



A Report for

National Infrastructure Commission

Curation of Historical Infrastructure Data:
Water & Wastewater

April 2020

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Executive Summary

The National infrastructure Commission is seeking to curate historical data across a range of infrastructure sectors as part its role to provide expert impartial advice and recommendations to the government on economic infrastructure in the UK.

This report summarises the findings of a pilot project to investigate the availability of historical data for the water and sewerage sector prior to 1990.

The Commission has already sourced consistent time series generated back to the early 1990s, which has been published as part of the Commission's Strategic Investment and Public Confidence report. This aligns with the beginning of a consistent information reporting framework introduced by the sector regulator Ofwat after privatisation of the ten regional water authorities in 1989.

We wish to acknowledge the invaluable assistance and guidance provided by Professor John W. Sawkins and Professor David S. Saal. Both academics have undertaken original research on the economic performance of the water and sewerage sectors in England and Wales and through this work have collated key data series for the sector in the pre-privatisation period. We have referenced their respective contributions in this report.

Data availability

Data availability for the water and sewerage sector in the pre-privatisation period can be best summarised as:

“Taken as whole, the data series in the UK are both chaotic and generally very inaccessible”¹

This highlights that privatisation represented an important “data break” for the water sector. Post privatisation the information requirements of the newly established regulatory framework quickly established a more ordered picture on data availability. Whereas, prior to this in the pre-privatisation period two factors reinforced a more diffuse situation, namely:

- The fragmented and regional nature of the sector. The general absence of centralised accountability meant there was less need to create and maintain consistent data reporting; and
- The disbanding of the national Water Data Unit (1981) and the National Water Council (1983). These bodies had been set up following the 1973 re-organisations with national data gathering and dissemination roles.

We observe a clear progression towards an improving (and less chaotic) picture on data availability as the sector moved towards privatisation during the 1980s.

It is also very evident that significant volumes of data from original sources (e.g. annual reports) are available typically in archive form, but as yet much of this data remains uncollated nor synthesised.

¹ Quoted from Penning-Roswell, E.C. and Parker, D.J. (1983) Water Volume 17 Reviews of United Kingdom Statistical Sources (ed. W.F. Mauder), Pergamon Press: Oxford.

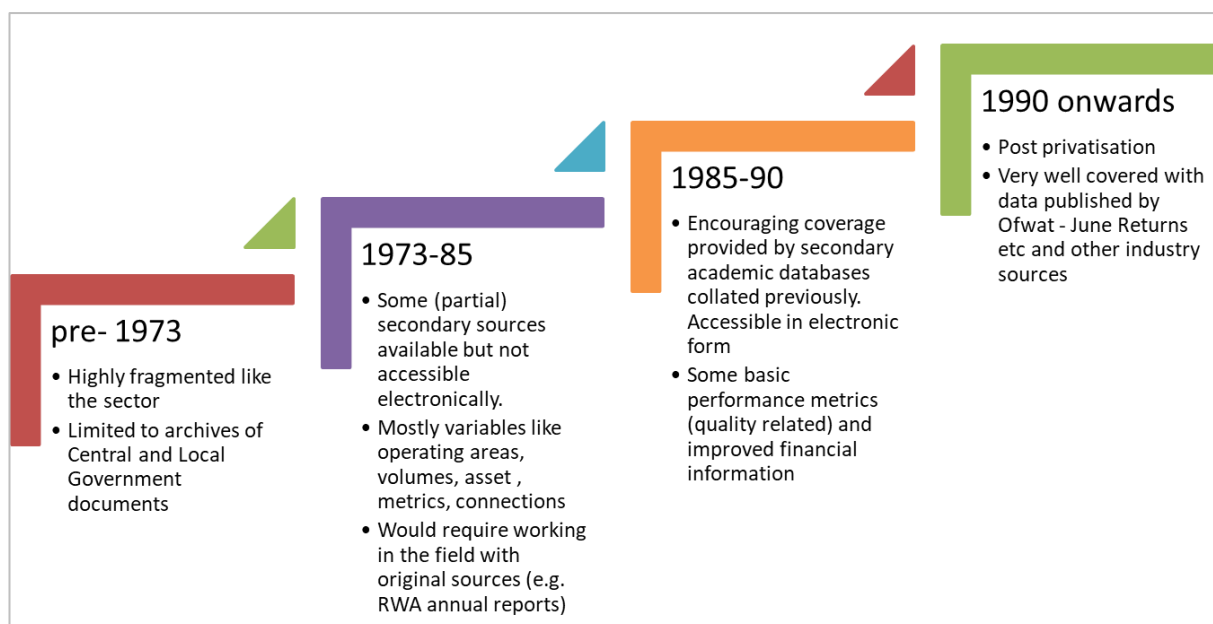


Figure 0.1 Availability of Water Sector Data over time

Data Sources

We have identified a number of key publications containing data that can be compiled into suitable time series to extend the Commission's metrics in some areas. These are largely only available in hard copy and are spread throughout a number of libraries nationally.

Key publications identified are:

- Waterfacts - a series of this water industry body publications has been sourced from 1985 to 2000 in pdf form from Ofwat
- Cipfa - annual statistics published on the sector covering a range of measures - a sample of three publications have been collected as part of this project
- Digest of Environmental Protection and Water Statistics - a sample of tables from one report has been collected
- Annual Reports and Plans - a sample of three companies and three authorities in each of 3 years have been collected as part of this project.

We have sampled tables from these reports in order to:

- Compile times series where possible
- Identify the challenges to compile additional times series

Key source material is provided to the Commission in pdf form alongside this report.

Our detailed findings are summarised in Table 4.1 (reproduced below). The Commission's current performance metrics are highlighted in blue in the table.

It has been possible to create a time series for two of the Commission's highest priority performance metrics:

- Average domestic water and sewerage bills

- Volumes of water supplied

As well as for domestic water meter penetration.

At this stage it has not been possible to collate a time series for other high priority metrics such as leakage. A number of the Commission's metrics relate to England only and consistent time series could be generated for England and Wales, rather than England only.

Table 0.1 Summary of Historical Data Compilation Potential

Metric	Description	Earliest current data point	Historical Data Compilation Potential
Volume	Volume of consumption		
	Water consumed (Mld England)	1999	1961-1998 data compiled (structural break 98-99 could be resolved)
	Average daily water consumption (litres/ person/day)	1992-93	Limited possibilities (few data points available)
	Water abstracted (billion cubic metres, England)	2000	Possible with additional sources
Resilience	Resilience to large shocks		
	Security of Supply Index	2016/17	No comparable measures
	Everyday resilience		
	Time that properties lose access to water	2015/16 (199/92 with other measures)	Very limited data pre-1990 and measures not directly comparable
	Number of sewer flood events	1992/93	Very limited data pre 1990
	Properties with below adequate pressure (per10k connections)	1992/93	Very limited data pre 1990 Explore DoE archives at Kew.
	Annual mains bursts per 1,000 km	1991/92	
	Annual sewer collapses per 1,000 km	1991/92	
Quality	Service Quality		
	Number of water quality incidents	1991/92	No comparable measures or data pre 1991
	Quality of User experience		
	Satisfaction derived from survey	2006	Not available
Cost	Average annual water and sewerage bill	1989/90 (2018/19 CPI)	1975/76 - 1990/91 (nominal prices)
Environment	Emissions		
	CO2e emissions per megalitre of water consumed	2015/16	Limited possibilities based on sources reviewed

	Total CO2e emissions from water and wastewater	2017/18	Limited possibilities based on sources reviewed
	Environmental Externalities		
	Number of serious pollution incidents caused by water companies	2002	Potential with additional sources. (NRA annual reports)
	Percentage of water bodies with unsustainable levels of abstraction		Very limited - no comparable definition of 'unsustainable'
	Average concentration of reactive phosphorous in rivers	1974	Already compiled to 1974
	River Water Quality: Percentage of river by classification III or IV for England and Wales.	n/a	Time series attempted but some gaps remain 1970, 1975, 1980, 1984-88. Potential to complete with further sources.
	Percentage of river and canal in each GQA chemical grade by RWA	n/a	1990-1994, 1996-1998 Waterfacts
	Percentage of river and canal in each GQA chemical grade by nation	n/a	1990-1995 Waterfacts international comparisons. Possible extension with other sources
	Bathing water quality in England % meeting standards; % passed 1976 directive	1989	Can be extended back to 1986. Earlier historical data (1979-1985) on different basis.
	Natural capital		
	Value of water services provided by natural environment	1997	Not observed in sources reviewed.
Efficiency	System efficiency		
	Leakage	1992/93	Limited. Potential to create series from original sources with definitional differences.
Financial	Multiple - full accounts available covering operating expenditure, capital expenditure, turnover, profit/loss, manpower	n/a	Extendable to 1975/76 via additional sources.
	Capital expenditure	n/a	1974-75 to 1987/88 compiled. Potential to further refine and extend
Infrastructure	Household meter penetration	1999/00	Extended to 1985/86

	Length of mains & sewers (kms)	n/a	Possible with additional sources
	Numbers of treatment works (water and sewerage) & other categories of infrastructure (e.g. reservoirs, pumping stations etc)	n/a	

Recommendations and Next Steps

The benefit of this pilot project has been to establish that data for the pre-privatised water sector in England and Wales is available. The challenge going forward will be to collate more holistically and systematically catalogue - ideally in electronic format- the available data, much of which lies in original archived materials.

With some additional work, it would be possible to compile significantly improved data series by sourcing additional copies of the publications sampled in this pilot project. This could also be extended to involve collection of additional original material from a range of sources including exploration of the DoE archives in the National Archives at Kew and a request to water companies.

Our recommendations would be:

- In the light of our findings, obtain further copies of relevant annual reports and publications to confirm the sets of measures where data availability is best for the pre-privatisation periods;
- Commission further detailed investigations to develop a full data inventory consistent with the Commission's current measures;
- Establish working relationships with academic researchers who are active as researchers in the sector and who can offer expertise and insight on the interpretation of data for the pre-privatisation periods.

1 Introduction

This report summarises the results of a pilot project undertaken for the National Infrastructure Commission (the Commission) to identify and collate historical water performance data.

1.1 Objectives

The Commission has developed a framework to assess the quality of the UK's infrastructure services, identifying key performance measures across relevant sectors within a consistent framework.² This allows the Commission to compare different infrastructure systems and measure the performance of infrastructure against the Commission's objectives.

The Commission has worked with the water regulator, Ofwat, to curate and publish key performance metrics describing water sector performance over time.³ Data for most of these metrics has generally been sourced and consistent time series generated, where possible, back to the early 1990s, shortly after privatisation.

This report summarises a pilot project to explore the possibility of further curation of more historical data to generate a longer-term view of the performance of the water sector.

1.2 Approach

The project methodology involved two phases:

1. Literature review & data search
2. Collation & synthesis of data

Literature review and data search

This step involved identification of possible sources of historical data in either:

- compiled databases or
- original source documents.

A literature review was carried out to identify relevant government, industry and academic publications containing or drawing on relevant pre 1990 water industry data. Online catalogue searches included the National Archives, the British Library and the National Library of Scotland.

Enquiries were made to a number of academic researchers as well as current and former water industry personnel to identify the location of any pre 1990 data sources.

A formal freedom of information request was made to Ofwat.

² <https://www.nic.org.uk/publications/technical-annex-measuring-infrastructure-performance/>

³ <https://www.nic.org.uk/wp-content/uploads/Performance-data-for-water-energy-and-telecoms.pdf>

Collation & synthesis of data

Following review and prioritization of the potential data sources with the Commission a sample of original hard copy sources was collected from the National Library of Scotland.

An electronic database containing historical water performance data collected as part of academic research was kindly made available for the project by Professor David Saal.

Data contained in the samples has been catalogued enabling time series to be collated from the different sources for some metrics and an understanding of the scope for:

- a. extending the collated time series further back in time
- b. generating time series for additional metrics

This report summarises the data available in the original and collated sources identified together with the times series that it has been possible to collate.

It concludes with recommendations for future work arising from this pilot project, to collate further historical water industry performance metrics of interest to the Commission.

2 Context

2.1 Introduction

Data availability for different time periods historically and the extent of the challenge of collection and collation reflects the evolving structure of the water sector in England & Wales.

2.2 Evolution and consolidation in the sector

The structure of the Water sector in England & Wales has evolved and consolidated over time from its very disparate beginnings. In the nineteenth century provision was carried out by a variety of private companies and undertakings which did not provide universal access. Two Public Health Acts, in 1848 and 1875, increased the responsibility of local authorities to improve access to water and sanitation.

In 1945 the sector remained highly fragmented with over 1,000 bodies involved in water supply and over 1,400 in sewerage, most of which were local authorities.⁴ The 1945 Water Act set up a structure to encourage amalgamation and mergers between water suppliers. A 1963 Act introduced abstraction permits in response to a severe drought in 1959.

In response to continued problems with planning water resources the 1973 Water Act established ten Regional Water Authorities to whom the duties of providing water and sewerage services were transferred from local authorities. These new authorities were required to operate on a cost recovery basis and were organised along river basin lines to aid planning and co-ordination. 29 privately owned statutory water companies (only supplying water services, not sewerage) remained outside the scope of these new regional water authorities. Two industry bodies, the Water Authorities Association and the Water Companies Association represented the industry (specifically the water authorities and the water companies respectively). The Chartered Institute of Public Finance & Accounting drew together sector wide expenditure information and central government retained oversight via the Department of the Environment and its predecessors together with the Welsh Office.

Whilst regional co-ordination was widely seen as bringing efficiency benefits, capital investment halved between 1974 and 1980.⁵ The 1983 Water Act enabled the regional authorities to access private capital and the regional water authorities were privatised in 1989.

2.3 Data accessibility

The implications of this evolution and consolidation are that the availability and accessibility of water sector performance data improves over time. Authority and company reporting evolved over the 1980s with the Department of the Environment & Welsh Office overseeing corporate planning for investment needs and requesting longer term plans in 1983.

⁴ 'The development of the Water Industry in England & Wales', Ofwat & Defra, 2006

⁵ 'The Nation's Infrastructure: Water', national economic Development Office, 1985

Figure 2.1 summarises the picture that has emerged of the availability and accessibility of data over time.

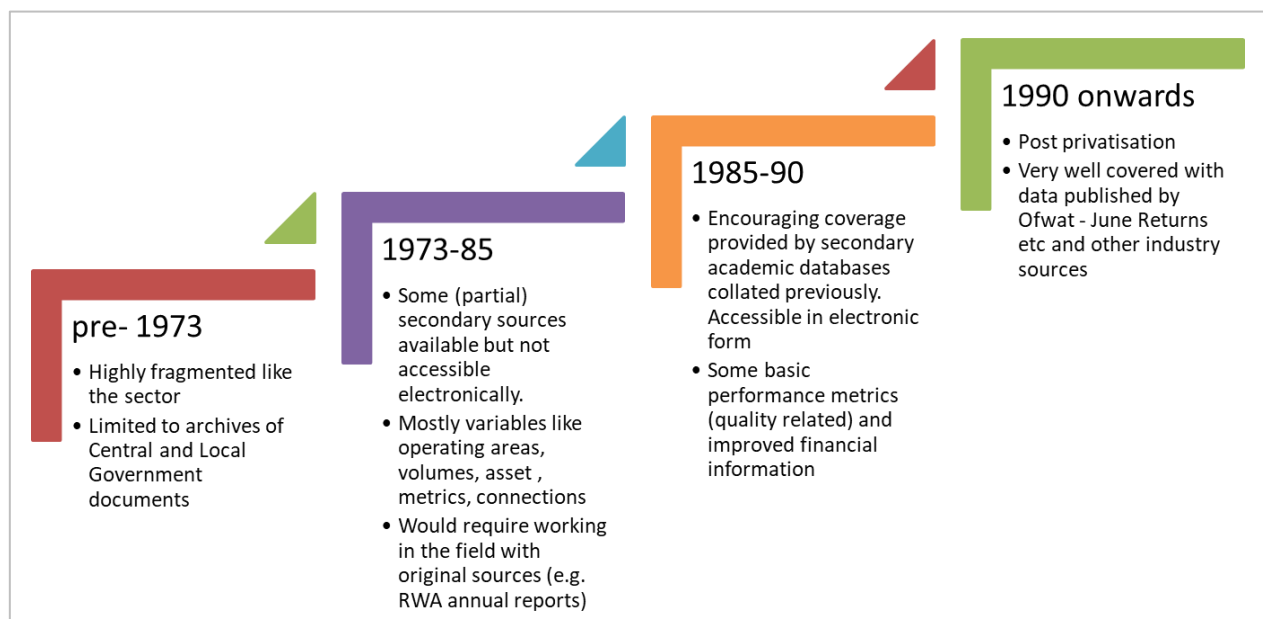


Figure 2.1 Availability of Water Sector data over time

3 Sources

3.1 Introduction

This section summarises the historical data sources relating to performance and expenditure in the water industry identified through primary searches and discussions with academics.

3.2 Collated Data sources

We identified two relevant collated data sources that have their origins in academic research undertaken in the early to mid 1990s and early 2000s. The academics we consulted were:

- Professor John W. Sawkins, currently Deputy Principal (Learning and Teaching) and Pro-Vice-Chancellor, Heriot-Watt University. We describe this dataset below as the Sawkins dataset.
- Professor David S. Saal, currently Professor of Microeconomics at the School of Business and Economics, Loughborough University. We describe this dataset below as the Saal dataset.

Both academics were known in professional and personal capacities to the project team and their knowledge, experience and contributions were invaluable to our data searches.

The Sawkins Dataset

Professor Sawkins completed in 1993 a PhD thesis at University of Edinburgh titled:

Can yardstick competition work? A study of the water and sewerage industry in England and Wales.

As well as communicating with Professor Sawkins directly we also obtained an electronic copy of this PhD thesis which is freely available at the Edinburgh Research Archive (<https://era.ed.ac.uk/handle/1842/21517>).

This thesis presents comparative efficiency studies of water supply in England and Wales and sewage treatment and disposal in England and Wales. Econometric and statistical methods were used to assess the relative efficiency of the pre-privatisation water companies.

As this was novel research at the time, Sawkins developed his own databases to undertake his analysis. The data described in his thesis in all likelihood remains a unique collation of water sector data for the pre-privatisation period, but it was very much focused on his research requirements.

We have established that no electronic form of the data used in the Sawkins thesis remains and there is no reproduction of his full dataset in the published thesis - we do however include extracts of his datasets below.

Communications with Professor Sawkins revealed that his original source library collated for the purposes of his research had been deposited with the National Library of Scotland (NLS). The project team undertook a visit to NLS guided by the sources revealed by Professor Sawkins and the results of this visit from this are reported more fully below in Section 4.

Sawkins dataset - Water supply data

On water supply the Sawkins datasets collated data for 20 water authorities/statutory water (only) companies. The data he constructed covered the 10 year period 1977 to 1986. Table 3.1 below shows the company composition of the sample and Table 3.2 details the variables that were collated.

Table 3.1 Sawkins water supply dataset - companies (original source)

Regional Water Authorities:	Identification
* Anglian	1
* Northumbrian	2
* North West	3
* Severn Trent	4
* Southern	5
* South West	6
* Thames	7
* Welsh	8
* Wessex	9
* Yorkshire	10
Statutory Water Companies:	
Bournemouth and District Water Company	
Bristol Water Company	
Cambridge Water Company	
Chester Waterworks Company	
* Colne Valley Water Company	11
East Anglian Water Company	
East Surrey Water Company	
* East Worcestershire Waterworks Company	12
Eastbourne Water Company	
* Essex Water Company	13
Folkestone and District Water Company	
Hartlepool Water Company	
Lee Valley Water Company	
* Mid Kent Water Company	14
Mid Southern Water Company	
Mid Sussex Water Company	
Newcastle and Gateshead Water Company	
North Surrey Water Company	
Portsmouth Water Company	
Rickmansworth Water Company	
* South Staffordshire Water Company	15
* Sunderland and South Shields Water Company	16
* Sutton District Water Company	17
Tendring Hundred Waterworks Company	
* West Hampshire Water Company	18
West Kent Water Company	
* Wrexham and East Denbighshire Water Company	19
* York Waterworks Company	20
Cholderton and District Water Company	
* = indicates companies included in the sample.	

