where practicable it will derive average unmeasured household consumption from the company's own IHM or SAM;
- where it does not derive average unmeasured household consumption from the company's own IHM or SAM it will justify the method;
- the PHC for the IHM or SAM sample shall be extrapolated to an average for the whole company based on stratification;
- the IHM or SAM shall follow the principles set out in the 1999 Report and the more recent report Future Estimation of Unmeasured Household Consumption (2017 Report);<sup>8</sup>
- IHMs and SAM monitors shall be continually monitored and maintained;
- the company shall demonstrate that its IHM or SAM is representative of the company as a whole. Valid data from the survey shall be from at least 80% of monitors as an annual average measure. The company may develop and use an alternative monitor as defined in the 2017 Report but it must set out the approach taken and demonstrate why this is appropriate;
- in general, it is expected that where the proportion of metered premises in a SAM exceeds 50% of total premises then the area should not be included in the estimation of unmeasured consumption. Companies with high meter penetration may not be able to comply with this and this should be considered when deciding their approach to estimating unmeasured household consumption;
- meters shall be selected to provide sufficient granularity to detect low continuous flows indicative of plumbing losses or leakage. The value of meter under registration must be based on evidence and should be less than the company's average meter stock and updated annually; and
- estimates of supply pipe leakage shall be based on a company's own data which is updated annually.

The 2017 Report provides further guidance on monitoring processes, including the impact of adopting models to increase meter penetration. The 2017 Report sets out several potential options for estimating unmeasured households and a framework for selection of an alternative method. Companies with high meter penetration that need to use a different approach to estimating unmeasured household consumption must do so consistently with this guidance and they should set out their approach.

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<sup>8</sup> UKWIR, 17/WR/01/16, published 13/07/2017.

## Data infilling

Data will not always be available from IHMs or SAMs for a range of reasons. In these cases, data can be infilled using the following guiding principles; where a SAM or IHM is inoperable data can be infilled using historic data from the same SAM or IHM premises or average data from a SAM or IHM premises with similar characteristics (from the same stratification).

## Meter under and over-registration (MUR)

Any measurement is subject to an element of error. Some meters may under-read (under registration) and some over-read (over registration).

Within the calculation of per capita consumption, the company will use metered data taken from either customer meters (installed but not used for revenue purposes), small area monitor or individual household monitor.

There is potential for both meter under and over registration to impact on estimates for unmeasured consumption and the water balance.

Dependant on technology and the flow through the meter, there may be no bias (to either under or over read). Any adjustment applied to any meter readings shall therefore be supported by sufficient evidence which shall be published to accompany the company's annual performance report. Any such adjustment to meter readings shall be reviewed by the company annually.

Meter accuracy can be checked by removing meters for off-site testing in an accredited test rig or by in situ verification or calibration.

Meters checks can be undertaken on a representative sample of the meters removed as part of the company's routine meter replacement programme and the results then extrapolated.

The company will make any adjustment to the sum of meter readings used in the water balance calculation consistently each year.

The company shall provide compelling evidence to support any calibration or verification of greater than +/-3%.

The company shall set out its approach to stopped meters and demonstrate that there is no double counting between stopped meters in consumption from billing data and MUR.

## 1.3 Specific exclusions

### Supply pipe leakage (SPL) and plumbing losses

Supply pipe leakage is excluded from consumption data. For measured households which are externally metered supply pipe leakage allowances shall be deducted from the metered data. For unmeasured households externally metered as part of IHM surveys supply pipe leakage shall also be excluded from the data. For SAMs estimates of supply pipe leakage must also be removed from the data.

The company shall use its own estimates of supply pipe leakage and must set out its approach to deriving these estimates and how it excludes supply pipe leakage from metered household consumption and IHM or SAM data used in the PCC calculation. This is also linked to estimates of plumbing losses that is included. The company shall have a robust methodology to determine this. The 2020 UKWIR study examining plumbing losses<sup>9</sup> may help with this.

The company shall:

- take account of supply pipe leakage in the estimation of both measured household consumption and unmeasured household consumption;
- use its own estimates of supply pipe leakage which are annually updated; and
- demonstrate how these estimates have been derived.

The information and assumptions made for leakage, per capita consumption and business demand PCs must be consistent and be based on the same water balance calculations. If any information is restated for one of the PCs, the others must also be restated if there is any impact on them.

