

# Methods and sources for National Infrastructure Delivery Plan 2016-2021

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## Introduction

This note provides further information regarding the methods employed and sources used to produce estimates presented within the National Infrastructure Delivery Plan 2016-21.

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# Methods and sources for the average annual infrastructure investment estimates

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**1.1** The estimates of average annual infrastructure investment in the UK cover the periods 2005-06 to 2009-10 and 2010-11 to 2014-15. These estimates improve the understanding of historic infrastructure investment, statistics for which are not available elsewhere.

**1.2** The sources and method provide a consistent, transparent and reliable estimate of infrastructure investment across periods, using publicly-available data. The estimates capture both public and private capital spending from the identified published sources, across six key economic infrastructure sectors covered in the National Infrastructure Delivery Plan 2016-2021: communications, energy, transport, water, waste and flood defence.

## Sources

**1.3** The sources provide a transparent estimate of infrastructure investment across periods by using publicly-available data. To accomplish this, data are compiled from published public sector sources. Additionally, published data from private sector sources, such as company accounts, are included to provide a more comprehensive picture of investment.

**1.4** The sources provide a consistent estimate of investment through time. Although some sources report data by financial year while other sources report it by calendar years, no adjustments have been made to account for differences in the point at which a year ends. This is because the year end is consistent within each source. Therefore there is only a minimal impact when making comparisons across the two time periods.

**1.5** The sources provide a reliable estimate of investment across sectors by including robust and relevant published measures. Minor differences between sources may arise reflecting the terminology of the measures that are available and the variation in accounting methods used in company accounts. For example, some sources may include maintenance and repair costs whereas others cover just the initial development and construction costs. Some examples of variance across sectors and organisations in the terminology used include, 'investment spending', (e.g. Oxford Economics report on UKMPG ports); 'capital expenditure', (e.g. regulatory accounts for water companies in England and Wales); and, 'capital investment' (e.g. Manchester Airports Group annual report).

**1.6** Data are compiled across infrastructure sectors in the following way:

- 1 Communications:** Investment made by providers, networks and services listed in the Ofcom Infrastructure Report 2013 update.<sup>1</sup> Data for Three (Hutchinson Whampoa), Arqiva and Everything Everywhere, and their respective predecessors, are not included as they have not published consistent UK specific data across the two periods.
- 2 Energy:** A comprehensive measure of investment by the energy industries is taken from the Energy Sector Indicators 2015, published by DECC.
- 3 Transport:** Public sector capital expenditure data are as published by HM Treasury in the Public Expenditure Statistical Analysis (PESA) and the COINS datasets.<sup>2</sup> Private

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<sup>1</sup> Ofcom, Infrastructure Report 2013 Update, 24 October 2013: [http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/infrastructure-report/IRU\\_2013.pdf](http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/infrastructure-report/IRU_2013.pdf)

<sup>2</sup> HM Treasury, COINS datasets, 2013: [http://webarchive.nationalarchives.gov.uk/20130405170223/http://www.hm-treasury.gov.uk/psr\\_coins\\_data.htm](http://webarchive.nationalarchives.gov.uk/20130405170223/http://www.hm-treasury.gov.uk/psr_coins_data.htm)

sector investment consists of investment made by the major UK airports, namely Heathrow, Gatwick, Stansted and Manchester Airport Group (which from this year incorporates Stansted airport), which account for over 64% of passengers at airports in the UK;<sup>3</sup> and estimates on port infrastructure investment made by members of the UK Major Ports Group, covering 42 ports which account for over 70% of the tonnage handled in UK ports.

- 4 **Waste:** Public sector capital expenditure on waste, as published in the COINS and OSCAR datasets<sup>4</sup> and PESA Country and Regional Analysis 2015<sup>5</sup>.
- 5 **Water:** Data on gross capital expenditure for England and Wales are sourced from Ofwat (the Water Services Regulation Authority) for the period up to 2009-10, and the individual regulatory accounts of water companies, as identified by Ofwat,<sup>6</sup> in later years. Data on capital investment are also obtained from the accounts of Scottish Water (a publicly owned company, answerable to the Scottish Government) and on capital expenditure from the accounts of Northern Ireland Water (a government owned company) for all years.
- 6 **Flood defence:** Data comprise of expenditure in England as measured using the element of Defra funding identified as capital expenditure. Expenditure for 2014-15 is provisional.