Table 3.2 : Sawkins water supply dataset - variables (original source)

<u>Table 4.1: Database Variables.</u>	
AREA	Area of supply (square kilometres).
POPU	Population (thousands).
MAIN	Length of mains (kilometres).
EMPL	Total number of employees.
RAIN	Rainfall (mm per year).
WATE	Output (megalitres per day).
SRWT	Surfacewater (proportion of total water abstracted from surfacewater sources - percentage).
GDWT	Groundwater (proportion of total water abstracted from groundwater sources - percentage).
OPCT	Operating cost (thousands of pounds).
CAPE	Historic cost capital expenditure (thousands of pounds).
TSCT	Total staff cost (thousands of pounds).
FIXA	Fixed assets historic cost net book value (thousands of pounds).
CCFA	Fixed assets current replacement cost (thousands of pounds).
PK	Price of capital (public works loan board average rate of interest on new advances).
PE	Price of electricity (average net selling value per kilowatt hour sold for waterworks etc , pence).
PR	Price of rates (average non domestic rate poundage for English authorities, pence).
PL	Price of labour (average hourly earnings for manual men in other energy and water supply industries, pence).
PP	Price of other materials (retail prices index).

Sawkins dataset - Sewerage data

The sewerage service analysis in the Sawkins thesis was cross-sectional in design and therefore a time series of data was not collated. The dataset was also not company level but at treatment works level. Table 3.3 summarises the variables that were collated and used.

Table 3.3 : Sawkins sewerage dataset - variables (original source)

CIPFA Sewage Treatment and Disposal Statistics 1979-80:	
Variables Reported.	
Water Authority / Division / Works.	
Date of commencement of operation or any major reconstruction.	
Population of area draining to the works.	
Method of purification.	
Dry weather flow (cubic metres per day).	
Trade effluent (cubic metres per day).	
Total Sewage Flow (cubic metres per day).	
Proportion of dry weather flow which is treated (%).	
Average strength of influent (mg/litre)	
- 5 days Biochemical Oxygen Demand (BOD) at 20°C	
- Chemical Oxygen Demand (COD)	
- Suspended solids (SS)	
Approved river standard (mg/litre)	
- 5 days BOD at 20°C	
- COD	
- Suspended solids	
Standard of purification actually achieved (mg/litre)	
- 5 days BOC at 20°C	
- COD	
- Suspended solids	
Works charges (costs per cubic metre DWF)	
- Sewage purification (subdivided by treatment method)	
- Sludge disposal (subdivided by disposal method)	
- Other direct works charges	
- Gross works costs	

The sewerage service variables were sourced from CIPFA which as documented elsewhere is one of the primary sources we have identified for pre-privatisation period data.

Sawkins dataset - Primary sources

To summarise, our communications with Professor Sawkins and review of his published thesis identified the following primary sources as relevant for the pre-privatisation period:

- National Government: Digest of Environmental Pollution and Water Statistics and 'Water Data' (published by the disbanded Water Data Unit).
- Regional Water Authorities: annual reports issued between 1974 and 1989.
- Statutory Water Companies: annual reports between 1974 and 1989 and the WSA publication.
- Local government statistics:
 - CIPFA (1981) 'Water Supply and Sewage Treatment and Disposal Statistics 1979-80 Actuals', CIPFA, London.
 - CIPFA (1986) 'The Water Industry: United Kingdom Service and Costs 1986', CIPFA, London.
 - CIPFA (1989) 'The Water Industry: United Kingdom Services and Costs 1988 and Charges for Services 1989/90' CIPFA, London.

We present more details from these original sources in Section 3.3 below.

The Saal Dataset

Professor Saal published the following academic research papers in 2000 and 2001:

- *The Impact of Privatization and Regulation on the Water and Sewerage Industry in England and Wales: A Translog Cost Function Model*, Managerial & Decision Economics, 21 (6):253-268, 2000
- *Productivity and Price Performance in the Privatized Water and Sewerage Companies of England and Wales*, Journal of Regulatory Economics, 20 (1):61-90, 2001

The research estimated models of total factor productivity in the water sector in England and Wales over the period 1985-1999. This means it covers the period immediately preceding the privatisation of the RWAs in England and Wales. The research was undertaken with a database that Professor Saal collated from original sources over a 12 month period.

Professor Saal provided the project team with the datasets used in this research in electronic form. We have included as an annex to this report an EXCEL spreadsheet containing some of the data series collated by Professor Saal.

As a summary we document in the following tables an overview of the data sources and variables available in the Saal dataset with an indication of available time periods. Our own review of this dataset has also focused on understanding the

quality of the data that was collated. In particular we have reviewed the data to establish:

- Where a data time series is complete
- Where there is evidence of data-breaks and (the reasons for those breaks)
- Where data has been based on interpolation rather than actual data

Table 3.4 : Saal Dataset - water operational / infrastructure variables

Source	Data variable	Coverage - Years	Coverage - Companies	Status of Data Checks and Reviews
CIPFA	Resident winter population 000s	1983/84 to 1987/88	All 10 WaSCs	Data missing for 88/89 and 89/90, but not an essential variable
CIPFA	Area Served for Water Supply	1983/84 to 1987/88	All 10 WaSCs	Some missing years (88/89 and 89/90) but not a significant issue given it is a non-changing variable
CIPFA & Waterfacts	Water Supplied ML/day	1979/80 to 1985/86, 1987/88	All 10 WaSCs	Data series complete and available for all RWAs
CIPFA	Km of water mains	1983 to 1987/88	7 WASCs complete without issue, 2 data points missing, 9 data points red for review	Data issues appear more pertinent for Severn Trent and Thames RWAs. Evidence of step changes in some data around 90/91 which might impact on reliability of time series. Earlier data (84 to 88) described as crude estimates for Thames and North West RWAs
CIPFA	Proportion of water supply from underground sources	1982/83, 1985/86, 1987/89	All 10 WaSCs	Variable is very company specific (depends on mix of sources) and limited time series. But available data pre-90s suggests proportions are reasonably stable.

Table 3.5 : Saal Dataset - wastewater operational / infrastructure variables

Source	Data variable	Coverage - Years	Coverage - Companies	Status of Data Checks and Reviews
CIPFA	Area served (sewerage)	1983/84 to 1987/88	All 10 WaSCs	Data missing for 88/89 & 89/90 but not considered an issue given non-changing nature of variable
CIPFA	Trade effluent ML/day	1983/84 to 1987/88	All 10 WaSCs	Data for 88/89 to 91/92 is missing for all RWAs and has been interpolated in database.
CIPFA	Km of sewers	1983/84 to 1987/88	8 WaSCs (North West and Thames missing)	Same issues as water mains. Evidence of step changes around 90/91 which suggest definition or measurement changes. Most likely to relate to new obligations on Section 24 sewers. Impacts on trends.
CIPFA	% of population connected to any STW	1983/84 to 1987/88	9 data points in red	Data missing pre 88 for Welsh (87/88), North West (83/84 to 87/88) and Thames (85/86 to 87/88). Currently interpolated in dataset. Definitional change around 90/91 which affects comparisons pre and post privatisation. No specific data pre-90 for secondary or tertiary treatment works
CIPFA	Resident pop of sewerage Area	1983/84 to 1987/88	All 10 WaSCs	Missing data for all RWAs in 88/89 and 89/90 which is currently interpolated in dataset
CIPFA	% pop connected to sewers	1983/84 to 1987/88	All 10 WaSCs	Missing data for 88/89 which is currently interpolated in the dataset
CIPFA	Connected Sewerage Population	1983/84 to 1987/88	All 10 WaSCs	Missing data for all RWAs in 88/89 and 89/90 which is currently interpolated in dataset

The Saal datasets also collated data on the following quality/performance indicators:

- Drinking Water Compliance
- Sewage Treatment Plant compliance
- River Water Quality - England & Wales
- Bathing Water Quality

Professor Saal constructed his own index measures to quantify changes in these performance metrics. Table 3.6 provides details on the nature of this data

(specifically whether it is derived or interpolated data) - particularly for the period prior to 1990.

Table 3.6 : Saal Dataset - water and environmental quality indicators

Quality Indicator	Assessment of data issues
Drinking Water compliance - all measures	No actual observed data before 1991. Data for the period 85 to 90 in the dataset is based 91 values
Sewage works compliance	First Available Data is for 1987. Therefore 1986 and 1985 assumed equal to this value
River Water quality - England & Wales	
% in Good, Fair Categories	Data in pre-privatisation period has been re-weighted to be consistent with 1991 classification weightings.
Average Weighted Index of River Water Quality	Classification weightings differ between 85-91 and 91-99 periods. Therefore, break in the time series due to definitions
Net improvements in GQA Chemical Quality (Relative to 1991)	First Available for 1994, linearly extrapolated backward to 1991, assumed equal to zero for all years 1985-90
Bathing Water Compliance	First available data is 1986. Therefore 1985 assumed equal to this. Index is adjusted for change in number of identified beaches and is constructed as 3 year moving avg. in order to correct for erratic trend.

3.3 Original Data sources

Searches confirmed the location of a number of primary sources which could contain data to build time series data for the water industry.

Department of the Environment Digest of environmental protection and water statistics

The digest is available at the National Library Scotland which can be ordered [here](#). The series runs from 1984 to 1994 and is stored off-site meaning the source must be requested two days before.

Examination of the beginning of the series has found data relating to the following areas:

- Abstraction
- Bathing Water Quality
- Expenditure on pollution control
- Sewage treatment and disposal
- Water supply

The data found is catalogued in Appendix A.

Cipfa

Cipfa statistics are published for a range of measures covering the water industry. Searches located three sources in the National Library of Scotland which have all been examined and the references are listed below.

CIPFA (1981) 'Water Supply and Sewage Treatment and Disposal Statistics 1979-80 Actuals', CIPFA, London.

CIPFA (1986) 'The Water Industry: United Kingdom Service and Costs 1986', CIPFA, London.

CIPFA (1989) 'The Water Industry: United Kingdom Services and Costs 1988 and Charges for Services 1989/90' CIPFA, London.

Some points of note are that CIPFA (1981) did not provide any runs of time series data for the data tables documented. Furthermore, the sewerage data whilst grouped by authority is presented at works level, e.g. measuring the performance of each works. It would require some work to aggregate up to region level and in many cases this would not be possible. Due to these limitations a full inventory has not been completed of the photographic records relating to the sewerage data.

CIPFA (1986) has a small number of variables which go outside of the reporting year and these relate to customer charges for three years; 1981/82, 1985/86 and 1986/87.

CIPFA (1989) contains more variables which run as time series or provide data points outside of the reporting year for context. Reflecting the needs of the day many of these relate to expenditure, manpower and population - all useful inputs for assessing cost efficiency. These variables cover the years 1983/84 to 1987/88.

Across the three cipfa sources there are variables relating to a number of areas which are set out below

- Asset value
- Expenditure
 - Total/Capex/Opex/normalised
- Income
- Leakage
- Population
 - Nr of properties
 - Area supplied
 - By metered/unmetered
- River water quality
- Sewerage infrastructure
- Trade effluent volumes
- Water and sewerage bills
- Water assets
- Water resources
- Water supply / water distributed

The data tables for each of the three respective cipfa sources are catalogued in Appendix B.

Company reports

Coverage of RWA Annual reports from the National Library of Scotland for the period 1974 to 1991 is not complete however, full enough to provide useful data series.

Figure 3.1 shows a summary of the coverage of these reports 1974-1991 where

- green = records at NLS
- Blue = records out in regional libraries in England
- Orange = other records for review

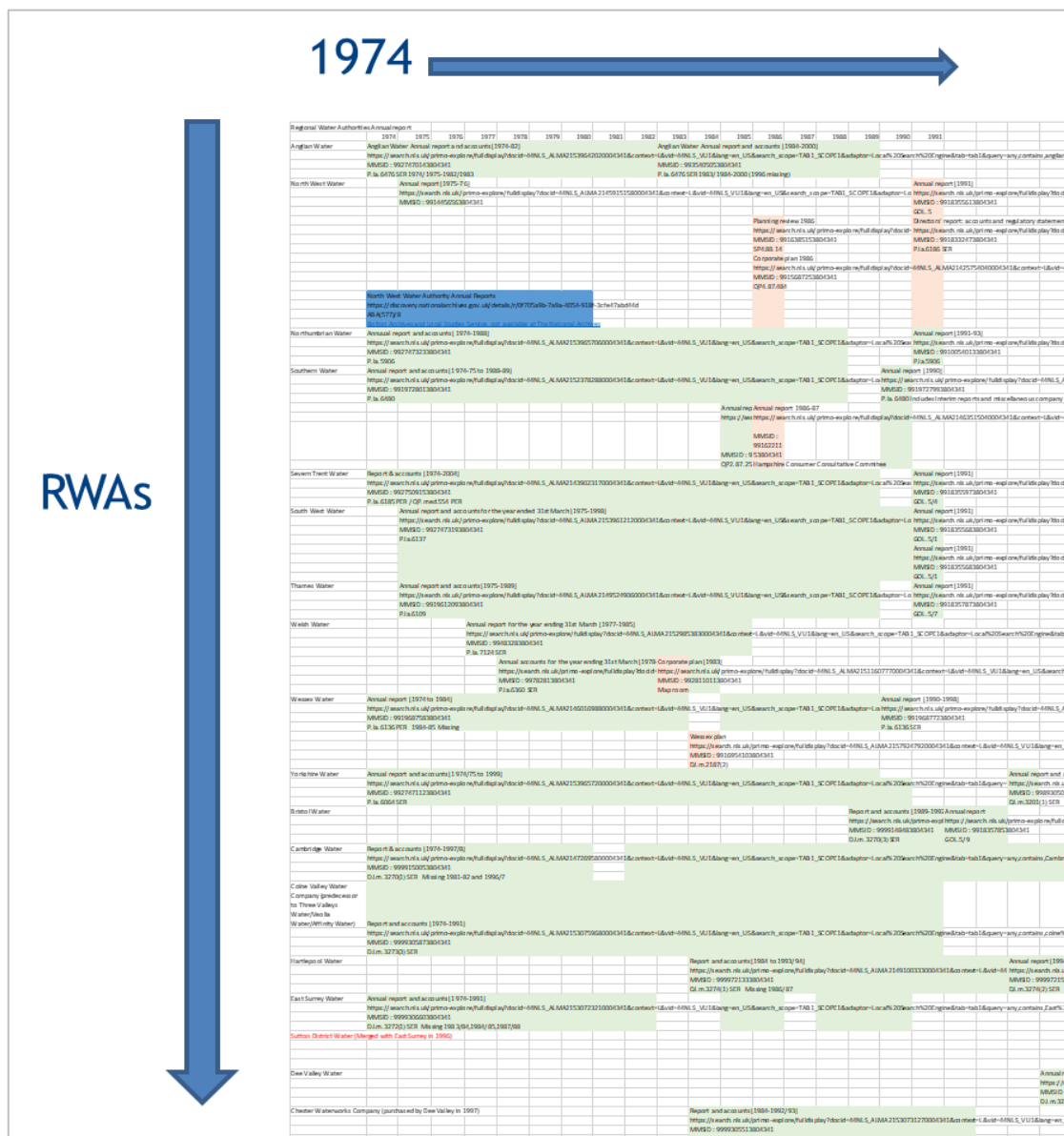


Figure 3.1: Regional Water Authority and Statutory Water Company annual reports

Sampling strategy

Acknowledging the time constraints within the project we decided to collect extracts from a sample of annual reports for 3 years three RWAs and three Statutory Water Companies relating to 1975, 1980 and 1985. The selected companies were

- Anglian Water (financial year)

- Severn Trent (financial year)
- Yorkshire Water (financial year)
- Cambridge Water
- Colne Valley
- East Surrey Water (financial year)

This has been with the aim of understanding the potential of this source to produce time series data. Photographic records of the data tables and accounts have been produced for all of the above.

A full inventory of this has been produced for the Anglian Water region excluding the accounts in Table E.1 as an example in the appendix. It shows that numerous variables are retained across the period 1975-75 to 1984-85. At the same time level of information documented increases for the final year examined.

This pattern is true for the other companies' reports reviewed albeit the breadth of information included in the statutory water company reports is narrower.

While we see a focus on expenditure information and the asset base, there are also records relating to some aspects of performance. These are often standardised between companies - such as with river water quality capturing river lengths falling into each classification band.

Data for the RWAs relates to the following areas:

- Asset data
- Asset value
- Drinking Water Quality
- Expenditure
- Manpower
- Per Capita Consumption
- Population
- River Water Quality
- Sewage treatment and disposal
- Sewerage infrastructure
- Water resources / water supply

The statutory water companies' annual reports typically finish with some general statistics looking back over a 10 year period which can include

- Supply area
- Population supplied
- Number of supplies
- Length of mains
- Average daily supply
- Per capita consumption
- Manpower

Annual Plans

From our research we understand that water authorities and water only companies began to provide 5 year plans to DoE in 1985.

These plans include indicators of Levels of Service as set out in DoE Guidance Notes. We anticipate that the Guidance Notes and company submissions may be held in the DoE files in the National Archives at Kew. However, the relevant bundles have not been made available electronically. Company plans may also be available from company archives or regional archives.

We have located and taken samples of 1985 Plan for Wessex and 1986 for North West Water. The latter contains levels of service for 1984/85 which includes

Water resources:

- Nr of people whose water resources fail to satisfy the water authority's design standard for reliability
 - For resources
 - For inadequate capacity

Water treatment

- Estimated quantity supplied failing to comply with certain chemical standards of EC Directive
- Estimated quantity supplied failing to comply with certain acceptable standards of EC Directive

Water distribution

- Number of people experiencing inadequate pressure
- Number of people suffering loss of supply >12hrs

Sewerage

- Number of properties flooded in 1984/85
- Number of significant sewer failures
- Number of unsatisfactory storm sewage overflows (now being reassessed)

Sewage treatment and disposal

- Equivalent population whose sludge is disposed of unsatisfactorily
- Equivalent population for which effluent discharged other than in compliance with consent conditions
- Equivalent population connected to unsatisfactory sea outfalls

Land drainage

- Area within which NWW's land drainage and flood protection standards are not achieved
- Length of main river requiring improvement to achieve NWW's land drainage and flood protection standards
- House equivalents not covered by flood warning schemes

River and estuarial water quality

- River water quality
 - Class 1 - good / Class 2 - fair / Class 3 - poor / Class 4 - bad by % and km
- Estuary water quality
 - Class A - good / Class B - fair / Class C - poor / Class D - bad by % and km

These examples can be accessed at the National Library of Scotland in Edinburgh.

We have purchased a summary of the plans titled *The Nation's Infrastructure Water*. As a new data set, there were concerns about the comparability of the data and the report highlights ongoing work to improve definitions and data quality. However, the source provides data for the 10 water authorities for 1983/84 and forecasts for 1988/89 for the following measures:

Water supply

- Connected properties (millions)
- % of population with inadequate supplies; pressure
- % of population with inadequate supplies; supply failure
- Water quality volume deficiencies (%); Bacteriological
- Water quality volume deficiencies (%); Chemical
- Water quality volume deficiencies (%); Aesthetic
- Water quality volume deficiencies (%); Acceptability

Sewerage

- Connected properties (millions)
- Extent of flooding - % of properties
- Number of sewer failures
- Number of unsatisfactory storm overflows
- % of unsatisfactory storm overflows (where known)

Environment

- % of river length not attaining long term objectives
- Equivalent population connected to unsatisfactory sea outfalls
- % of total equivalent population connected to unsatisfactory sea outfalls
- Length of estuary in each class (A,B,C,D)

An example of the good but incomplete coverage of some data sets from this source is shown in Figure 3.2.

2 S E W E R A G E		Levels of service indicators					
Water Authority	Number of connected properties <u>1.4.83</u> <u>million</u>	QUALITY OF SERVICE					
		Extent of flooding % of properties		Number of sewer failures		Number of unsatisfactory storm overflows + % of total where known	
		1983/84	1988/89	1983/84	1988/89	1983/84	1988/89
YORKSHIRE	2.0	0.1%	0.09%	1225	1450	519 (27%)	490 (26%)
SEVERN-TRENT	3.3	0.03%	0.02%	478	?	182 (15%)	?
NORTH WEST	2.8	0.09%	0.03%	600	580	630 (42%)	395 (26%)
ANGLIAN	2.0	0.05%	0.04%	275	?	N/A	?
THAMES	N/A	0.3	0.14	491	745	41	37
SOUTHERN	1.6	0.01%	0.04%	210	380	79	63
WESSEX	0.8	0.4%	0.4%	275	300	150 (10%)	85 (6%)
NORTHUMBRIAN	1.1	0.02%	0.01%	256	304	18 (1%)	6
SOUTH WEST	0.5	0.15%	0.13%	300	220	256(25.6%)	237(23.7%)
WELSH	1.1	0.09%	0.03%	227	326	N/A	N/A

Notes

- 1 For fuller details of standards being set reference needs to be made to DOE Guidance Notes or to Corporate Plans.
- 2 N/A Information not available from Corporate Plan.
- 3 ? = no forecasts have been made.
- 4 Figures for Severn Trent Water Authority cover 1983/84 and 1987/88: Figures for Thames Water Authority 1984/85 and 1989/90: Welsh Water Authority 1984/85
- 5 * = Provisional estimate for 1984/85

Figure 3.2: The Nation's Infrastructure Water - Sewerage Levels of Service (original source)

In conclusion there is potential to generate a time series for Levels of Service from 1983/4 to privatisation. Data will be improving over time as definitions are refined and company data collection processes improve. As forerunner of the June Return, this data will provide some potential for generating a longer time series by connecting with JR data series.