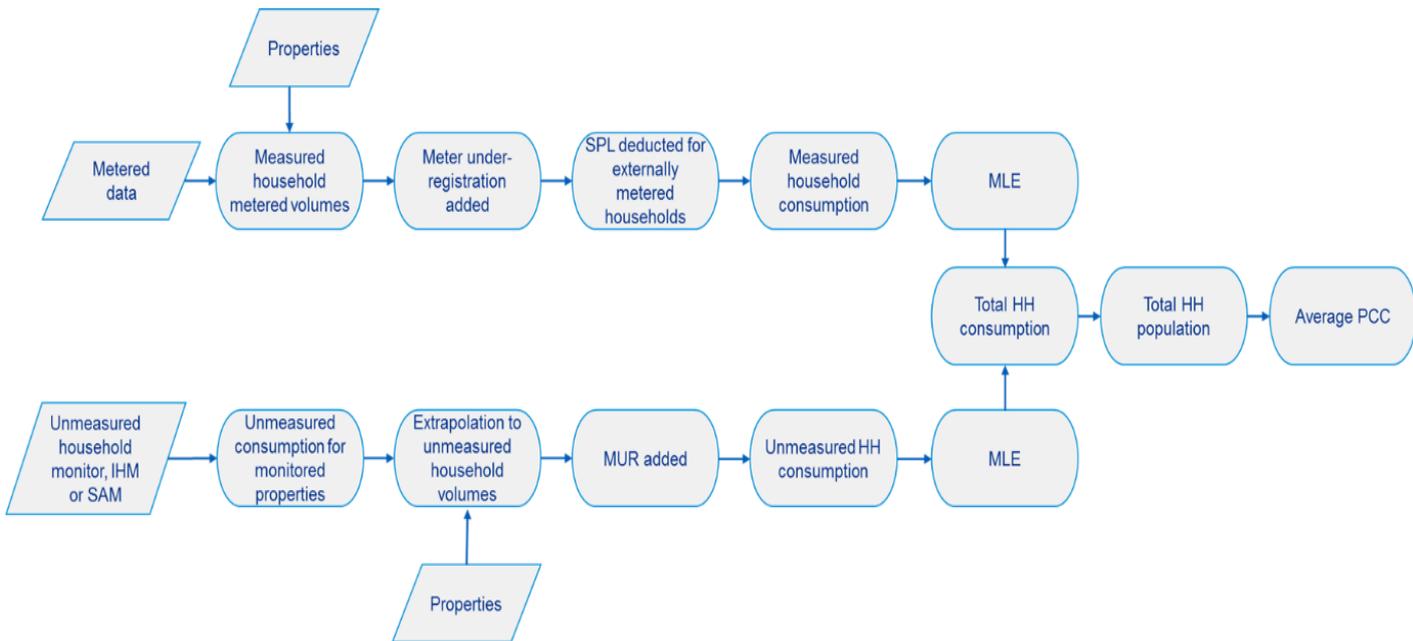
## 1.4 Reporting and assurance

The components of PCC are described in the following sections. The process for deriving average PCC is shown below.

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<sup>9</sup> Understanding the Balance Between Customer Use, Supply Pipe Leakage and Plumbing Losses in Water Delivered to Household Properties, 20/WM/08/72, UKWIR 2020.

**Figure 1 – Flow diagram to derive PCC**



The company will also report per capita consumption as a three year average in litres per person per day to one decimal place, corresponding to the percentage reduction reported.

The PCC performance commitment should be broken down into its constituent elements for assessment of compliance for reporting purposes. The compliance checklist identifies the elements in average per capita consumption to be considered.

The company shall ensure that its outcome delivery incentive payments only relate to real performance changes and not definitional, methodological or data changes in performance commitments.

**Compliance checklist**

The company shall complete the checklist below and report to Ofwat if any element is not green. Where an element is not green, we may intervene to protect customers and ensure that the company does not benefit from insufficient data quality. See Annex 1 for assessment rules for each element.

**Table 1 – PCC compliance checklist**

	Component / Element	Component R/A/G	Element R/A/G	Reason for any non-compliant component	Confidence grade
1	Household population estimates				

	Component / Element	Component R/A/G	Element R/A/G	Reason for any non-compliant component	Confidence grade
1a	Household population derived using WRMP methodology				
1b	Evidence for adjustments for clandestine population if any				
1c	Household population updated annually				
1d	Exclusion of non-household population in accordance with WRMP methods				
<b>2</b>	<b>Household premises estimates</b>				
2a	Definition of household/ non-household consistent with eligibility under market separation.				
2b	Evidence of void premises updated annually				
2c	Property figures annually updated				
<b>3</b>	<b>Measured household consumption</b>				
3a	Metered data is derived from own billing system				
3b	If leakage allowances are applied the process and evidence for this is clearly set out.				
3c	Average SPL deductions for externally metered households using company own data updated annually.				
3d	Meter under-registration (MUR) is applied consistent with own estimates. Evidence of MUR available and is compelling for MUR above 3%.				
3e	Meter replacement consistent with own replacement programme.				
<b>4</b>	<b>Unmeasured household consumption</b>				
4a	Monitors follow principles set out in the UKWIR report 'Best Practice for unmeasured per capita consumption monitors 1999' <sup>10</sup> and the more recent				

<sup>10</sup> UKWIR, 99/WM/08/25, published 17/04/2002.