A full list of sources is available at the end of this document.

**1.7** The source data consist of a mixture of current price data (CP) and constant price data (KP). Current price data are expressed in terms of the prices in that period; for example 2013-14 data expressed in terms of the prices in 2013-14. Constant price data allow figures to be represented with the effects of changes in the price level removed. The values for each time period are expressed in terms of the prices in some base period, for example 2011-12 data expressed in terms of the prices in 2014-15. This provides an approximation of how much the investment carried out in 2011-12 would equate to if it had been carried out in 2014-15.

## Methods

**1.8** Once the data are collected, the current price data are converted to constant 2014-15 prices using the GDP deflator.<sup>7</sup> This removes the impact of inflation and changes in price levels through time so that all of the data are comparable. The same adjustments are applied across all sectors and types of infrastructure, as is a standard practice when deflating spending measures.

**1.9** The method of adjusting current price data to constant price data is shown in Equation 1. The current price investment data ( $I_{s,y}(CP)$ ) for each source ( $s$ ) and year ( $y$ ), are multiplied by the ratio of the deflator in the required base year ( $P_0$ ) and the deflator in the reference year to which the prices currently relate ( $P_t$ ) to produce the constant price measure ( $I_{s,y}(KP)$ ). This accounts for the difference in the general price level between the two years.

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<sup>3</sup> Civil Aviation Authority, UK Airport Statistics: 2013 – annual, *Table 01 Size of UK Airports 2013 Comp 2008*:

<http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&sglid=3&fld=2013>

<sup>4</sup> HM Treasury, OSCAR datasets, 2014: <https://www.gov.uk/government/collections/hmt-oscar-publishing-from-the-database>

<sup>5</sup> HM Treasury, Country and regional analysis, 2015: <https://www.gov.uk/government/statistics/country-and-regional-analysis-2015>

<sup>6</sup> Ofwat, Links to companies' regulatory accounts, 2012: [http://www.ofwat.gov.uk/regulating/reporting/earlierreports/prs\\_web2012regaccounts](http://www.ofwat.gov.uk/regulating/reporting/earlierreports/prs_web2012regaccounts)

<sup>7</sup> HM Treasury, GDP deflators at market prices and money GDP, updated December 2015: <https://www.gov.uk/government/statistics/gdp-deflators-at-market-prices-and-money-gdp-december-2015-quarterly-national-accounts>.

### Equation 1: Adjusting current price investment data to constant price investment data using a price deflator

$$I_{s,y}(KP) = I_{s,y}(CP) \cdot \frac{P_0}{P_t}$$

**1.10** Equation 1 can be applied to express investment data for the year 2011-12 in terms of 2014-15 prices. The value of the deflator in 2014-15 ( $P_0$ ) would be divided by the value of the deflator in 2011-12 ( $P_t$ ), and then multiplied by the value of current price investment in 2011-12. See Annex A for a worked example.

**1.11** In some instances the sources publish data in constant prices but these are not comparable with the other data when measured in terms of the prices for a different base year, for example if measured in 2010-11 prices as opposed to 2014-15 prices. Therefore data published in constant prices in the source material are also adjusted to 2014-15 prices, using the GDP deflator, under the same principle. One exception to this concerns the publication for water investment in England and Wales from 2005-06 to 2009-10. This source originally expressed data in terms of the price level in 2009-10, using the retail price index (RPI) as a deflator. These data are therefore converted to current prices using the RPI<sup>8</sup> before applying the GDP deflator to estimate constant price figures on a consistent basis to all other data. This means that all data have been adjusted, to take account of changes in the general price level through time, in the same manner.