This would require future work to investigate Department of the Environment archives held at Kew to estimate the time required to collect and collate this level of service data.

Waterfacts

The Waterfacts publications provide data relating to the water industry covering RWA characteristics, financials and performance. Scanned copies of the original documents have been obtained from the Ofwat library through a Freedom of Information Request with the permission of WaterUK, the original authors.

Annual publications in the series collated cover 1985 to 2000, without 1999.

The earliest publication includes data on the following for RWAs, many which reach back to 1974/75, including:

- Rainfall and abstractions 1974-84
- Water supply by RWA 1984/85

- Water supply for England and Wales 1961-1984/85
- Sewerage and sewage disposal
 - BOD removed and population served 1980, 1984/85
- River water quality
 - Classification of rivers and canals, estuaries 1984/85
 - Total water pollution incidents reported 1984
- Bathing water quality
 - Compliance with standards of Directive at identified bathing waters 1979-84
- Water quality
- Charges
 - Household bills 1975/76 to 1985/86 by RWA and England/Wales
 - p/m3 1974/75 to 1985/86
 - Trade effluent 1985/86
- Income and revenue expenditure
 - Water authority current cost accounts 1984/85
- Capital expenditure and assets
 - Total capex 1974/75 to 1984/85
 - Capital expenditure by service 1974/75 to 1984/85
 - Capital expenditure by purpose 1978/79 to 1984/85
- Asset information for 1984/85
- Employment costs for England and Wales 1974/75 to 1984/85
- Manpower 1975 to 1985
- Performance indicators
 - Industrial injuries 1977/78 to 1984/85 for England and Wales
 - Accidents by RWA 81/82 to 84/85
 - Normalised costs by RWA 1980/81 to 1984/85
 - Classified river length class III and class IV by RWA 1980/81 to 1984/85
 - Normalised opex / capex by service by RWA 1980/81 to 1984/85
- Population by service
- For statutory water companies the following is available
- Population
- Length of mains
- Area served
- International comparisons for 1984/85

Consideration of the final publication in the series provides the opportunity to identify additional sources for variables which have appeared. Some of these include the following:

- Drought orders by region, England & Wales, Northern Ireland 1974 to 1998
- Drinking water compliance England and Wales 1990 to 1998
- Drinking water compliance Scotland 1996/97 to 1998
- Sewage treatment works compliance (% that comply) RWAs and England and Wales 1991 to 1997, Northern Ireland 1997
- Bathing water quality compliance by RWA, England and Wales, Scotland, Northern Ireland 1989 to 1998
- Profit and loss accounts by RWA/SWC

- Infrastructure
 - Improvements for the industry in England and Wales 1992/93 to 1998/99
 - Total length of water main new, renewed or relined
 - Total length of sewers - new or relined
 - Nr of communication pipes replaced
 - Nr of lead communication pipes replaced
 - Sea outfalls abandoned
 - New sea outfalls commissioned
 - More detailed data is available for RWA, SWCs and home nations for 1998/99 only
- International comparisons are more detailed

4 Data Compiled

4.1 Introduction

This section takes each of the Commission's current performance metrics and assesses the possibility of compiling additional historical time series data in each domain.

Our conclusions are summarised in Table 4.1. The Commission's primary metrics are highlighted in blue.

Table 4.1: Summary of Historical Data Compilation Potential

Metric	Description	Earliest current data point	Historical Data Compilation Potential
Volume	Volume of consumption		
	Water consumed (Mld England)	1999	1961-1998 data compiled (structural break 98-99 could be resolved)
	Average daily water consumption (litres/person/day)	1992-93	Limited possibilities (few data points available)
	Water abstracted (billion cubic metres, England)	2000	Possible with additional sources
Resilience	Resilience to large shocks		
	Security of Supply Index	2016/17	No comparable measures
	Everyday resilience		
	Time that properties lose access to water	2015/16 (1991/92 with other measures)	Very limited data pre-1990 and measures not directly comparable
	Number of sewer flood events	1992/93	Very limited data pre 1990
	Properties with below adequate pressure (per10k connections)	1992/93	Very limited data pre 1990
	Annual mains bursts per 1,000 km	1991/92	Very limited data pre 1990
	Wastewater		
	Annual sewer collapses per 1,000 km	1991/92	Very limited data pre 1990
Quality	Service Quality		
	Number of water quality incidents	1991/92	No comparable measures or data pre 1991
	Quality of User experience		
	Satisfaction derived from survey	2006	Not available
Cost	Average annual water and sewerage bill	1989/90 (2018/19 CPI)	1975/76 - 1990/91 (nominal prices)

Environment	Emissions		
	CO2e emissions per megalitre of water consumed	2015/16	Limited possibilities based on sources reviewed
	Total CO2e emissions from water and wastewater	2017/18	Limited possibilities based on sources reviewed
	Environmental Externalities		
	Number of serious pollution incidents caused by water companies	2002	Potential with additional sources. (NRA annual reports)
	Percentage of water bodies with unsustainable levels of abstraction		Very limited - no comparable definition of 'unsustainable'
	Average concentration of reactive phosphorous in rivers	1974	Already compiled back to 1974
	River Water Quality: Percentage of river by classification III or IV for England and Wales.	n/a	Time series attempted but some gaps remain 1970, 1975, 1980, 1984-88. Potential to complete with further sources.
	Percentage of river and canal in each GQA chemical grade by RWA	n/a	1990-1994, 1996-1998 Waterfacts
	Percentage of river and canal in each GQA chemical grade by nation	n/a	1990-1995 Waterfacts international comparisons. Possible extension with other sources
	Bathing water quality in England % meeting standards; % passed 1976 directive	1989	Can be extended back to 1986. Earlier historical data (1979-1985) on different basis.
	Natural capital		
	Value of water services provided by natural environment	1997	Not observed in sources reviewed.
Efficiency	System efficiency		
	Leakage	1992/93	Limited. Potential to create series from original sources with definitional differences.
Financial Metrics	Multiple - full accounts available covering operating expenditure, capital expenditure, turnover, profit/loss, manpower	n/a	Extendable to 1975/76 via additional sources.
	Capital expenditure	n/a	1974-75 to 1987/88 compiled. Potential to

			further refine and extend
Infrastructure Metrics	Household meter penetration	1999/00	Extended to 1985/86
	Length of mains & sewers (kms)	n/a	Possible with additional sources
	Numbers of treatment works (water and sewerage) & other categories of infrastructure (e.g. reservoirs, pumping stations etc)	n/a	Possible with additional sources

4.2 Volume metrics

The Commission's Volume metrics are set out in Table 4.10, together with the earliest currently available data.

Table 4.2: Commission's Volume Metrics (Water)

Volume	Earliest current data point
Volume of consumption	
Water consumed (Mld England)	1999

The Commission has also already collected data set out in Table 4.3 as part of the work underpinning the Commission's Strategic Investment and Public Confidence report.

Table 4.3: Commission's Wider Volume Data (Water)

Volume	Earliest current data point
Volume of consumption	
Average daily water consumption (litres per person per day)	1992-93
Abstraction	
Water abstracted (billion cubic metres, England)	2000

Mld

It has been possible to extend the Mld series back to 1961 with one structural break: The Commission's current data series for this metric (1999-present) is for England, whereas the historic data (1961 to 1998) is for England and Wales.

The time series is summarised in Figure 4.1 and the data provided in Table 4.4.

It would, in principle, be possible to remove the Welsh data from the historic time series (at least for the more recent years). This would be a relatively simple task for the years 1985 to 2000 for which the WaterFacts data is available. Earlier years would be more difficult and require obtaining to hard copies of annual reports. We would recommend the Commission investigate requesting data for England & Wales

combined for the more recent years to generate a consistent time series for water supplied.

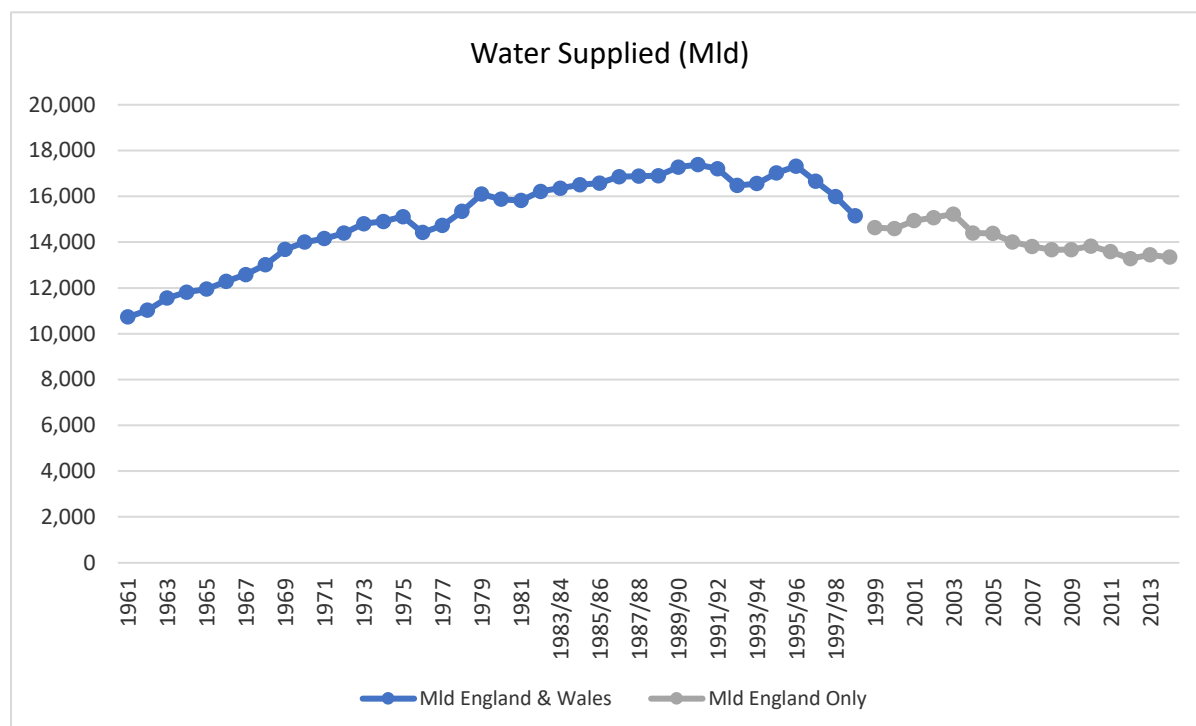


Figure 4.1: Water Supplied (Mld)

Table 4.4: Water Supplied (Mld)

Year	Combined Data Set	
	Mld England & Wales	Mld England Only
1961	10,733	
1962	11,029	
1963	11,554	
1964	11,815	
1965	11,948	
1966	12,286	
1967	12,584	
1968	13,011	
1969	13,679	
1970	14,004	
1971	14,157	
1972	14,395	
1973	14,806	
1974	14,904	
1975	15,109	
1976	14,417	
1977	14,724	
1978	15,343	

1979	16,094	
1980	15,876	
1981	15,814	
1982	16,215	
1983/84	16,354	
1984/85	16,504	
1985/86	16,576	
1986/87	16,854	
1987/88	16,879	
1988/89	16,896	
1989/90	17,273	
1990/91	17,381	
1991/92	17,209	
1992/93	16,471	
1993/94	16,554	
1994/95	17,015	
1995/96	17,321	
1996/97	16,658	
1997/98	15,990	
1998/99	15,144	
1999		14,638
2000		14,588
2001		14,937
2002		15,072
2003		15,225
2004		14,398
2005		14,381
2006		14,011
2007		13,812
2008		13,669
2009		13,670
2010		13,825
2011		13,585
2012		13,281
2013		13,444
2014		13,347
	England & Wales	
	England Only	

Water consumption (pcc)

Although not one of its key performance metrics, the Commission has obtained data for domestic water consumption per capita (pcc) back to 1992/93 as shown in Figure 4.2 which is reproduced from the technical annex of the Commission's 2019 Strategic Investment and Public Confidence report.

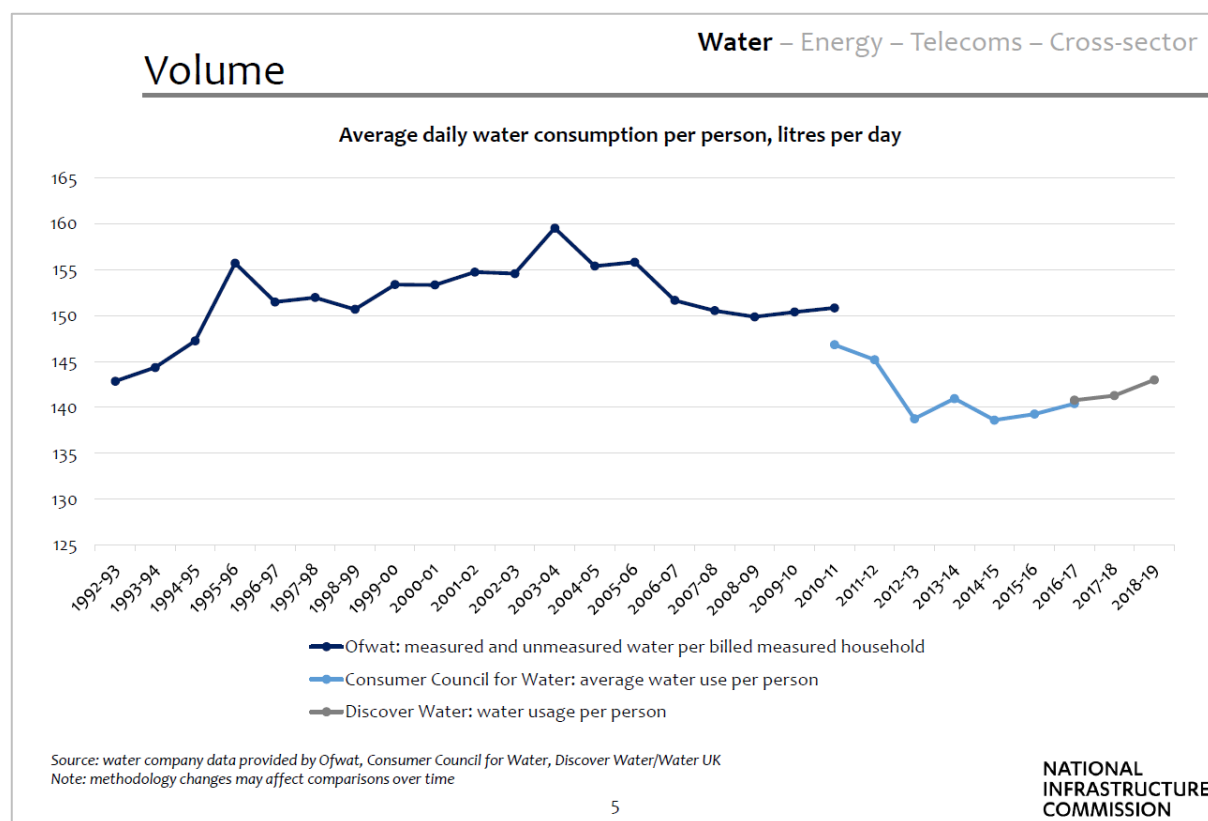


Figure 4.2: Commission's current pcc time series data (original source)

It would be possible to construct some historic information in this area, but it would involve compiling data from a number of different sources and is unlikely to be complete.

WaterFacts 2000 states that pcc was 85 litres per head per day in 1961 and 160 litres per head per day in 1997. WaterFacts 1985 states that average household use 130 litres per head per day but does not give a clear year for the data (assumed to be 1984/85 as per the majority of the data in that report). 1990 report states 136 l/head/day in 1989. Whereas WaterFacts 1993 quotes IWSA data for a number of countries including the UK (as opposed to England & Wales) giving figures of 154 l/h/d for households and small businesses of 154 in 1980 and 161 in 1991.

The sampled water company annual reports show that some companies report pcc but others do not.

Water abstraction

Although not one of its key performance metrics, the Commission has obtained data for water abstraction in England from 2000 to 2017.

It would be possible to construct some historic information in this area, by reference to hard copies of the Department of the Environment's Statistical Digests. See for example Figure 4.3 However, this data is for England & Wales, whereas the Commission's data is for England only.

Waterfacts also contains abstraction data (by water Authority area) so it may be possible to use the WaterFacts data (1984-1999) to strip out the Welsh abstractions and create a consistent time series for abstractions.

6.1 Surface water and groundwater combined: annual abstractions by purpose
England and Wales

Megalitres a day

	Water supply ¹	Agriculture		Industry		Quantity abstracted
		Spray irrigation ²	Other	Central electricity generating board	Other ³	
1972	14,797	63	170	18,118	9,162	42,310
1973	15,252	58	156	17,767	8,658	41,890
1974	15,153	78	72	14,988	7,082	37,373
1975	15,361	118	95	13,714	6,561	35,849
1976	15,013	160	99	13,211	6,657	35,140
1977	14,768	115	120	13,406	6,958	35,367
1978	15,830	79	151	12,539	6,627	35,226
1979	16,268	106	140	12,710	6,773	35,997
1980	16,115	92	133	13,088	4,634	34,062
1981	16,039	116	111	12,208	4,972 ^R	33,446 ^R
1982	16,331	139	117	11,587	4,729	32,903

¹Water supply (ie piped mains water) includes abstractions by water authorities, water companies and small private abstractions.
²Includes small amounts for non-agricultural spray irrigation.
³Excludes abstractions for water power and fish farming.

Source: Department of the Environment

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Figure 4.3: Abstraction data available in the DoE Digest (original source)

4.3 Resilience

Resilience is a key data domain for the Commission as it directly relates to the level of performance and health of the nation's water and sewerage infrastructure. Despite this importance, the systematic collation of resilience measures is itself only fairly recent in the post privatisation period.

The Commission has identified two categories (sub-domains) for measuring resilience as shown in Table 4.5

Table 4.5: Commission's Resilience Metrics (Water)

Resilience	Earliest current data point
Resilience to large shocks	
Security of Supply Index	2016/17
Everyday resilience	
Time that properties lose access to water	2015/16 (1991/92 with other measures)
Number of sewer flood events	1992/93

The available measure for Resilience to large shocks is the Security of Supply Index (SOSI) and SoSI was developed by Ofwat and used as an Ofwat Key Performance Indicator (KPI) during AMP5 (2010-2015). Two areas are of importance to everyday resilience; "Time that properties lose access to water" through supply interruptions events and sewer flooding events.

Resilience to large shocks

This sub-domain attempts to reflect the levels of service risk associated with infrequent drought events and in turn how much resilience (or headroom capacity) is available in the current water supply systems. The annual Waterfacts publications provide annual and monthly rainfall statistics - see below for example Figure 4.4 and Figure 4.5 which are extracts from the 1985 Waterfacts publication, but these data only provide a back-cloth to the weather variations that water supply systems operate under in these periods. We have not identified any comparable risk type measure like SOSI that is available for the pre-privatisation periods.