	Component / Element	Component R/A/G	Element R/A/G	Reason for any non-compliant component	Confidence grade
	report 'Future Estimation of Unmeasured Household Consumption'. <sup>11</sup>				
4b	Consumption is derived from own IHM or SAM or evidence to support other method appropriate for high meter penetration companies.				
4c	Evidence that survey is representative (based on demography, property type or other factors) of the company as a whole; Valid data available from at least 80% of monitors as an annual average measure.				
4d	For companies using SAMs - SAM comprises a representative sample of customer' characteristics. The sample size is sufficient to provide a statistically representative sample after allowing for outages. Where the proportion of metered premises in an area exceeds 50% of total premises then further data validity tests are applied. For companies using IHMs – IHM comprises representative sample of customer characteristics. The sample is at least 1000 premises.				
4e	Uncertainty allocated to unmeasured household consumption is estimated and justified.				
4f	There is continual monitoring and maintenance of IHMs and SAM monitors.				
4g	Meters are selected to provide sufficient granularity to detect low continuous flows indicative of plumbing losses or leakage short duration flow variations. The value of meter under registration is				

<sup>11</sup> UKWIR, 17/WR/01/16, published 13/07/2017

	Component / Element	Component R/A/G	Element R/A/G	Reason for any non-compliant component	Confidence grade
	less than the company's average meter stock.				
4h	Estimate of plumbing losses is based on own data.				
4i	Company own estimate of MUR for monitor meters which is updated annually. Evidence of MUR available and is compelling for MUR above 3%.				
4j	Meter replacement consistent with own replacement programme.				
<b>5</b>	<b>The information and assumptions made for leakage, per capita consumption and business demand PCs is consistent and be based on the same water balance calculations.</b>				

**Table 2 Definition parameters**

<b>Parameters</b>	
<b>Measurement unit and decimal places</b>	Percentage reduction from 2019-20 baseline, reported to one decimal place. The volumetric levels resulting from the application of the percentage reduction in litres/person/day (l/p/d) reported to one decimal place.
<b>Measurement timing</b>	Reporting year
<b>Incentive form</b>	Revenue
<b>Incentive type</b>	Outperformance and underperformance payments
<b>Timing of underperformance and outperformance payments</b>	In-period
<b>Price control allocation</b>	50% Water resources 50% Water network plus
<b>Frequency of reporting</b>	Annual

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<b>Parameters</b>	
<b>Any other relevant information</b>	Performance commitment levels are set as percentage reduction from 2019-20 baseline. Incentive payments relate to performance changes expressed in litres/person/day (l/p/d).
<b>Links to relevant external documents</b>	N/A

## Annex 1 Compliance Checklist

This annex sets out the criteria on which to report checklists where specified in the performance commitment definition.

Compliance for elements is reported against:

<b>R</b>	Not compliant with the guidance and having a material impact on reporting
<b>A</b>	Not compliant with the guidance and having no material impact on reporting
<b>G</b>	Fully compliant with the guidance

An overall RAG to be assigned for each component based on the following rules:

Compliance for overall components is reported against:

<b>R</b>	There are one or more red elements in the component, or the combined effect of amber elements is considered to produce a material impact.
<b>A</b>	Half or more of the elements in the component are amber and the combined effect of the amber elements is considered not to produce a material impact
<b>G</b>	More than half of the elements in the component are green

For each component on the checklist, and for the overall performance measure, the company will report a confidence grade. Confidence grades provide a reasoned basis for the company to qualify the reliability and accuracy of the data.

The company shall employ a quality assured approach in the methodology used to assign confidence grades, particularly if sampling techniques are in place. The confidence grade combines elements of reliability and accuracy, for example:

A2 – Data based on sound records etc. (A, highly reliable) and estimated to be within +/- 5% (accuracy band 2) Reliability and accuracy bands are shown in the tables below.

Reliability Band	Description
A	Sound textual records, procedures, investigations or analysis properly documented and recognised as the best method of assessment.
B	As A, but with minor shortcomings. Examples include old assessment, some missing documentation, some reliance on unconfirmed reports, some use of extrapolation.
C	Extrapolation from limited sample for which Grade A or B data is available.

D	Unconfirmed verbal reports, cursory inspections or analysis.
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Accuracy band	Accuracy to or within +/-	But outside +/-
1	1%	-
2	5%	1%
3	10%	5%
4	25%	10%
5	50%	25%
6	100%	50%
X	Accuracy outside +/- 100 %, small numbers or otherwise incompatible (see table below)	

Certain reliability and accuracy band combinations are considered to be incompatible, and these are blocked out in the table below.

Compatible confidence grades				
Accuracy band	Reliability band			
	A	B	C	D
1	A1			
2	A2	B2	C2	
3	A3	B3	C3	D3
4	A4	B4	C4	D4
5			C5	D5
6				D6
X	AX	BX	CX	DX