**1.12** The two time periods, 2005-06 to 2009-10 and 2010-11 to 2014-15, presented in the publication are selected to allow for a comparison across parliaments. The constant price data for each source are averaged across the years that make up the relevant time periods, by first aggregating the data for the relevant years ( $\sum_{y \in Y} (I_{s,y})$ ) and then dividing by the relevant number of years ( $Y$ ); five years for the first period and five years for the second period, as shown in Equation 2. An exception is for data on UK ports which are only available to 2011-12 and are therefore averaged across 2 years in the latter period. This provides the average annual investment, in constant price terms, for each source across the relevant period ( $\bar{I}_s$ ). See Annex A for a worked example.

### Equation 2: Estimating average annual investment by source

$$\bar{I}_s = \frac{\sum_{y \in Y} (I_{s,y})}{Y}$$

**1.13** The figures for the average annual value of investment from each source are aggregated across the six economic infrastructure sectors, as shown in Equation 3, resulting in the estimates presented in the National Infrastructure Delivery Plan 2016-2021.

### Equation 3: Aggregating average annual investment across all sources

$$\text{Average annual infrastructure investment} = \sum_{s \in S} \bar{I}_s$$

## Updates

**1.14** Since the estimates of average annual infrastructure investment were published in 2014, the following changes have been made:

- an update to the price base year from 2013-14 to 2014-15

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<sup>8</sup> ONS, Consumer Price Inflation, October 2013: <http://www.ons.gov.uk/ons/re/cpi/consumer-price-indices/october-2013/index.html>

- updates to the GDP deflator, consistent with the ONS Quarterly National Accounts
- revisions to data, as published in the respective sources

1.15 There has been no change in the methodology since the estimates were published in NIP 2014.

## Status

1.16 The source data are already in the public domain and are owned by the departments, organisations or companies that provided the sources. As a result the estimates are not considered to be Official or National Statistics.

## Full list of sources

1.17 The following sources were used to calculate average annual infrastructure investment from 2005-06 to 2009-10, and from 2010-11 to 2014-15.

### Water companies and regulators

- [Water Services Regulation Authority \(Ofwat\) – Financial performance and expenditure of the water companies in England and Wales 2005-2010](#)
- [Affinity \(formerly Veolia Central\) – Regulatory Accounts 2011-15](#)
- [Anglian Water – Regulatory Accounts 2011-15](#)
- [Bristol Water – Regulatory Accounts 2011-15](#)
- [Cambridge Water – Regulatory Accounts 2011-15](#)
- [Dee Valley Water – Regulatory Accounts 2011-15](#)
- [Dwr Cymru – Regulatory Accounts 2011-15](#)
- [Northumbrian Water – Regulatory Accounts 2011-15](#)
- [Portsmouth Water – Regulatory Accounts 2011-15](#)
- [Sembcorp Bournemouth – Regulatory Accounts 2011-15](#)
- [Severn Trent Water – Regulatory Accounts 2011-15](#)
- [South East Water – Regulatory Accounts 2011-15](#)
- [South Staffordshire Water – Regulatory Accounts 2011-15](#)
- [South West Water – Regulatory Accounts 2011-15](#)
- [Southern Water – Regulatory Accounts 2011-15](#)
- [Sutton and East Surrey Water – Regulatory Accounts 2011-15](#)
- [Thames Water Utilities – Regulatory Accounts 2011-15](#)
- [United Utilities Water – Regulatory Accounts 2011-15](#)
- [Wessex Water – Regulatory Accounts 2011-15](#)
- [Yorkshire Water – Regulatory Accounts 2011-15](#)
- [Northern Ireland Water – Company Accounts 2006-2015](#)
- [Scottish Water – Annual Reports 2006-2015](#)

## Telecommunications providers

- [BT Group Annual Reports 2006-2015](#)
- [Telefonica \(and formerly O2\) Annual Reports 2005-2015](#)
- [Vodafone Annual Reports 2006-2014](#)
- [Kcom Annual Reports 2006-2015](#)
- [Virgin Media Annual Reports 2006-2015](#)
- [Sky Annual Reports 2006-2015](#)
- [TalkTalk Group Annual Reports 2006-2015](#)