2A. Annual rainfalls (mm)											
	average										
	1941/70	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Anglian	611	520	583	628	694	640	649	644	572	624	597
Northumbrian	879	831	847	941	905	987	885	829	858	847	907
North West	1217	1045	1206	1147	1322	1389	1381	1299	1222	1145	1191
Severn Trent	773	655	839	752	845	853	834	791	754	756	740
Southern	787	693	797	706	867	734	839	838	712	834	734
South West	1194	1013	1179	1087	1215	1197	1353	1307	1097	1200	1118
Thames	704	586	744	680	820	660	764	763	635	726	682
Welsh	1334	1065	1258	1155	1380	1290	1479	1479	1328	1282	1346
Wessex	864	787	934	811	1025	931	925	945	790	868	814
Yorkshire	856	788	856	876	972	952	935	838	871	827	787
England/Wales	912	794	925	903	1001	977	999	973	884	899	885

Figure 4.4: Annual rainfalls (mm) available in the annual Waterfacts publications (original source)

2B. <u>Monthly</u> <u>rainfalls</u> (mm)	1985												1986							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Anglian	56	11	42	44	60	100	52	55	16	21	56	84	61	21	52	62	64	24	52	91
Northumbrian	87	13	85	68	70	60	100	126	93	27	86	92	107	48	62	108	87	46	49	131
North West	70	19	80	101	69	74	123	184	131	68	105	167	147	9	130	88	111	66	72	127
Severn Trent	50	32	49	63	70	101	57	81	21	49	70	97	107	16	67	76	74	38	44	111
Southern	71	31	60	48	51	76	51	112	18	29	67	120	127	16	71	66	57	22	43	84
South West	116	48	107	95	57	94	65	157	54	65	84	176	170	8	106	90	93	97	64	143
Thames	54	33	47	38	69	111	52	77	17	29	48	107	97	15	57	67	65	21	50	100
Welsh	92	53	97	111	75	137	98	199	63	97	118	206	184	10	123	110	114	56	75	150
Wessex	74	47	60	51	47	87	57	113	32	44	49	153	131	6	65	73	91	35	53	109
Yorkshire	77	7	59	89	73	52	77	102	45	41	79	95	112	31	68	112	94	39	36	115
England/Wales	72	29	66	70	65	94	73	117	46	48	77	128	120	17	81	80	84	46	60	112
Average 1941/70	86	65	59	58	67	61	73	90	83	83	97	90	86	65	59	58	67	61	73	90

Figure 4.5: Monthly rainfalls (mmm) available in the annual Waterfacts publications (original source)

There are available periodic publications that will provide some information about water supply resilience under drought resilience. For example, Waterfacts published Drought '84 which was a review of the drought of 1984 which affected major parts of England and Wales.

Everyday resilience

There is a similar picture relating to the service performance measures that capture everyday resilience. The two measures used by the Commission were introduced in the post-privatisation period as part of Ofwat's information requirements and annual reporting (and these measures have been gradually developed and refined in the post-privatisation period).

The only potentially comparable performance data we have identified on supply interruptions and sewer flooding events was to be found in the annual plans that

water authorities and SWC's began to submit to DoE from 1985. A major caveat noted for these data sources was concern about comparability of the data.

We have obtained a snapshot of the data for 1983/84, as shown in Figure 4.6 and Figure 4.7.

It may theroretically be possible to compile a time series of this data from Water company annual plans submitted to DoE from this point on. It may, therefore, be available in one of the bundles of DoE documents available in hard copy in the National Archives at Kew.

1 WATER SUPPLY											
Water Authority	Connected Population 1.4.83 million	QUANTITY % of population with inadequate supplies				QUALITY Volume deficiencies					
		Pressure		Supply failure		Bacteriological		Chemical		Aesthetic Acceptability	
		1983/84	1988/89	1983/84	1988/89	1983/84	1988/89	1983/84	1988/89	1983/84	1988/89
YORKSHIRE	4.3	1%	1%	0.7%	1.2%	26%	9%	NIL	47%	26%	
SEVERN TRENT	6.8	7%	6%	0.7%	0.5%	10%	?	14.5%	?	23%	?
NORTH WEST	6.8	4%	3%	0.5%	0.5%	6%	4%	2%	NIL	35%	20%
ANGLIAN	3.5	4%*	4%*	0.1%	0.1%	0.7%	0.7%	66%	? taste & odour discolouration	52% 28%	45% 20%
THAMES	N/A	10%*	6*	N/A	N/A	2%	0.12%	3%	NIL	0.1%	0.02%
SOUTHERN	2.0	0.7%	0.05%	0.14%	0.3%	0.8%	0.6%	NIL	NIL	0.7%	0.3%
WESSEX	1.0	1%	1%	0.1%	0.1%	1%	1%	3%	3%	0.1%	0.1%
NORTHUMBRIAN	1.2	0.3%	0.3%	0.1%	0.1%	1.3%	2%	?	?	?	?
SOUTH WEST	1.3	0.23%	0.14%	0.18%	0.18%	3.1%	2.7%	2.2%	2.1%	17%	8%
WELSH	2.7	2.2%	2.0%	2.2%	2.0%	Less than 5%	Less than 5%	15%	?	12.4%	?

NOTES

- For fuller explanation of the standards being set reference needs to be made to DoE guidance notes or to the detailed submissions of Water Authorities
- *Indicators based on an Authority's own definition of satisfactory levels of service, eg Yorks indicator represents percentage of population receiving water which fails to meet the standard for a tiny proportion of the time.
- The first and last dates in the Corporate Plan have been taken
- Many percentages have been derived from Water Authority sampling techniques, eg measures for water quality in Northumbria refer to the percentage of unsatisfactory bacteriological samples rather than a volume deficiency.
- Question marks under volume deficiencies indicate an Authority has applied for delays and derogations
- N/A - information not available
- Thames Water Authority Figures cover 1984/85 and 1989/90: Southern Water Authority 1984/85 and 1988/89: Severn Trent Water Authority 1983/84 and 1987/88

Figure 4.6: Levels of service data - water supply - % of population with inadequate supplies 83/84 (NB 88/89 data is forecast data)

Source: The Nation's Infrastructure - Water (original source)

2 SEWERAGE		Levels of service indicators					
Water Authority	Number of connected properties 1.4.83 million	QUALITY OF SERVICE					
		Extent of flooding % of properties		Number of sewer failures		Number of unsatisfactory storm overflows + % of total where known	
		1983/84	1988/89	1983/84	1988/89	1983/84	1988/89
YORKSHIRE	2.0	0.1%	0.09%	1225	1450	519 (27%)	490 (26%)
SEVERN-TRENT	3.3	0.03%	0.02%	478	?	182 (15%)	?
NORTH WEST	2.8	0.09%	0.03%	600	580	630 (42%)	395 (26%)
ANGLIAN	2.0	0.05%	0.04%	275	?	N/A	?
THAMES	N/A	0.3	0.14	491	745	41	37
SOUTHERN	1.6	0.01%	0.04%	210	380	79	63
WESSEX	0.8	0.4%	0.4%	275	300	150 (10%)	85 (6%)
NORTHUMBRIAN	1.1	0.02%	0.01%	256	304	18 (1%)	6
SOUTH WEST	0.5	0.15%	0.13%	300	220	256 (25.6%)	237 (23.7%)
WELSH	1.1	0.09%	0.03%	227	326	N/A	N/A

Notes

- 1 For fuller details of standards being set reference needs to be made to DOE Guidance Notes or to Corporate Plans.
- 2 N/A Information not available from Corporate Plan.
- 3 ? = no forecasts have been made.
- 4 Figures for Severn Trent Water Authority cover 1983/84 and 1987/88: Figures for Thames Water Authority 1984/85 and 1989/90: Welsh Water Authority 1984/85
- 5 * = Provisional estimate for 1984/85

Figure 4.7: Levels of service data - sewerage - Extent of flooding (% of properties) and Number of Sewer Failures - 1983/84 (NB 88/89 data is forecast data)
Source: The Nation's Infrastructure - Water (original source)

The Commission has also collected the resilience data set out in Table 4.6 as part of the work underpinning the Commission's Strategic Investment and Public Confidence report.

Table 4.6: Commission's Wider Resilience Data

Everyday Resilience	Earliest current data point
Water	
Properties with below adequate pressure (per10k connections)	1992/93
Annual mains bursts per 1,000 km	1991/92
Wastewater	
Annual sewer collapses per 1,000 km	1991/92

Inadequate pressure and sewer failures both appear in the Annual Plan data. We would therefore recommend investigating the DoE archives at Kew to understand the extent of annual data submissions by the Water Authorities and Companies to DoE. This would enable us to understand whether it would be possible to extend the time series back to 1983/84, albeit with caution around improving data consistency over time.

4.4 Quality

The Commission has identified two categories (sub-domains) for measuring as shown in Table 4.7.

Table 4.7: Commission's Current Quality Metrics (Water)

Quality	Earliest current data point
Service Quality	
Number of water quality incidents	1991/92
Quality of User experience	
Satisfaction derived from survey	2006

We comment on potential data sources for each below.

Number of water quality incidents

There are a number of disparate data sources that provide some data availability on drinking water quality performance in the pre-privatisation periods. However, the measures are not directly comparable to the Commission's "number of water quality incidents".

For example, the DoE annual plans (1985) provide some information about the quality deficiency by bacteriological, chemical, aesthetic and acceptability parameters for 1983/84 for the 10 RWAs- see Figure 4.8.

1 WATER SUPPLY		Levels of service indicators										
Water Authority	Connected Population 1.4.83 million	QUANTITY % of population with inadequate supplies				QUALITY Volume deficiencies						
		Pressure		Supply failure		Bacteriological		Chemical		Aesthetic Acceptability		
		1983/84	1988/89	1983/84	1988/89	1983/84	1988/89	1983/84	1988/89	1983/84	1988/89	
YORKSHIRE	4.3	1%	1%	0.7%	1.2%	26%	9%	NIL	?	47%	26%	
SEVERN TRENT	6.8	7%	6%	0.7%	0.5%	10%	?	14.5%	?	23%	?	
NORTH WEST	6.8	4%	3%	0.5%	0.5%	6%	4%	2%	NIL	35%	20%	
ANGLIAN	3.5	4%*	4%*	0.1%	0.1%	0.7%	0.7%	66%	? taste & odour	52%	45%	
THAMES	N/A	10%*	6%	N/A	N/A	2%	0.12%	3%	NIL	0.1%	0.02%	
SOUTHERN	2.0	0.7%	0.05%	0.14%	0.3%	0.8%	0.6%	NIL	NIL	0.7%	0.3%	
WESSEX	1.0	1%	1%	0.1%	0.1%	1%	1%	3%	3%	0.1%	0.1%	
NORTHUMBRIAN	1.2	0.3%	0.3%	0.1%	0.1%	1.3%	2%	?	?	?	?	
SOUTH WEST	1.3	0.23%	0.14%	0.18%	0.18%	3.1%	2.7%	2.2%	2.1%	17%	8%	
WELSH	2.7	2.2%	2.0%	2.2%	2.0%	Less than 5%	Less than 5%	15%	?	12.4%	?	

NOTES

- For fuller explanation of the standards being set reference needs to be made to DoE guidance notes or to the detailed submissions of Water Authorities
- *Indicators based on an Authority's own definition of satisfactory levels of service, eg Yorks indicator represents percentage of population receiving water which fails to meet the standard for a tiny proportion of the time.
- The first and last dates in the Corporate Plan have been taken
- Many percentages have been derived from Water Authority sampling techniques, eg measures for water quality in Northumbria refer to the percentage of unsatisfactory bacteriological samples rather than a volume deficiency.
- Question marks under volume deficiencies indicate an Authority has applied for delays and derogations
- N/A - information not available
- Thames Water Authority Figures cover 1984/85 and 1989/90: Southern Water Authority 1984/85 and 1988/89: Severn Trent Water Authority 1983/84 and 1987/88

Figure 4.8: Drinking water quality performance - 1983/84 (NB 88/89 data are forecasts)
Source: The Nation's Infrastructure - Water (original source)

The annual Waterfacts publications are legislation focused in respect of drinking water quality. For example, compliance is reported by quality parameter alongside derogations permitted at the time. While drinking water quality was a significant investment focus in the post privatisation period, the emphasis was on legal compliance compared to infrastructure performance per se.

As we observed in Table 3.6 the collated datasets compiled by Professor Saal appear to echo strongly these sources, with no actual observed data relating to drinking water quality performance prior to 1991.

Satisfaction with service provision

We have not identified any comparable evidence relating to user experience and service satisfaction in any of the pre-privatisation publications and documents. For example, the content of the annual Waterfacts publications is very much cost and delivery focused with no evidence on user experience or satisfaction.

Further investigations of archived materials for individual authorities and companies would need to be investigated.

4.5 Cost

The Commission's current historic water bill information is set out in Table 4.8, and Figure 4.9, which is reproduced from the technical annex of the Commission's 2019 Strategic Investment and Public Confidence report.

Table 4.8: Commission's Cost Metric (Water)

Cost	Earliest current data point
Cost	
Average annual water and sewerage bill (on dashboard)	2016/17
Average annual water and sewerage bill (Chart in report)	1989/90
Average annual water and sewerage bill as % of average household Spending (in report)	1989

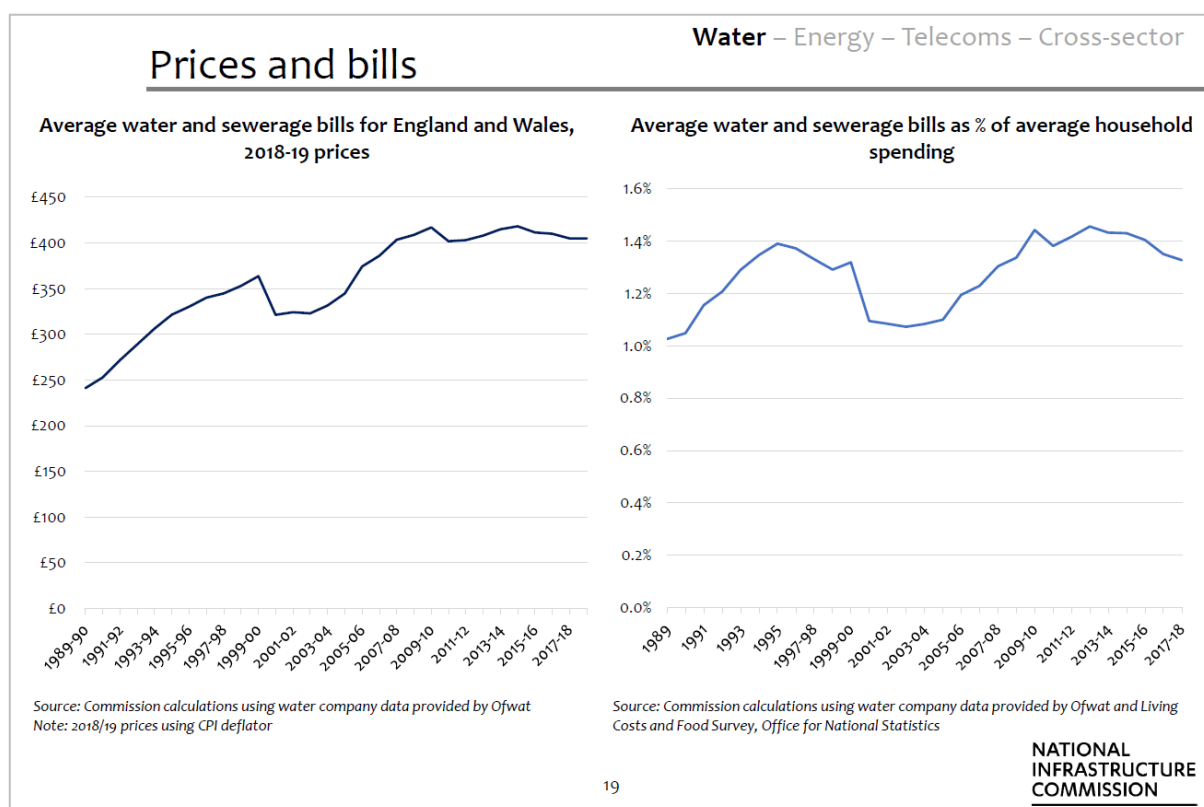


Figure 4.9: Commission's current bill information (original source)

We have been able to compile average domestic water and sewerage bills for the years 1975/96 to 1990/91 from various WaterFacts publications. The time series is shown in Table 4.9 and Figure 4.10.

It should be noted that these figures are in nominal terms. To produce a time series consistent with the Commission's current data as given in Figure 4.9 will require adjusting to a consistent price base. This has not been undertaken at this stage to allow the Commission to determine the most appropriate inflation index (e.g. RPI is available throughout the period or CPI after 1988).

Table 4.9: Compiled Average Domestic Water & Sewerage Bill (£pa, nominal prices)

Year	WaterFacts
	£pa
1975/76	27.44
1976/77	34.64
1977/78	36.01
1978/79	38.00
1979/80	41.98
1980/81	51.98
1981/82	60.01
1982/83	67.09
1983/84	72.00
1984/85	76.85
1985/86	85.85
1986/87	92.84

1987/88	98.81
1988/89	107.25
1989/90	119.17
1990/91	133.82

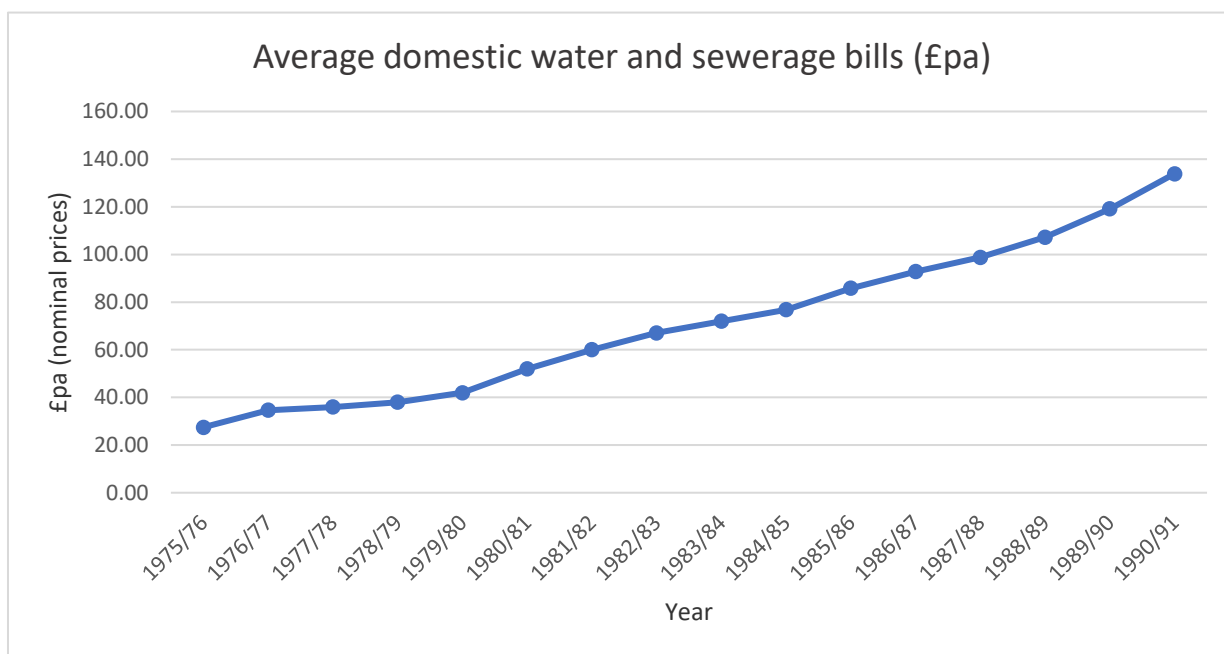


Figure 4.10: Average Domestic Water & Sewerage Bills (1975/76 to 1990/91)

4.6 Environment

The Commission's Environment metrics are set out in Table 4.10, together with the earliest currently available data.

Table 4.10: Commission's Environment Metrics (Water)

Environment	Earliest current data point
Emissions	
CO2e emissions per megalitre of water consumed	2015/16
Total CO2e emissions from water and wastewater	2017/18
Environmental externalities	
Number of serious pollution incidents caused by water companies	2002
Percentage of water bodies with unsustainable levels of abstraction	2016
Average concentration of reactive phosphorus in rivers	1974
Natural capital	
Value of water services provided by natural environment	1997

While there is environmental data within the sources examined, it is challenging to build time series data over long term. This is because as our understanding of the

environment progresses and pressures change, so do the metrics used to judge success.

Our searches for levels of service measures have not uncovered data for CO₂ emissions as they did not receive regulatory attention in the period 1974-1990.

For serious pollution incidents, we have collected data for 1986/87 & 1989/90 which is available in the Waterfacts series that we have sourced. After this time, reporting moves to National Rivers Authority annual reports and so would depend on data contained therein. Hard copies for years 1989/90 to 1995/96 are available in the National Library of Scotland. NRA Facts may also be useful.

River water quality

The DoE Digest includes statistics for freshwater water river lengths by classification. Their statistics span a change in standards in 1980. They equate the pre 1980 standard of “poor” to the 1980-1985 standard “Class III”. They also match “grossly polluted” to the 1980-1985 standard “Class III”.

Class III is defined as “Waters that are polluted to an extent that fish are absent or only sporadically present, may be used for grade industry abstraction purposes, considerable potential if cleared up”.

Class IV is defined as “Waters which are grossly polluted and likely to cause nuisances”.

Applying these assumptions to data from the DoE Digest and cipfa (1988) shows an incomplete picture for river water quality shown in Figure 4.11.

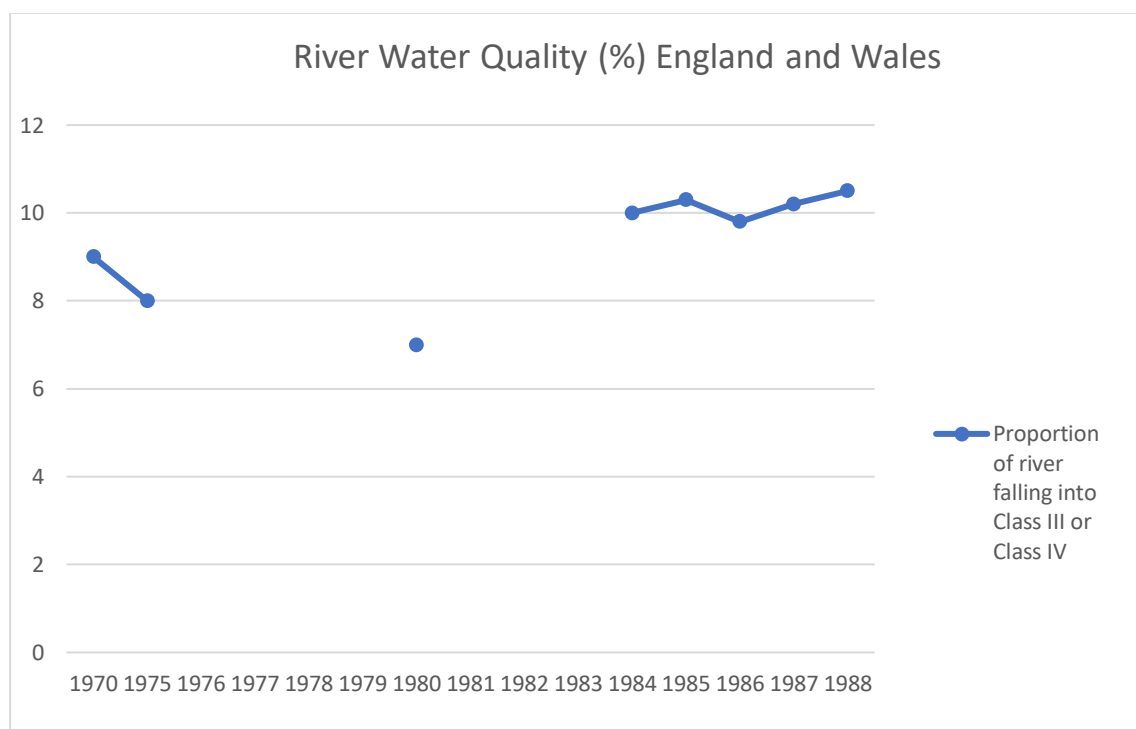


Figure 4.11: River water quality England and Wales 1970 to 1988

Table 4.11 shows that with some simple calculations this series could be extended forward for England and Wales. Other home nation statistics also exist going forward.

Table 4.11: River water quality extract Waterfacts (1990) (original source)

8F. River quality 1989/90					
	class 1A	class 1B	class 2	class 3	class 4
	good	good	fair	poor	bad
Anglian	360	2197	1543	333	25
Northumbria	1730	722	284	44	5
North West	2442	829	1463	921	245
Severn Trent	893	2574	2494	629	90
Southern	545	731	656	187	11
South West	420	998	1002	331	38
Thames	1570	1473	597	169	0
Welsh	2407	1456	663	255	21
Wessex	600	782	784	90	19
Yorkshire	2267	2114	860	641	152
England and Wales	13234	13876	10346	3600	606
total 1988/89	13592	13771	9918	3592	621

Source: NRA annual report 1990. Figures on pollution incidents are also given.

It may also be possible to fill some of the data points in the before 1983/84 as these statistics are carried within the company reports examined. Albeit on a company by company basis, a full set is needed to create a data point for England and Wales. Alternatively RWA level data could be summarised from Waterfacts and supplemented by earlier company reports if available.

It is likely that there will be further breaks in the data as classification standards change again.

Table 4.12 also shows there is potential to track international progression against standards for river water quality using Waterfacts data.

Table 4.12: International river water quality extract Waterfacts (1990) (original source)

9B. River quality		Date of survey	% of river lengths in each class				
			1A	1B	2	3	4
Belgium		1975-79	35	21	17	16	11
Denmark	(estimate)	1986	<----- 80 ----->----- 20 ----->				
France		1981	8	26	60	6	
West Germany		1985	6.5	38	40	14	1.5
Greece	(estimate)		20	40	20	15	5
Ireland		1980/81	<----- 84 ----->----- 14 ----->----- 2 ----->				
Italy	(no survey)						
Luxemburg		1984	47	25	13	11	4
Netherlands		1978	12	65	18	4	1
UK							
England and Wales		1985	33	34	24	9	2
Scotland		1980	<----- 95 ----->				
Northern Ireland		1985	15	69	11	5	0

Source: *Survey of European River Quality*, P. Newman.

Bathing water quality

While only a small addition, the Waterfacts data sources could be used to extend the series 'bathing water quality in England % meeting standards; % passed 1976 directive' for the period 1986 to 1989 shown in Figure 4.12. It is possible to go further back through counting of individual published results for each year for identified bathing waters.

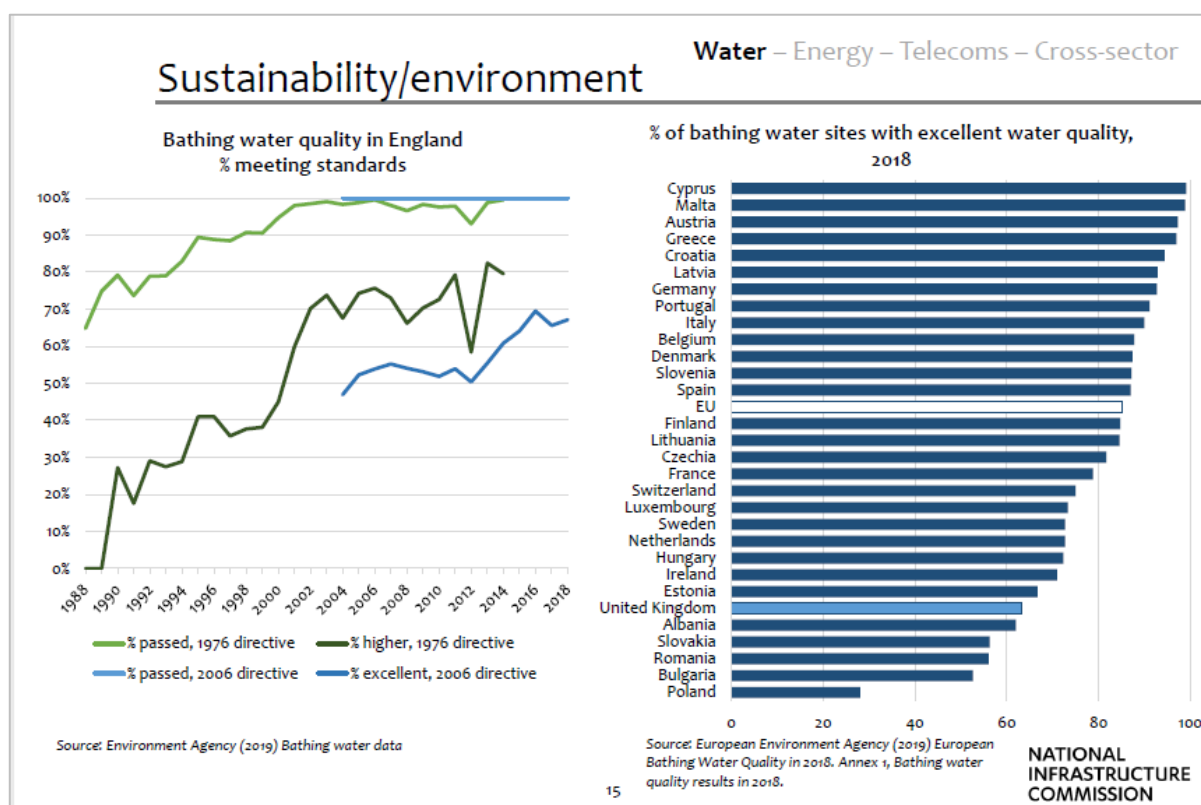


Figure 4.12 Commission data for Bathing Water Quality (1989 to 2018) (original source)

4.7 Efficiency

The Commission's preferred efficiency metric is leakage. The current historic leakage information is set out in Table 4.13 and Figure 4.13, which is reproduced from the technical annex of the Commission's 2019 Strategic Investment and Public Confidence report.

Table 4.13: Commission's Cost Metric (Water)

Efficiency	Earliest current data point
System Efficiency	
Leakage (Mld England & Wales) (on dashboard)	2017/18
Leakage (Mld England & Wales) (Chart in report)	1992/93

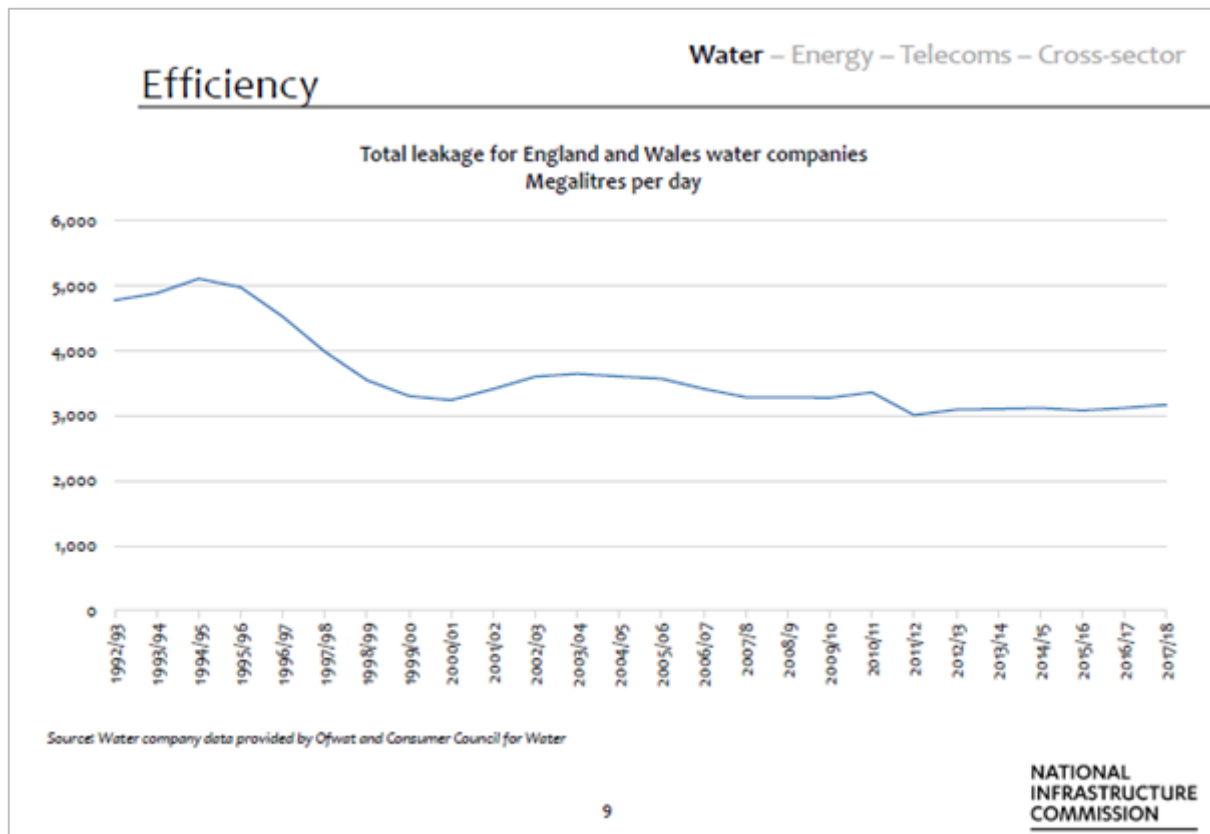


Figure 4.13: Commission's current leakage information (original source)

We have had very limited success in compiling historical leakage data.

Leakage is not included in the WaterFacts publications. Distribution losses are reported in Cipfa 1981 for all companies as a % of water distributed. It may be possible to compile a data series for leakage from additional hard copies of Cipfa reports for additional years which may be available via the British Library. The data is presented by company and will be time consuming to compile.

4.8 Financial metrics

Financial metrics are not included in the Commission's performance metrics and so are not of primary concern for this project. However, we understand that some metrics in this area maybe of secondary interest to the Commission and this is an area where is it possible to compile some time series data form the original sources collected as part of this pilot project.

There is data available on expenditure at an aggregated level but also disaggregated by service. For instance, for the latter, the capital expenditure data for sewage treatment and disposal is provided across

- DoE digest 1974/75 to 1985/86
- Cipfa (1988) 1987/88
- Waterfacts 1988/89 to 1998/99

Also available is revenue expenditure for RWAs, gross employment costs, operating expenditure by service and profit and loss. Some data is normalised per head of equivalent population to aid comparisons between RWAs. Through Waterfacts this can be traced back to 1980 and for some expenditure measures back to 1974/75 for the RWAs.

Similar information can be found for the statutory water companies in their annual reports where available. Cipfa provides higher level financial data such as trends in capital and operating expenditure for statutory water companies 1983/84 to 1987/88. For 1988/89 and 1989/90 annual reports could extend these series for

- Cambridge Water
- Colne Water
- Hartlepool Water
- East Surrey Water
- Chester Waterworks Company

Our research has identified the table shown in Figure 4.14 which appears in a virtually identical form for all three RWAs. Assuming therefore this is a standard requirement for all RWAs, with their mid to late reports a considerable number of variables could build up from a manageable number of reports.

Costs and expenditure series are available for the service in elements and in total, split by operating and capital. Other potential variables include turnover, rates of return (later years), profit and loss, employee numbers and asset values. An example of this table is included below.

Summary of statistics for the period 1975/76 to 1984/85												
	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85		
	£m	£m	£m	£m	£m	£m	£m	£m	£m	£m		
1 TURNOVER	140.1	177.0	196.3	200.4	234.4	275.0	316.9	337.7	351.8	362.7		
2 OPERATING COSTS BY SERVICE												
Water resources	1.2	1.4	4.8	5.3	6.1	7.0	7.3	7.9	8.2	8.4		
Water supply	32.5	38.0	45.4	52.7	61.9	71.9	78.2	83.1	87.2	90.7		
Sewerage	33.2	8.2	10.3	11.5	14.5	16.1	16.7	18.9	20.7	21.3		
Sewage treatment and disposal	29.1	34.3	39.0	49.5	58.1	59.0	61.8	64.5	65.7			
Environmental services	—	—	—	—	—	—	0.4	0.4	0.5	0.6		
Water quality regulation	1.2	1.3	1.6	1.7	2.1	2.4	2.4	2.2	2.3	2.3		
Pollution alleviation	0.2	0.2	0.2	0.2	0.3	0.4	0.6	1.2	1.3	1.5		
Recreation and amenity	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.2	1.3	1.3		
Fisheries	0.4	0.5	0.6	0.7	0.7	0.9	1.0	1.0	1.0	1.1		
Land drainage and flood protection	3.0	3.3	4.0	4.8	5.8	6.3	6.3	7.0	7.8	7.5		
Total	71.8	82.4	101.7	116.5	141.6	164.0	172.9	184.7	194.8	198.4		
3 HISTORICAL COST EXPENDITURE												
Employment costs	32.1	39.2	44.8	51.0	62.9	74.2	82.0	85.4	88.7	89.7		
Other operating costs	39.7	43.2	56.9	65.5	78.7	89.8	90.9	99.3	106.1	108.7		
Exceptional items	(1.2)	(2.6)	(0.7)	(1.2)	0.3	0.4	(1.7)	—	4.6	2.8		
Historical cost depreciation	16.1	17.4	18.6	19.7	21.0	21.4	27.7	28.8	31.8	36.3		
Intangible assets written off	—	—	—	—	—	—	0.5	0.7	0.7	1.1		
Supplementary depreciation	—	—	7.4	7.9	8.4	8.5	—	—	—	—		
Interest	47.8	53.0	56.6	60.8	72.4	85.5	85.2	86.5	92.9	95.3		
Extraordinary items	—	—	—	—	—	—	—	2.1	—	39.9		
Total	194.5	150.2	183.6	203.7	243.7	279.8	284.6	302.8	324.8	373.8		
4 HISTORICAL COST PROFIT/(LOSS) FOR YEAR												
(Item 1 less Item 3)	5.6	26.8	14.7	(3.3)	(9.3)	(0.8)	32.3	34.9	27.0	(11.1)		
5 PROFIT AND LOSS ACCOUNT												
Balance at 31 March:-												
Land drainage and flood protection	1.0	1.7	2.0	1.7	0.8	0.2	0.8	1.7	1.6	1.7		
DoE services	5.0	21.9	31.3	21.2	10.7	6.0	12.4	20.0	14.2	3.7		
6 CURRENT COST EXPENDITURE												
Operating costs including exceptional items	N/A	N/A	N/A	N/A	N/A	N/A	172.9	184.7	199.4	201.2		
Current cost depreciation	N/A	N/A	N/A	N/A	N/A	N/A	95.2	94.4	105.7	113.8		
Other current cost adjustments	N/A	N/A	N/A	N/A	N/A	N/A	—	—	—	—		
Intangible assets written off	N/A	N/A	N/A	N/A	N/A	N/A	—	—	1.4	1.2		
Total	N/A	N/A	N/A	N/A	N/A	N/A	268.6	279.8	307.2	317.3		
7 CURRENT COST OPERATING PROFIT												
Total (Item 1 less Item 6)	N/A	N/A	N/A	N/A	N/A	N/A	48.3	57.9	44.6	45.4		
Analysed over:-												
Land drainage and flood protection	N/A	N/A	N/A	N/A	N/A	N/A	2.3	2.7	1.8	2.4		
DoE services	N/A	N/A	N/A	N/A	N/A	N/A	46.0	55.2	42.8	43.0		
8 CURRENT COST VALUE OF NET ASSETS (DoE Services)	N/A	N/A	N/A	N/A	N/A	N/A	4,070.7	4,068.6	3,877.1	4,280.8		
9 SPECIFIED RATE OF RETURN % (DoE Services)	N/A	N/A	N/A	N/A	N/A	N/A	1.02	1.17	1.25	1.25		
10 ACHIEVED RATE OF RETURN % (DoE Services)	N/A	N/A	N/A	N/A	N/A	N/A	1.13	1.36	1.10	1.00		
Current cost operating % profit	N/A	N/A	N/A	N/A	N/A	N/A	—	0.30	0.52	0.33		
Over achievement from previous years	N/A	N/A	N/A	N/A	N/A	N/A	1.13	1.66	1.62	1.33		
11 EMPLOYEE NUMBERS (Full time equivalent at 31 March)												
Manual	5,767	5,726	5,625	5,599	5,593	5,506	5,282	5,069	4,865	4,318		
Non Manual	4,597	4,925	5,240	5,586	5,335	5,380	5,220	5,113	4,987	4,881		
12 CAPITAL EXPENDITURE (before deduction of grants)												
Land drainage and flood protection	£m	2.0	3.2	4.6	4.7	6.0	5.4	6.3	5.7	6.1	6.2	
DoE Services	£m	70.3	71.3	71.6	76.4	75.9	98.8	97.2	139.8	114.9	106.9	
13 EXTERNAL FINANCE												
Limit	£m	N/A	N/A	N/A	N/A	55.3	49.4	67.3	61.9	66.3	40.0	
Actual	£m	N/A	N/A	N/A	N/A	46.2	49.0	41.6	61.9	66.3	43.1	
14 EQUIVALENT POPULATION NUMBERS												
Water supply	000s	10,713	10,147	10,340	10,557	10,635	10,852	10,825	10,747	10,688	10,655	
Sewage treatment and disposal	000s	10,540	10,357	10,325	10,344	10,355	9,926	9,851	9,882	10,192	10,150	

Note 1 From 1980/81 onwards employee numbers include the full time equivalent of both temporary and permanent employees.
2 The figures in the above table are taken from the published accounts of the Authority for each year. They have not been amended to reflect technical adjustments effected in individual years and are therefore not fully comparable.