## Airport operators

- [Gatwick Airport Limited Regulatory Accounts 2006-2015](#)
- [Heathrow Airport Limited Regulatory Accounts 2006-2015](#)
- [Stansted Airport Limited Regulatory Accounts and Annual Reports 2006-2013](#)
- [Manchester Airport Group Annual Reports 2006-2015](#)

## Maritime Ports Trade Association

- [UK Major Port Group \(with Oxford Economics\) – Investment and productivity growth at UKMPG ports](#)

## Price indices

- [HM Treasury – GDP deflators at market prices, and money GDP: December 2015](#)
- [ONS – Retail Price Index: December 2015](#)

## Government departments

- [Defra Funding for Flood and Coastal Erosion Risk Management in England: April 2015](#)
- [Department for Energy and Climate Change – UK energy sector indicators 2015](#)
- [HM Treasury – Public Expenditure Statistical Analyses, Country and regional analysis: 2015](#)



# Worked examples of methods for the average annual infrastructure investment estimates

**A.1** A worked example of the deflation process is provided in Table A.1. In summary, current price data are multiplied by the ratio of the prices in the required base year and the year that the prices are currently measured in, to account for differences in the price level between these years.

**A.2** In the example, the value of investment for source A in 2012-13 is £960 million in terms of current 2012-13 prices. The first step in adjusting this to constant prices is to create a price adjustment factor, using the ratio of the deflator in the required base year (2014-15) and the year that the data is currently measured (2012-13). In the example the price level, expressed as an index, increased from 96 to 100 between 2012-13 and 2014-15. This indicates that prices increased by approximately 4.2%, resulting in a price adjustment factor of 1.042. Next, the price adjustment factor is multiplied by the current price measure to obtain a constant price measure. In the example, the value of investment in 2012-13 is estimated to be worth £1,000 million in terms of 2014-15 prices. This process adjusts data to account for changes in the general price level across years, and provides an approximation of how much the investment carried out by source A in 2012-13 would be worth if it had been carried out in 2014-15.

**Table A.1: Worked example of the converting current prices into constant prices source A**

Measure	2012-13	2013-14	2014-15
£ million, current prices (CP)	960	1274	1000
Deflator (index 2014-15=100)	96	98	100
Price adjustment factor	$100/96 = 1.042$	$100/98 = 1.020$	$100/100 = 1$
Price adjustment calculation	$960 \times 1.042$	$1274 \times 1.020$	$1000 \times 1$
£ million, constant 2014-15 prices (KP)	1000	1300	1000

Note: Data are for illustrative purposes only. Differences occur in the example due to rounding.

**A.3** A worked example of the averaging and aggregation process is provided in Table A.2.

**A.4** Constant price data for each source are averaged across years, by aggregating the data across the years within a period and then dividing by the number of years for which data are included. The averaging calculation, as shown in Table A.2, aggregates the constant price value of investment for source A across four years to obtain £4,400 million. This is then divided by four to provide an estimated £1,100 million of investment for that source in the period covering 2012 to 2015. No investment data are available for source C in the year 2014-15; however, this does not automatically mean that zero investment occurred in this year. Therefore data are only aggregated and divided across the three years for which data from this source are available to calculate average investment for that source. The figures for the average value of investment for each source are then aggregated across sources, resulting in £2,000 million of average annual infrastructure investment for the period covering 2012 to 2015 in the example.

**Table A.2: Worked example of the averaging and aggregation process, £ million, constant 2014-15 prices**

Source	2011-12	2012-13	2013-14	2014-15	Averaging calculation	Average 2011-15
A	1100	1000	1300	1000	$4400/4 = 1100$	1100
B	700	700	700	700	$2800/4 = 700$	700
C	200	150	250	-	$600/3 = 200$	200
<b>Total</b>						<b>2000</b>

Note: Data are for illustrative purposes only.