Figure 4.14: Severn Trent Water Annual Report and Accounts 1984/85 - 10 year figures example (original source)

The cipfa statistics include capital expenditure trends which can be linked back to company reports. At a national and regional level, they cover 1983/84 to 1987/88. These are shown in Figure 4.15 and Figure 4.16 based on CIPFA (1988).

Note, total capital expenditure excludes land drainage and flood protection for the years 1974/75 to 1982/83 in the series presented below. For 1983/84 to 1987/88 the water industry total capital expenditure statistics taken from cipfa (1988) are not accompanied by a detailed definition.

We have been unable to determine whether the 1983/4 to 1987/8 data contain land drainage & flood expenditure or just water & sewerage expenditure. Initial investigations suggest a blend of both (i.e. different approaches taken by different Authorities). Therefore, this data series requires further investigation before it can be relied upon as a consistent time series.

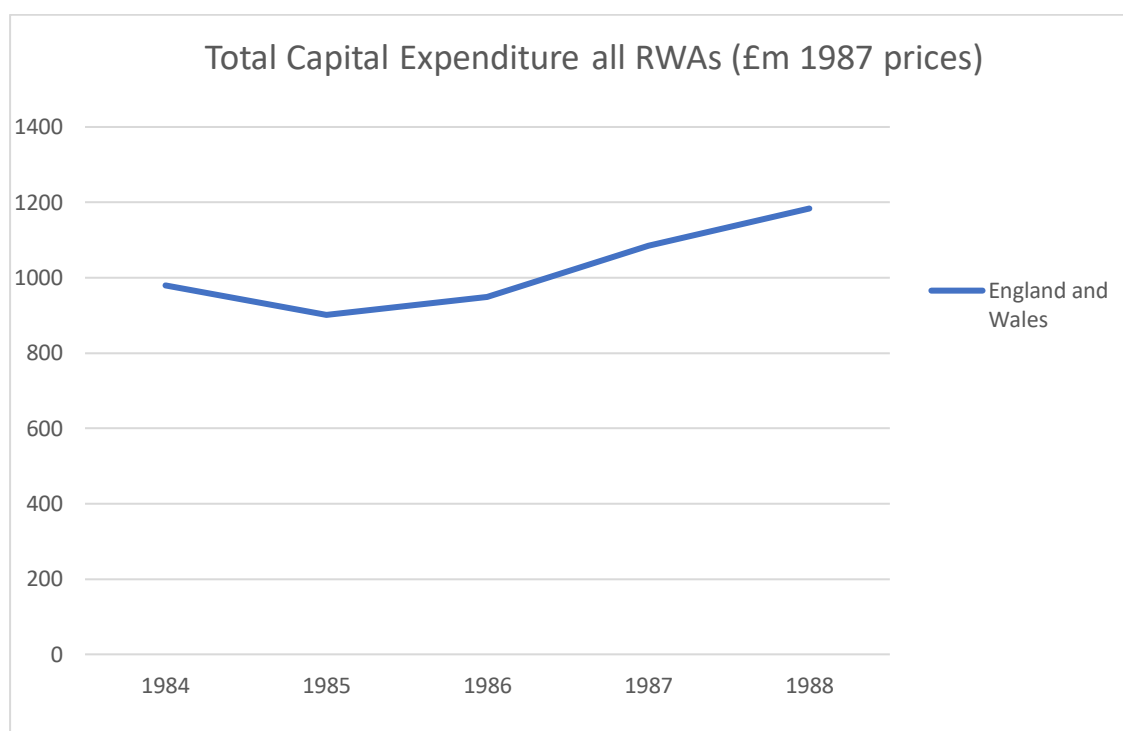


Figure 4.15: Total Capital Expenditure for Water and Sewerage England and Wales (cipfa 1988)

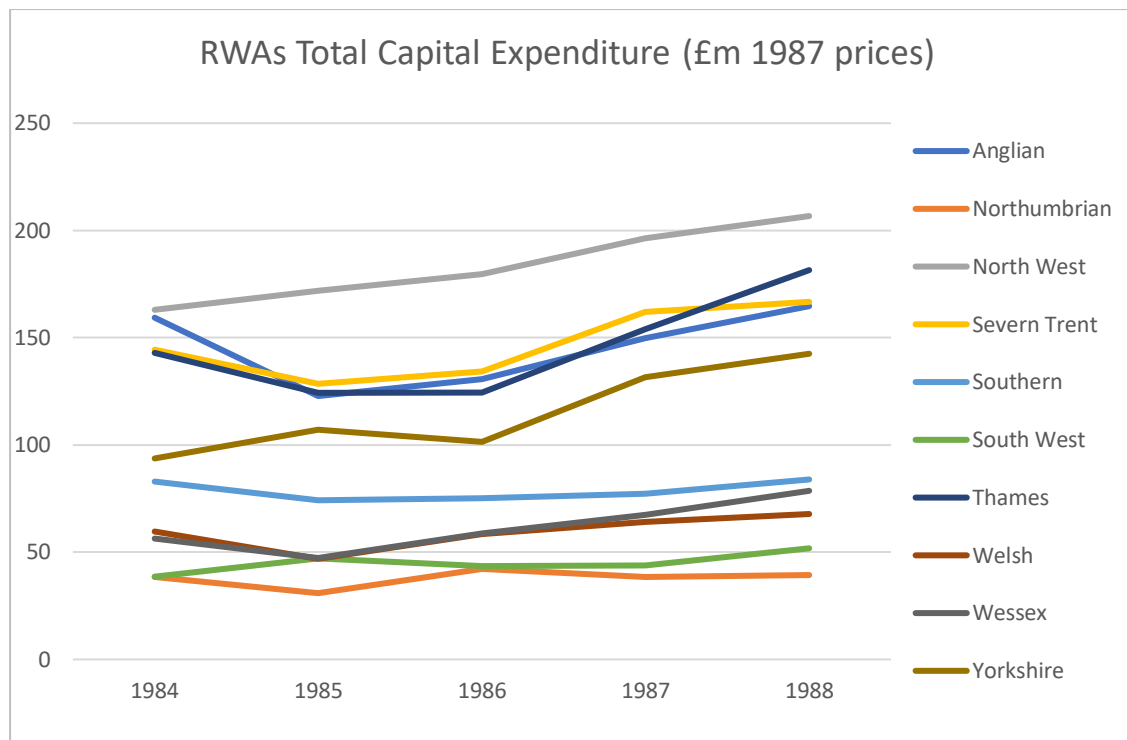


Figure 4.16: Total Capital Expenditure for Water and Sewerage RWAs (cipfa 1988)

Integrating the data from the annual reports we can extend the reach of this time series data to 1975/76 as shown below. It would be possible to fill the remaining gaps with the remaining company reports and potentially extend the reach of this and other time series information contained in Figure 4.17. Nine regions' annual reports are available in the National Library of Scotland for 1984/85 meaning the series could almost be completed and values calculated for England and Wales back to 1975/76 from 1987/88. Versions could be created including and excluding flood protection and land drainage.

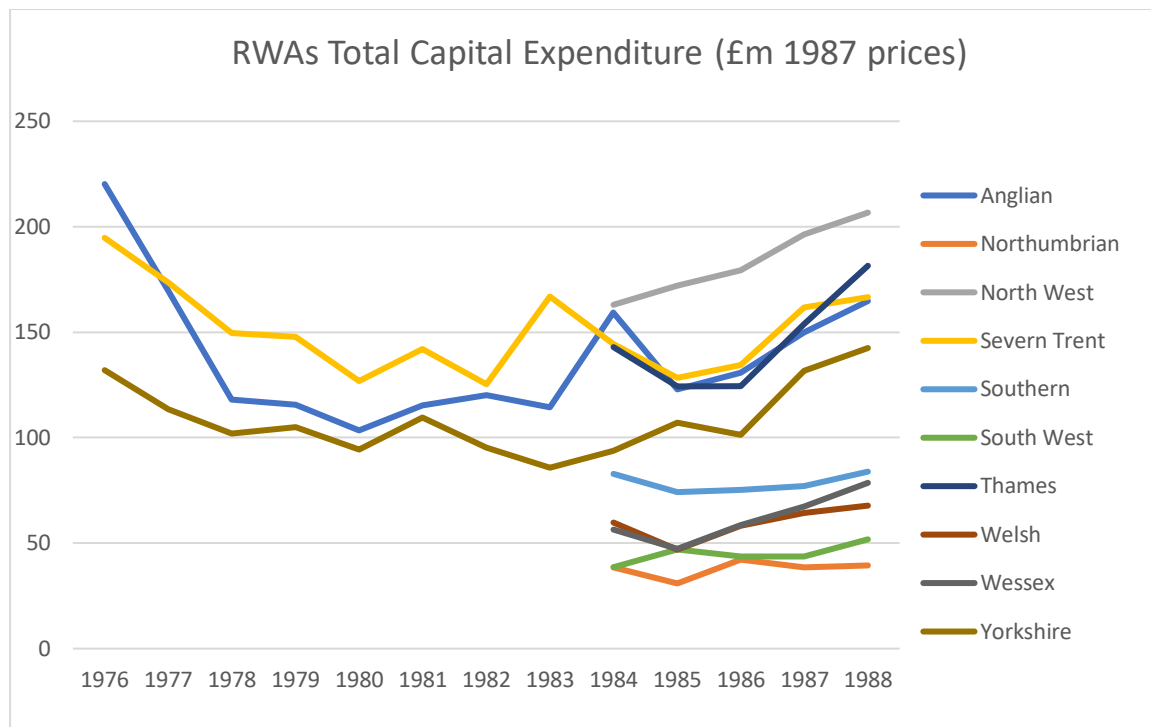


Figure 4.17: Total Capital Expenditure (cipfa 1988) and company reports

Note: Company report data excludes land drainage and flood protection capex to align with Waterfacts 1985 below

There are as previously mentioned some metrics within Waterfacts which go back to 1974/75 for the RWAs. This includes total capital expenditure, meaning Waterfacts (1985) can be used to complete the above chart as an alternative. See data extract in Table 4.14 which can also be used to extend the series.

Table 4.14: Waterfacts 1985 Total capital expenditure (£m 1984/85 prices) (original source)

8A. Total capital expenditure 1974/75 to 1984/85 *											
	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85
	£m	£m	£m	£m	£m	£m	£m	£m	£m	£m	£m
Anglian	73.4	86.0	80.1	70.4	79.7	89.5	106.8	122.3	112.6	133.3	108.0
Northumbrian	24.4	44.9	59.4	61.3	65.4	61.2	59.2	37.9	37.9	32.2++	27.2
North West	56.1	59.9	73.0	69.8	69.8	86.8	96.2	92.6	112.1	136.5	151.3
Severn Trent	74.7	72.3	74.5	76.2	81.1	81.9	104.2	103.5	116.4+	121.0	113.1
Southern	26.6	36.0	39.0	38.1	46.2	60.7	68.8	68.3	65.5	69.4	65.3
South West	18.1	18.8	19.5	19.5	18.4	20.7	22.8	23.6	28.1	32.3	41.4
Thames	56.4	78.4	80.3	65.2	66.7	80.7	87.7	89.2	102.8	119.8	109.4
Welsh	34.9	41.1	32.9	37.2	38.9	34.9	38.5	46.4	55.9	50.0	41.3
Wessex	19.9	26.3	23.5	23.3	26.9	28.1	28.4	33.3	38.5	47.2	41.6
Yorkshire	37.5	49.2	48.6	51.7	56.9	60.1	79.6	78.2	76.1	82.7	99.2
England/Wales	422.0	512.9	530.8	512.7	550.0	604.6	692.2	695.3	745.9	824.4	797.8
Water Cos.	20.0	25.6	31.6	26.6	27.0	33.0	45.3	39.0	35.8	42.4	59.5

* includes intangible as well as tangible fixed assets
 + Severn Trent excludes £29.1M for transfer of Elan Valley assets
 ++ Northumbrian excludes £5.0M repayable revenue grant from Government

Adding in Waterfacts data for 1974/75 to 1982/83 helps to extend the data series further back as shown Figure 4.18 and Figure 4.19.

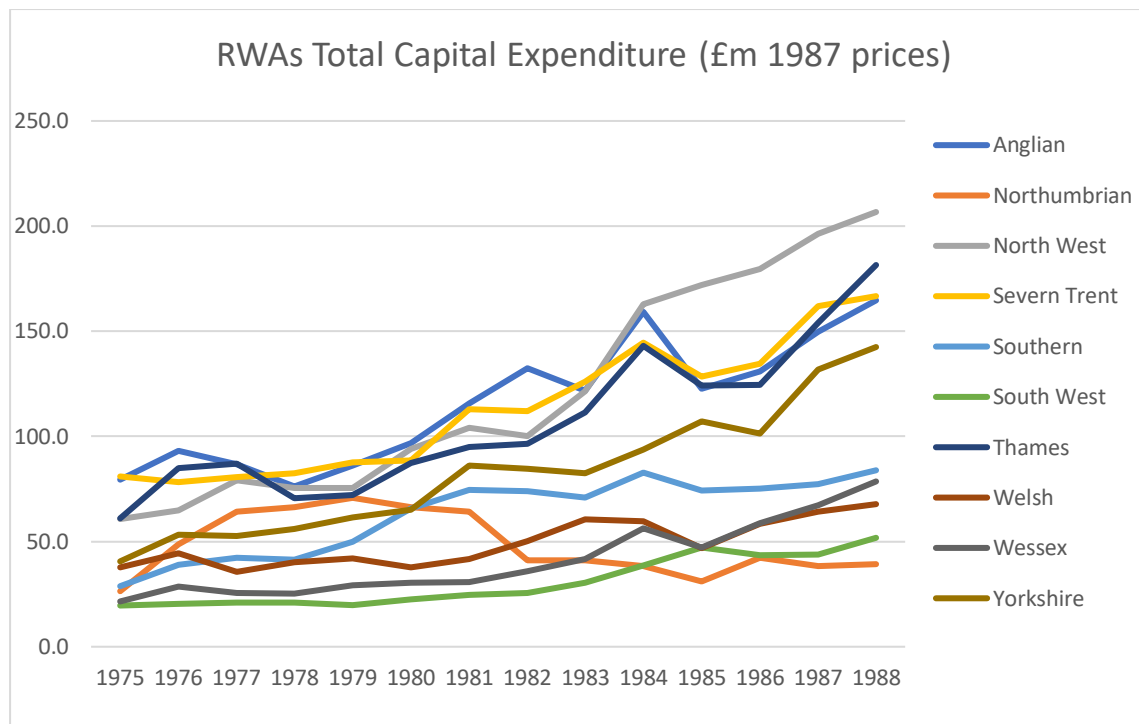


Figure 4.18: Total Capital Expenditure (cipfa 1988) and Waterfacts (1985) for RWAs

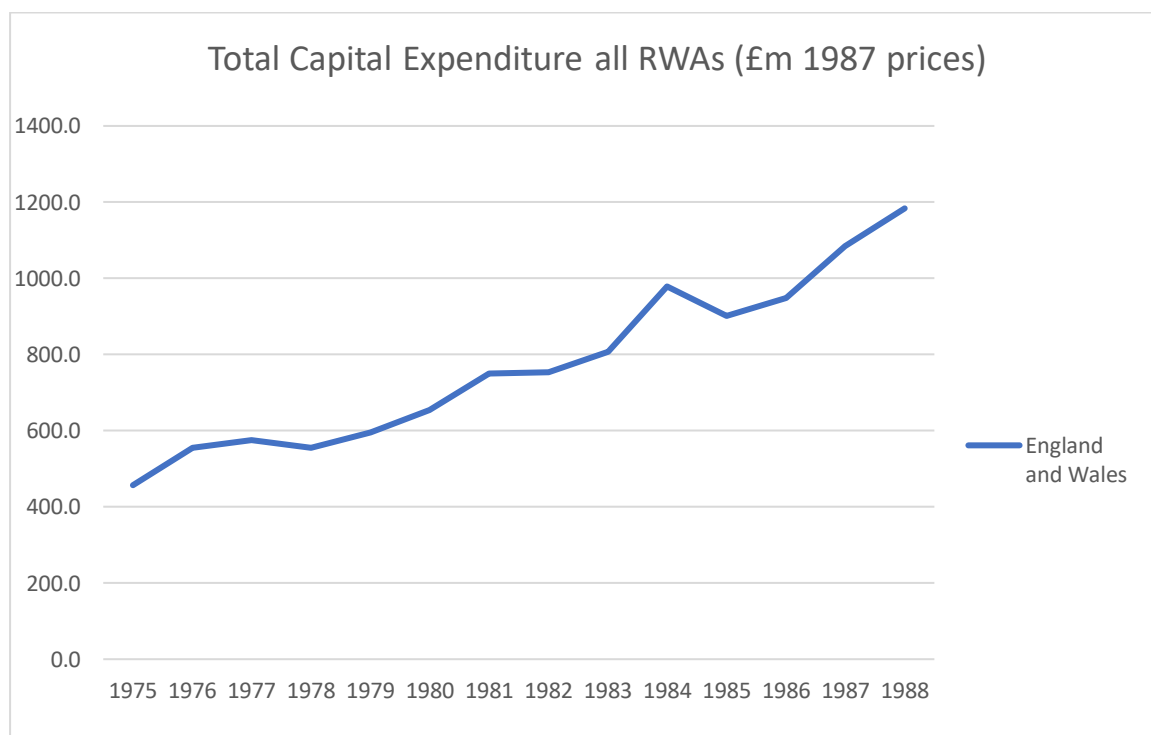


Figure 4.19: Total Capital Expenditure (cipfa 1988) and Waterfacts (1985) for England and Wales

In conclusion there is a large volume of financial time series data which could be assembled between the sources used in the examples above. This data could facilitate analysis of capital expenditure between water and waste services or disaggregated further for example to water resources and water supply.

4.9 Infrastructure metrics

Infrastructure descriptive metrics are not included in the Commission's performance metrics and so are not of primary concern for this project. However, we understand that some metrics in this area maybe of secondary interest to the Commission and this is an area where it is possible to compile some time series data from the original sources collected as part of this pilot project.

From the data sources collected we have determined that it would potentially be possible to compile time series data for the following metrics.

Domestic water meter penetration

The Commission's current historic information in this area relates to household meter penetration and is shown in Table 4.15 and Figure 4.20, which is reproduced from the technical annex of the Commission's 2019 Strategic Investment and Public Confidence report.

Table 4.15: Commission's Infrastructure data

Infrastructure	Earliest current data point
Household water meter penetration % (England)	1999/00

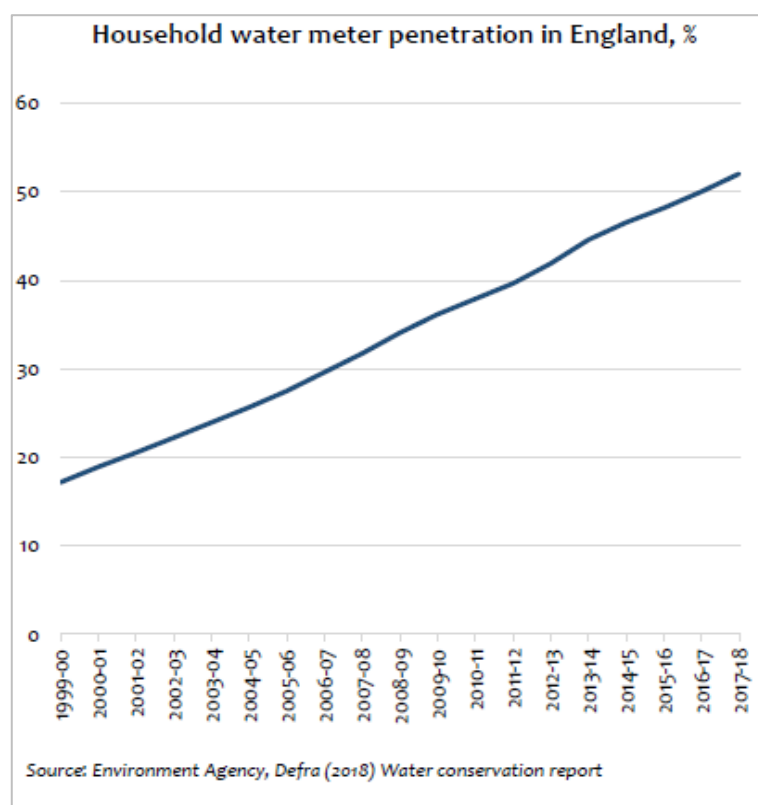


Figure 4.20: Commission's current infrastructure data (original source)

We have been able to extend this data series back to 1985/86 by compiling data from the Waterfacts publications sourced as part of this pilot project. The time series is shown in Table 4.16 and Figure 4.21.

The Waterfacts sources includes figures for each RWA and for water companies combined, for metred and unmetred household connections. In order to produce a consistent time series with the Commission's data which is for England only, we have removed the Welsh Water (Dwr Cymru) data and calculated the percentage. It has not been possible to make an adjustment for the Welsh customers of Dee Valley, which is not anticipated to make a material difference to the overall trend shown in the data.

Table 4.16: % Domestic water meter penetration (England) compiled from Waterfacts

Year	%
1985/86	0.42%
1986/87	0.47%
1987/88	0.56%
1988/89	0.60%
1989/90	0.64%
1990/91	1.78%
1991/92	2.67%
1992/93	3.33%
1993/94	4.61%
1994/95	5.63%
1995/96	6.85%
1996/97	8.36%
1997/98	11.50%
1998/99	14.71%

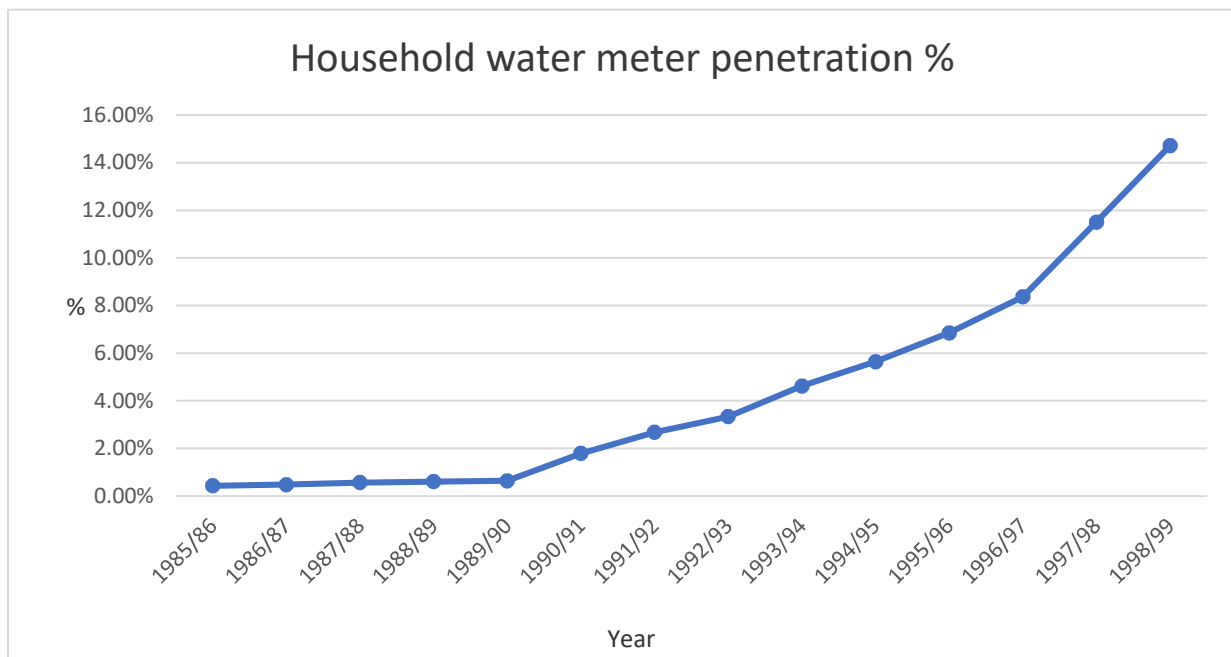


Figure 4.21: Household Water Meter Penetration % (England)

Length of mains & sewers (kms)

Information on the length of mains and sewers is available both in Cipfa annual publications and in RWA and Water Company Annual Reports. It would, therefore, be possible to construct a data series for these metrics by accessing further hard copies of the Cipfa reports (potentially available in the British Library) and/or Annual Reports.

Our sample of Cipfa (1989) contains snapshot data on the length of mains and sewers by RWA and SWC for 1987/88. The sample of annual reports shows that Anglian reported mains and sewer lengths for the reporting year whereas Cambridge Water reported a 10 year time series.

The Saal data set contains some collated data for the RWAs but the two series are not without issue (as set out in Table 3.4 and Table 3.5) and so would require recourse to the original sources to compile the full data set.

These metrics are interesting in their own right as a measure of the scale of the sector and also when normalised by population highlight regional differences in the diffuseness of the population.

Numbers of treatment works (water and sewerage)

Information on the numbers of water and sewerage treatment works are also available both in Cipfa annual publications and in RWA and Water Company Annual Reports. It would, therefore, be possible to construct a data series for these metrics by accessing further hard copies of the Cipfa reports (potentially available in the British Library) and/or Annual Reports. These metrics have not been collated in the Saal dataset.

These metrics are of interest to demonstrate consolidation of the sector over time.

Other infrastructure data

Further metrics are available in annual reports and annual cipfa documents. It would, therefore, potentially be feasible to compile time series on the stock of other assets (eg reservoirs, boreholes, water towers, outfalls) which could show the picture of the changing nature of the sector over time.

This would require recourse to original hard copy sources such as cipfa and annual reports. This was not a priority area for this pilot project and it is recommended that the practicality of compiling data sets in these areas is explored further.

5 Conclusions & Recommendations

5.1 Introduction

The Commission is seeking to curate historic data across a range of infrastructure sectors as part its role to provide expert impartial advice and recommendations to the government on economic infrastructure in the UK.

In this report we set out the findings of one of a number of pilot projects to investigate the availability of historical data for the water and sewerage sector. This is to complement the work already undertaken by the Commission to identify consistent data series for key performance measures in the water and sewerage sector.

Data for a set of water and sewerage performance measures has already been sourced and consistent time series generated back to the early 1990s, which is shortly after the privatisation of the 10 river water authorities in England and Wales. This aligns with the beginning of a consistent information reporting framework introduced by the sector regulator Ofwat.

In this context, the main objective for this project has been to identify available data for the water and sewerage sectors in England and Wales in the pre-privatisation period (i.e. pre 1990) and investigating the scope for developing and extending a consistent time series of data on a range of performance measures in the periods leading up to the privatisations in 1989.

We wish to acknowledge the invaluable assistance and guidance provided by Professor John W. Sawkins and Professor David S. Saal. Both academics have undertaken original research on the economic performance of the water and sewerage sectors in England and Wales and through this work have collated key data series for the sector in the pre-privatisation period. We have referenced their respective contributions in this report.

5.2 Findings

Data availability for the water and sewerage sector in the pre-privatisation period can be best summarised as:

“Taken as whole, the data series in the UK are both chaotic and generally very inaccessible”⁶

This highlights that privatisation represented an important “data break” for the water sector. Post privatisation the information requirements of the newly established regulatory framework quickly established a more ordered picture on data availability. Whereas, prior to this in the pre-privatisation period two factors reinforced a more diffuse situation, namely:

⁶ Quoted from Penning-Roswell, E.C. and Parker, D.J. (1983) Water Volume 17 Reviews of United Kingdom Statistical Sources (ed. W.F. Mauder), Pergamon Press: Oxford.

- The fragmented and regional nature of the sector. The general absence of centralised accountability meant there was less need to create and maintain consistent data reporting; and
- The disbanding of the national Water Data Unit (1981) and the National Water Council (1983). These bodies had been set up following the 1973 re-organisations with national data gathering and dissemination roles.

We observe a clear progression towards an improving (and less chaotic) picture on data availability as the sector moved towards privatisation during the 1980s.

It is also very evident that significant volumes of data from original sources (e.g. annual reports) are available typically in archive form, but as yet much of this data remains uncollated nor synthesised.

At the same time our investigations have identified a number of key publications from a more limited number of organisations and it is here that potential lies for making what has been chaotic more orderly and making what has been generally inaccessible into more readily accessible data.

Key publications identified in hard copy are:

- Waterfacts - a series of this water industry body publications has been sourced from 1985 to 2000
- Cipfa - annual statistics published on the sector covering a range of measures - a sample of three publications have been collected as part of this project
- Digest of Environmental Protection and Water Statistics - a sample of tables from one report has been collected
- Annual Reports and Plans - a sample of three companies and three authorities in each of 3 years have been collected as part of this project.

Key source material is provided to the Commission in pdf form alongside this report.

Our detailed findings are summarised in Table 4.1 (on page 28).

It has been possible to create a time series for two of the Commission's highest priority performance metrics:

- Average domestic water and sewerage bills
- Volumes of water supplied

And also for domestic water meter penetration.

At this stage it has not been possible to collate a time series for other high priority metrics such as leakage. A number of the Commission's metrics relate to England only and consistent time series could be generated for England and Wales, rather than England only.

5.3 Recommendations and Next Steps

The benefit of this pilot project has been to establish that data for the pre-privatised water sector in England and Wales is available. The challenge going forward will be

to collate more holistically and systematically catalogue - ideally in electronic format- the available data, much of which lies in original archived materials.

With some additional work, it would be possible to compile significantly improved data series by sourcing additional copies of the publications sampled in this pilot project.

Our recommendations would be:

- In the light of our findings, obtain further copies of relevant annual reports and publications to confirm the sets of measures where data availability is best for the pre-privatisation periods;
- Commission further detailed investigations to develop a full data inventory consistent with the Commission's current measures;
- Establish working relationships with academic researchers who are active as researchers in the sector and who can offer expertise and insight on the interpretation of data for the pre-privatisation periods.

Appendix A - DoE Digest of environmental protection and water statistics 1984/85

Table A.1 DoE Digest of environmental protection and water statistics 1984/85

Data tables	Variables	Units	Group	Dates
Surface water and groundwater combined: annual abstractions by purpose England and Wales 1972 to 1982	Water supply	ML/d	Abstraction	1972 to 1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales 1972 to 1982	Agriculture	ML/d	Abstraction	1972 to 1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales 1972 to 1982	Industry	ML/d	Abstraction	1972 to 1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales 1972 to 1982	Total abstraction	ML/d	Abstraction	1972 to 1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1982	Water supply	ML/d	Abstraction	1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1982	Agriculture	ML/d	Abstraction	1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1982	Industry	ML/d	Abstraction	1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1982	Total abstraction	ML/d	Abstraction	1982
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1984	Water supply	ML/d	Abstraction	1984
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1984	Agriculture	ML/d	Abstraction	1984
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1984	Industry	ML/d	Abstraction	1984
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1984	Total abstraction	ML/d	Abstraction	1984
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1985	Water supply	ML/d	Abstraction	1985
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1985	Agriculture	ML/d	Abstraction	1985
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1985	Industry	ML/d	Abstraction	1985
Surface water and groundwater combined: annual abstractions by purpose England and Wales River Authorities 1985	Total abstraction	ML/d	Abstraction	1985

Bathing water quality: compliance with mandatory (limit) values: Individual identified bathing waters	Identified bathing waters		Bathing water quality	1979 to 1983
Bathing water quality: compliance with mandatory (limit) values: Individual identified bathing waters	Identified bathing waters		Bathing water quality	1980 to 1985
Water authority expenditure on pollution: Opex	Opex pollution	£m current prices	Expenditure	1974/75 to 1983/84
Water authority expenditure on pollution: Capex	Capex pollution	£m current prices	Expenditure	1974/75 to 1983/84
River water quality classification	Unpolluted / Doubtful / Poor / Grossly polluted	km and %	River water quality	1958, 1970, 1975, 1980
River water quality classification	Good 1A / Good 1B / Fair 2 / Poor 3 / Bad 4	km and %	River water quality	1980, 1985
Dumping of sewage sludge industrial waste and dredgings at sea: amounts dumped and content of certain metals (National)	Total dumped sewage sludge/industrial waste/dredgings	Million tonnes	Sewage disposal	1978 to 1983
Dumping of sewage sludge industrial waste and dredgings at sea: amounts dumped and content of certain metals (National)	Mercury	Million tonnes	Sewage disposal	1978 to 1983
Dumping of sewage sludge industrial waste and dredgings at sea: amounts dumped and content of certain metals (National)	Cadium	Million tonnes	Sewage disposal	1978 to 1983
Dumping of sewage sludge industrial waste and dredgings at sea: amounts dumped and content of certain metals (National)	Copper	Million tonnes	Sewage disposal	1978 to 1983
Dumping of sewage sludge industrial waste and dredgings at sea: amounts dumped and content of certain metals (National)	Lead	Million tonnes	Sewage disposal	1978 to 1983
Dumping of sewage sludge industrial waste and dredgings at sea: amounts dumped and content of certain metals (National)	Zinc	Million tonnes	Sewage disposal	1978 to 1983
Water authority expenditure on pollution control: sewage collection, treatment and disposal	Opex	£m current prices	Sewage treatment and disposal	1974/75 to 1984/85
Water authority expenditure on pollution control: sewage collection, treatment and disposal	Capex	£m current prices	Sewage treatment and disposal	1974/75 to 1984/85
Water authority expenditure on pollution control: sewage collection, treatment and disposal	Opex	£m current prices	Sewage treatment and disposal	1975/76 to 1985/86
Water authority expenditure on pollution control: sewage collection, treatment and disposal	Capex	£m current prices	Sewage treatment and disposal	1975/76 to 1985/86
Water use: water supplied 1972 to 1982	Water supply by country	ML/d	Water supply	1972 to 1982
Water use: water supplied 1978 to 1982 by water authority metered/unmetered	Water supply water authority area	ML/d	Water supply	1978 to 1982

Water use: water supplied 1974 to 1984	Water supply by country	ML/d	Water supply	1972 to 1982
Water use: water supplied 1979 to 1984 by water authority metered/unmetered	Water supply water authority area	ML/d	Water supply	1978 to 1982
Water use: water supplied 1974 to 1984	Water supply by country	ML/d	Water supply	1972 to 1982
Water use: water supplied 1980 to 1985 by water authority metered/unmetered	Water supply water authority area	ML/d	Water supply	1978 to 1982

Appendix B - Cipfa (1981) data table summary

Table B.1 Cipfa (1981) data table summary

Data tables	Variables	Units	Group	Dates
Water supply statistics 1979-80 by authority / division /water only company	Fixed Assets W.D.V. 31/03/80	£000s	Asset value	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Sources of supply	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Abstraction of water	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Conveyance of raw water	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Treatment of water	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Bulk purchase of treated water	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Pumping	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Service reservoirs towers and tanks	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Repair and maintenance of mains	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Examination of water	pence	Expenditure	1979-80

Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Consumer meters	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Waste prevention and inspection	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Rates and water authority charges	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Research and Development	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Technical Services Control	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Policy management and administration	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Proportion of contribution to NWC & WRC	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Total working expenses	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Financing charges	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Expenditure per cubic meter of water supplied; Equalisation Act 1977	pence	Expenditure	1979-80

Water supply statistics 1979-80 by authority / division / water only company	Expenditure per cubic meter of water supplied; TOTAL EXPENSES	pence	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Capital expenditure in year	£000s	Expenditure	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Income per cubic meter of water supplied; Unmeasured supplies	pence	Income	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Income per cubic meter of water supplied; Measured supplies	pence	Income	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Income per cubic meter of water supplied; Other income	pence	Income	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Income per cubic meter of water supplied; Equalisation Act 1977	pence	Income	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Income per cubic meter of water supplied; Total income	pence	Income	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Estimated losses in distribution	%	Leakage	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Population served	000s	Population	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Area served	km2	Population	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Nr of households	Nr	Population	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Nr of combined residential/commercial properties	Nr	Population	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Nr of commercial properties	Nr	Population	1979-80
Sewage Treatment and Disposal Statistics 1979-80 by authority / division / works	Population of area draining to the works	Nr	Population	1979-80

Sewage Treatment and Disposal Statistics 1979-80 by authority / division / works	Method of purification		Sewage treatment and disposal	1979-80
Sewage Treatment and Disposal Statistics 1979-80 by authority / division / works	Dry weather flow	m3/day	Sewage treatment and disposal	1979-80
Sewage Treatment and Disposal Statistics 1979-80 by authority / division / works	Trade effluent	m3/day	Sewage treatment and disposal	1979-80
Sewage Treatment and Disposal Statistics 1979-80 by authority / division / works	Total sewage flow	m3/day	Sewage treatment and disposal	1979-80
Sewage Treatment and Disposal Statistics 1979-80 by authority / division / works	Proportion of dry weather flow which is treated	%	Sewage treatment and disposal	1979-80
Sewage Treatment and Disposal Statistics 1979-80 by authority / division / works	Various strength and cost of treatment/disposal for each works		Sewage treatment and disposal	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Length of mains	Mains	Water assets	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Unmeasured supplies	MI/yr	Water distributed	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Measured supplies	MI/yr	Water distributed	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Supplies to other undertakings	MI/yr	Water distributed	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Nr of meters installed	Nr	Water resources	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Storage capacity raw water	MI	Water resources	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Storage capacity treated water	MI	Water resources	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Water supplied from own supplies	MI/yr	Water supply	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Bulk supplies received	MI/yr	Water supply	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Surface sources	MI/yr	Water supply	1979-80
Water supply statistics 1979-80 by authority / division / water only company	Underground sources	MI/yr	Water supply	1979-80

Water supply statistics 1979-80 by authority / division /water only company	Average daily supply	MI/d	Water supply	1979-80
Water supply statistics 1979-80 by authority / division /water only company	Water supplied non-potable	%	Water supply	1979-80

Appendix C - Cipfa (1986) data table summary

Table C.1 Cipfa (1986) data table summary

Data tables	Variables	Units	Group	Dates
England and Wales Customer statistics - population and users by water authority	Population served water	000s	Population	1986/87
England and Wales Customer statistics - population and users by water authority	Population served sewerage	000s	Population	1986/87
England and Wales Customer statistics - population and users by water authority	Households metered	000s	Population	1986/87
England and Wales Customer statistics - population and users by water authority	Households unmetered	000s	Population	1986/87
England and Wales Customer statistics - population and users by water authority	Businesses metered	000s	Population	1986/87
England and Wales Customer statistics - population and users by water authority	Businesses unmetered	000s	Population	1986/87
England and Wales Statutory Water Companies Customer statistics (water supply)	Resident population	000s	Population	1986/87
England and Wales Statutory Water Companies Customer statistics (water supply)	Households	000s	Population	1986/87
England and Wales Statutory Water Companies Customer statistics (water supply)	Businesses	000s	Population	1986/87
England and Wales Customer statistics - water bills by water authority	Average bill water	£	Water and sewerage bills	1981-82,1985-86,1986-87
England and Wales Customer statistics - water bills by water authority	Average bill sewerage	£	Water and sewerage bills	1981-82,1985-86,1986-87
England and Wales Customer statistics - water bills unmetered households by water authority	Standing charges water	£	Water and sewerage bills	1986/87
England and Wales Customer statistics - water bills unmetered households by water authority	Standing charges water	% of average bill	Water and sewerage bills	1986/87
England and Wales Customer statistics - water bills unmetered households by water authority	Standing charges waste	£	Water and sewerage bills	1986/87
England and Wales Customer statistics - water bills unmetered households by water authority	Standing charges waste	% of average bill	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water (Metered)	Volumetric charges	p per m3	Water and sewerage bills	1986/87

England and Wales RWAs Charges to Businesses Water (Metered)	Standing charges; metering plus availability charge for the 15mm supply pipe size	£	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water (Metered)	Average equated value of metering and availability charges	p per m3	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water (Metered)	The total equated charge; the two part tariff expressed as an equivalent rate per cubic metre of water used	p per m3	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water (Metered)	Equated standing charge as a percentage of the equated charge	%	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water (Metered)	Standing charges (large suppliers) ratio of standing charges for 150mm and 15mm supplies	150mm/15mm	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered)	Drainage and used water; Volumetric charges for used water (domestic strength)	p per m3	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered)	Drainage and used water; Other charges on each £ of Rateable Value	p/£RV	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered)	Drainage and used water; Other charges on each business	£	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered)	Environmental charges on each £ of Rateable Value	p/£RV	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered) Trade effluent	Minimum charge	£	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered) Trade effluent	Volume dependent charge	p/m3	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered) Trade effluent	Total strength dependent charge	p/m3	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Water Sewerage (Metered) Trade effluent	Combined volume and strength charge	p/m3	Water and sewerage bills	1986/87

England and Wales RWAs Charges to Businesses Water (Metered) Trends	The equated charge for water supply	p/m3	Water and sewerage bills	1981/82, 1985/86, 1986/87
England and Wales RWAs Charges to Businesses Sewerage (Metered) Trends	Volumetric charge for domestic strength used water	p/m3	Water and sewerage bills	1981/82, 1985/86, 1986/87
England and Wales RWAs Charges to Businesses Sewerage (Metered) Trends	Trade effluent; % increase from 1985/86	%	Water and sewerage bills	1986/87
England and Wales RWAs Charges to Businesses Sewerage (Metered) Trends	Trade effluent; % increase from 1981/82	%	Water and sewerage bills	1986/87
England and Wales Statutory Water Companies Customer statistics (water supply)	The average bill	£	Water and sewerage bills	1981/82, 1985/86, 1986/87
England and Wales Statutory Water Companies Customer statistics (water supply)	The % bill increase from 1985/86	%	Water and sewerage bills	1986/87
England and Wales Statutory Water Companies Customer statistics (water supply)	The % bill increase from 1981/82	%	Water and sewerage bills	1986/87

Appendix D - Cipfa (1989) data table summary

Table D.1 Cipfa (1989) data table summary

Data tables	Variables	Units	Group	Dates
Capital statistics; Asset values, construction, revaluation and other changes during the year	Gross Replacement Cost	£m	Asset value	31/03/1987
Capital statistics; Asset values, construction, revaluation and other changes during the year	Previous year's depreciation	£m	Asset value	1987/88
Capital statistics; Asset values, construction, revaluation and other changes during the year	Commissioned works	£m	Asset value	1987/88
Capital statistics; Asset values, construction, revaluation and other changes during the year	Net disposal write offs	£m	Asset value	1987/88
Capital statistics; Asset values, construction, revaluation and other changes during the year	Depreciation provision	£m	Asset value	1987/88
Capital statistics; Asset values, construction, revaluation and other changes during the year	Net revaluation	£m	Asset value	1987/88
Capital statistics; Asset values, construction, revaluation and other changes during the year	Net Asset Values	£m	Asset value	31/03/1988
Water resources and supply; Extracts from balance sheet by Statutory Water Companies	Historic Gross Cost of Fixed Assets	£000s	Asset value	1987/88
Water resources and supply; Extracts from balance sheet by Statutory Water Companies	Share, loan and lease finance	£000s	Asset value	1987/88
Water resources and supply; Extracts from balance sheet by Statutory Water Companies	Finance as % of Historic Cost of Gross assets	%	Asset value	1987/88
Water resources and supply; Extracts from balance sheet by Statutory Water Companies	Historic Cost of Fixed Assets per Head of the population	£/person	Asset value	1987/88
Water resources and supply; Opex by RWAs	Water resources and supply Opex	£m	Expenditure	1987/88
Water resources and supply; Unit costs of piped supply by RWAs (1987/88 prices)	Operating costs per head equivalent population	£	Expenditure	1983/84 to 1987/88
Drainage, used water and environment; sewerage opex by RWAs	Sewerage opex	£m	Expenditure	1987/88
Drainage, used water and environment; sewerage opex by RWAs	Sewerage opex change from 1987/88	%	Expenditure	1983/84, 1987/88
Drainage, used water and environment; sewerage opex by RWAs (1987/88 prices)	Operating costs per head equivalent population	£	Expenditure	1983/84 to 1987/88

Water resources and supply; opex costs per head equivalent population by RWAs (1987/88 prices)	Operating costs per head equivalent population	£	Expenditure	1983/84 to 1987/88
Drainage, used water and environment; Total service operating costs by RWAs	Total service operating costs	£m	Expenditure	1983/84 to 1987/88
Drainage, used water and environment; Total service operating costs by RWAs	Operating costs per weighted head equivalent population	£	Expenditure	1983/84 to 1987/88
Capital costs for construction and rehabilitation of works by RWAs	Water resources and supply	£m	Expenditure	1987/88
Capital costs for construction and rehabilitation of works by RWAs	Sewerage	£m	Expenditure	1987/88
Capital costs for construction and rehabilitation of works by RWAs	Sewage treatment and disposal	£m	Expenditure	1987/88
Capital costs for construction and rehabilitation of works by RWAs	Land drainage	£m	Expenditure	1987/88
Capital costs for construction and rehabilitation of works by RWAs	Other	£m	Expenditure	1987/88
Capital costs for construction and rehabilitation of works by RWAs	Total capex	£m	Expenditure	1987/88
Total capital expenditure by RWAs (1987/88 prices)	Total capex	£m	Expenditure	1983/84 to 1987/88
Water resources and supply; operating costs by Statutory Water Companies	Opex	£000s	Expenditure	1983/84 to 1987/88
Water resources and supply; capital expenditure by Statutory Water Companies	Capex	£000s	Expenditure	1983/84 to 1987/88
Water resources and supply; Unit costs by Statutory Water Companies	Operating costs per km of main	£	Expenditure	1987/88
Water resources and supply; Unit costs by Statutory Water Companies	Operating costs per head resident population	£	Expenditure	1987/88
Water resources and supply; Unit costs by Statutory Water Companies	Capital expenditure per head resident population	£	Expenditure	1987/88
Operational Statistics Population and Area by RWAs	Statutory responsibility of RWA	km2	Population	1987/88
Operational Statistics Population and Area by RWAs	Actual direct water supply	km2	Population	1987/88
Operational Statistics Population and Area by RWAs	Actual direct sewerage and sewage disposal	km2	Population	1987/88
Operational Statistics Population and Area by RWAs	Resident population in RWA Statutory Area	000s	Population	1987/88

Operational Statistics Population and Area by RWAs	Resident population in direct supply area	000s	Population	1987/88
Operational Statistics Population and Area by RWAs	Resident population in sewerage area	000s	Population	1987/88
Operational Statistics Population and Area by RWAs	Sparsity of population; for the statutory area	m2 per person	Population	1987/88
Manpower statistics by RWA	Employees	Nr	Population	1983/84 to 1987/88
Operational Statistics Equivalent population by RWAs	Water supply	000s	Population	1987/88
Operational Statistics Equivalent population by RWAs	Sewerage	000s	Population	1987/88
Operational Statistics Equivalent population by RWAs	Sewage treatment and disposal	000s	Population	1987/88
Operational Statistics Equivalent population by RWAs	Environmental services	000s	Population	1987/88
Operational Statistics Equivalent population by RWAs	Land drainage	000s	Population	1987/88
Water resources and supply; operational statistics by Statutory Water Companies	Area served	km2	Population	1987/88
Water resources and supply; operational statistics by Statutory Water Companies	Population directly supplied	000s	Population	1987/88
Water resources and supply; operational statistics by Statutory Water Companies	Sparsity of population	m2 per person	Population	1987/88
Customer statistics by water authorities and statutory water companies	Population served water	000s	Population	1987/88
Customer statistics by water authorities and statutory water companies	Population served sewage disposal	000s	Population	1987/88
Customer statistics by water authorities and statutory water companies	Area served sewerage/Water supply	km2	Population	1987/88
Customer statistics by water authorities and statutory water companies	Area served sewerage/sewerage disposal	km2	Population	1987/88
Customer statistics by water authorities and statutory water companies	Number of properties on unmetered water supply; domestic	Nr	Population	1987/88
Customer statistics by water authorities and statutory water companies	Number of properties on unmetered water supply; combined domestic commercial	Nr	Population	1987/88
Customer statistics by water authorities and statutory water companies	Number of properties on unmetered water supply; commercial industrial etc.	Nr	Population	1987/88

Drainage, used water and environment; river quality by RWAs	Proportion of river water falling into Class III and Class IV	%	River water quality	1983/84 to 1987/88
Drainage, used water and environment infrastructure by RWAs	Length of sewers	km	Sewerage infrastructure	1987/88
Drainage, used water and environment infrastructure by RWAs	Length of sewers per head of equivalent population	m	Sewerage infrastructure	1987/88
Drainage, used water and environment infrastructure by RWAs	Sewage treatment works	Nr	Sewerage infrastructure	1987/88
Drainage, used water and environment infrastructure by RWAs	Average equivalent population per treatment works	Nr	Sewerage infrastructure	1987/88
Drainage, used water and environment; trade effluent by RWAs	Trade effluent volume	ML/d	Trade effluent	1983/84 to 1987/88
Water charges unmetered supply by Statutory Water Companies	Average charge to households (unmetered)	£	Water and sewerage bills	1982/83, 1988/89, 1989/90
Water resources and supply infrastructure by RWAs	Number of treatment works	Nr	Water assets	1987/88
Water resources and supply infrastructure by RWAs	Total length of mains	km	Water assets	1987/88
Water resources and supply infrastructure by RWAs	Length of mains per head of equivalent population	m	Water assets	1987/88
Water resources and supply infrastructure by RWAs	Length of mains per head of resident population connected	m	Water assets	1987/88
Water resources and supply; operational statistics by Statutory Water Companies	Length of mains	km	Water assets	1987/88
Water resources and supply; operational statistics by Statutory Water Companies	Length of main per 1000 Head of population	km	Water assets	1987/88
Water resources and supply; operational statistics by Statutory Water Companies	Resident population on supply	%	Water assets	1987/88
Water supply by RWAs	Piped water supply	ML/d	Water supply	1983/84, 1987/88
Water supply by Statutory Water Companies	Piped water supply	ML/d	Water supply	1983/84, 1987/88

Appendix E - Anglian Water Annual Reports 1974-75, 1979-80 & 1984-85 Data tables

Table E.1 Anglian Water Annual Reports 1974-75, 1979-80 & 1984-85 Data tables excluding accounts

Data tables	Variables	Units	Group	Dates
Water consumption and assets	Sources	Nr	Asset data	1974/75
Water consumption and assets	Pumping and booster stations	Nr	Asset data	1974/75
Water consumption and assets	Service Reservoirs	Nr	Asset data	1974/75
Water consumption and assets	Water towers	Nr	Asset data	1974/75
Table 1 Water consumption and assets	Sources	Nr	Asset data	1979/80
Table 1 Water consumption and assets	Pumping and booster stations	Nr	Asset data	1979/80
Table 1 Water consumption and assets	Service Reservoirs	Nr	Asset data	1979/80
Table 1 Water consumption and assets	Water towers	Nr	Asset data	1979/80
Table 1 Water consumption and assets	Sources	Nr	Asset data	1984/85
Table 1 Water consumption and assets	Pumping and booster stations	Nr	Asset data	1984/85
Table 1 Water consumption and assets	Service Reservoirs	Nr	Asset data	1984/85
Table 1 Water consumption and assets	Water towers	Nr	Asset data	1984/85
Table 1 Water consumption and assets	Impounding and storage reservoirs	Nr	Asset data	1984/85
Table 1 Water consumption and assets	Water treatment works; chlorination only	Nr	Asset data	1984/85
Table 1 Water consumption and assets	Water treatment works; other	Nr	Asset data	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Average size of works in population served; sewerage	Pop/works	Asset data	1980/81 to 1984/85
Table 1: Summary of bacteriological examinations of water samples showing % wholly free from coliforms by division, area or water company	Raw water total	Nr samples	DWQ	1974/75
Table 1: Summary of bacteriological examinations of water samples showing % wholly free from coliforms by division, area or water company	Treated water	Nr samples	DWQ	1974/75
Table 1: Summary of bacteriological examinations of water samples showing % wholly free from coliforms by division, area or water company	Treated water	% coliform free	DWQ	1974/75
Table 1: Summary of bacteriological examinations of water samples showing % wholly free from coliforms by division, area or water company	Distributed water	Nr samples	DWQ	1974/75

Table 1: Summary of bacteriological examinations of water samples showing % wholly free from coliforms by division, area or water company	Distributed water	% coliform free	DWQ	1974/75
Table 3: Summary of bacteriological examination of water supplies	Raw water total	Nr samples	DWQ	1979/80
Table 3: Summary of bacteriological examination of water supplies	Treated water	Nr samples	DWQ	1979/80
Table 3: Summary of bacteriological examination of water supplies	Treated water	% satisfactory	DWQ	1979/80
Table 3: Summary of bacteriological examination of water supplies	Distributed water	Nr samples	DWQ	1979/80
Table 3: Summary of bacteriological examination of water supplies	Distributed water	% satisfactory	DWQ	1979/80
Table 3: Summary of bacteriological examination of water supplies	Raw water total	Nr samples	DWQ	1984/85
Table 3: Summary of bacteriological examination of water supplies	Treated water	Nr samples	DWQ	1984/85
Table 3: Summary of bacteriological examination of water supplies	Treated water	% satisfactory	DWQ	1984/85
Table 3: Summary of bacteriological examination of water supplies	Distributed water	Nr samples	DWQ	1984/85
Table 3: Summary of bacteriological examination of water supplies	Distributed water	% satisfactory	DWQ	1984/85
Table 14 DOE Related Capital Works	Capex on current projects; Water supply	£000s	Expenditure	1984/85
Table 14 DOE Related Capital Works	Capex on current projects; Sewerage	£000s	Expenditure	1984/85
Table 14 DOE Related Capital Works	Capex on current projects; Sewage treatment	£000s	Expenditure	1984/85
Table 14 DOE Related Capital Works	Capex on current projects; Water resources	£000s	Expenditure	1984/85
Table 14 DOE Related Capital Works	Capex on current projects; Water other	£000s	Expenditure	1984/85
Table 14 DOE Related Capital Works	Capex on current projects; Total	£000s	Expenditure	1984/85
Table 15 MAFF Related Capital Works	Capex on current projects; Fluvial	£000s	Expenditure	1984/85

Table 15 MAFF Related Capital Works	Capex on current projects; Sea defences	£000s	Expenditure	1984/85
Table 15 MAFF Related Capital Works	Capex on current projects; Other	£000s	Expenditure	1984/85
Table 15 MAFF Related Capital Works	Capex on current projects; Total	£000s	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs water supply; Operational and management	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs water supply; Current cost depreciation	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs water supply; Current cost operating profit	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs water supply; Total	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs water supply; Operational and management	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs water supply; Current cost depreciation	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs water supply; Current cost operating profit	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs water supply; Total	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs water supply; Manpower costs	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs water supply; Power costs	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs water supply; Chemical costs	£/hd	Expenditure	1980/81 to 1984/85

Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage; Operational and management	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage; Current cost depreciation	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage; Current cost operating profit	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage; Total	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs sewerage; Operational and management	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs sewerage; Current cost depreciation	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs sewerage; Current cost operating profit	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs sewerage; Total	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage treatment; Operational and management	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage treatment; Current cost depreciation	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage treatment; Current cost operating profit	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Anglian Water unit costs sewerage treatment; Total	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs sewerage treatment; Operational and management	£/hd	Expenditure	1980/81 to 1984/85

Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs sewerage treatment; Current cost depreciation	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs sewerage treatment; Current cost operating profit	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average costs sewerage treatment; Total	£/hd	Expenditure	1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs sewage treatment (inc. in Operational and Management); Manpower costs	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Water industry average unit costs sewage treatment (inc. in Operational and Management); Power costs	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Environmental services; Ops and Man expenditure per head equivalent population	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Anglian Water; Water supply	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Anglian Water; Sewerage	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Anglian Water; Sewage treatment	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Anglian Water; Land drainage	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Water industry average; Water supply	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Water industry average; Sewerage	£/hd	Expenditure	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Water industry average; Sewage treatment	£/hd	Expenditure	1980/81 to 1984/85

Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Capital expenditure ratios Water industry average; Land drainage	£/hd	Expenditure	1980/81 to 1984/85
Water consumption and assets	Length of mains	km	Mains	1974/75
Table 1 Water consumption and assets	Length of mains	km	Mains	1979/80
Table 1 Water consumption and assets	Length of mains	km	Mains	1984/85
Manpower statistics; employment	Full time	Nr	Manpower	1974/75
Manpower statistics; employment	Part time	Nr	Manpower	1974/75
Manpower statistics; employment	Full time equivalent	Nr	Manpower	1974/75
Manpower statistics; employment costs	Revenue	£000s	Manpower	1974/75
Manpower statistics; employment costs	Rechargeable	£000s	Manpower	1974/75
Manpower statistics; employment costs	Capital	£000s	Manpower	1974/75
Manpower statistics; employment costs	Total	£000s	Manpower	1974/75
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Anglian Water; Water supply	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Anglian Water; Sewerage	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Anglian Water; Sewage treatment	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Anglian Water; Land drainage	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Water industry average; Water supply	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Water industry average; Sewerage	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85

Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Water industry average; Sewage treatment	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Manpower ratios Water industry average; Land drainage	Nr per 1,000 head of equivalent population	Manpower	1980/81 to 1984/85
Water consumption and assets	Average daily consumption	tcmd	PCC	1974/75
Diagram number 1	Average daily consumption	tcmd	PCC	1969/70 to 1974/75
Diagram number 1	Average daily metered consumption	tcmd	PCC	1969/70 to 1974/75
Diagram number 1	Average daily unmetered consumption	tcmd	PCC	1969/70 to 1974/75
Table 1 Water consumption and assets	Average daily consumption	tcmd	PCC	1979/80
Table 2 Water consumption by company (Cambridge Water, East Anglian Water, Essex Water, Tendering Hundred Water)	Average daily consumption	tcmd	PCC	1979/80
Table 5 Per capita consumption	PCC metered	Litres/Head/Day	PCC	1975/76 to 1979/80
Table 5 Per capita consumption	PCC domestic and unmetered	Litres/Head/Day	PCC	1975/76 to 1979/80
Table 5 Per capita consumption	PCC total	Litres/Head/Day	PCC	1975/76 to 1979/80
Table 1 Water consumption and assets	Average daily consumption	ML/d	PCC	1984/85
Table 2 consumption	Table 2 consumption; Per capita consumption metered	l/hd/d	PCC	1974/75 to 1984/85
Table 2 consumption	Per capita consumption unmetered	l/hd/d	PCC	1974/75 to 1984/85
Table 2 consumption	Per capita consumption total	l/hd/d	PCC	1974/75 to 1984/85
Water consumption and assets	Population supplied	000s	Population	1974/75
Water consumption and assets	Area	km2	Population	1974/75
Table 1 Water consumption and assets	Population supplied	000s	Population	1979/80
Table 1 Water consumption and assets	Area	km2	Population	1979/80
Table 1 Water consumption and assets	Population supplied	000s	Population	1984/85
Table 1 Water consumption and assets	Area	km2	Population	1984/85

Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Percentage Resident Population connected; sewerage	%	Population	1980/81 to 1984/85
Chemical classification of rivers and canals	Class	% of total length	River water quality	1974/75
Table 25 Summary of chemical survey tidal and non-tidal waters	Length of river by class (1,2,3,4)	km	River water quality	1974, 1978, 1979
Table 25 Summary of biological survey	Length of river by class (A,B,C,D)	km	River water quality	1975 to 1979
Table 16 NWC Classification - Fresh Water Rivers	Length of River Class (1A, 1B 2,3,4)	km	River water quality	1980 to 1984
Table 16 NWC Classification - Fresh Water Rivers	Length of River Class (1A, 1B 2,3,4)	%	River water quality	1980 to 1984
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Total length of classified rivers	km	River water quality	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Length of class III and class IV rivers	km	River water quality	1980/81 to 1984/85
Table 8 Performance of major sewage treatment works serving populations >10,000 Quarterly	Not complying with effluent consent conditions	Nr	Sewage treatment and disposal	1979/80
Table 8 Performance of major sewage treatment works serving populations 100 to 10,000 Quarterly	Not complying with effluent consent conditions	Nr	Sewage treatment and disposal	1979/80
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Pollution load removed per head served by works removing BOD	%	Sewage treatment and disposal	1980/81 to 1984/85
Table 7 Number of public sewage treatment works by population band and treatment type	Sewage treatment works by population band	Nr	Sewerage infrastructure	1979/80
Table 7 Number of public sewage treatment works by population band and treatment type	Sewage treatment process	Nr	Sewerage infrastructure	1979/80
Table 7 Number of public sewage treatment works by population band and treatment type	Sludge processes	Nr	Sewerage infrastructure	1979/80
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Percentage from Ground Sources	%	Water resources	1980/81 to 1984/85
Table 2 consumption	Average consumption metered	ML/d	Water supply	1974/75 to 1984/85
Table 2 consumption	Average consumption unmetered	ML/d	Water supply	1974/75 to 1984/85
Table 2 consumption	Average consumption total	ML/d	Water supply	1974/75 to 1984/85

Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Percentage supplied as metered potable	%	Water supply	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Percentage supplied as metered non-potable	%	Water supply	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Percentage supplied as unmetered	%	Water supply	1980/81 to 1984/85
Performance 1980/81 to 1984/85 by Anglian Water and Water Industry Average for some variables	Percentage Resident Population supplied	%	Water supply	1980/81 to 1984/85

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