

Improvement to the Construction Price Indices and impacts

Author Names: Frances Pottier (BIS), David Crosthwaite (AECOM), June 2014

Abstract

This article is one of a pair published in June 2014 to keep users informed of developments to the methodology for construction price and cost indices. This article outlines the development work carried out to date on the input cost indices and describes research into options for converting input cost indices to output price indices. The related article, published by the Office for National Statistics (ONS) gives some preliminary information of the effect of these developments on statistics on construction output and gross capital formation. A consultation on possible methods for the production of the output price indices will be launched shortly.

1. Introduction

Issues with the current methodology used to produce the construction price and cost indices (PCIs) have been identified in reviews by the Department of Enterprise and Regulatory Reform (BERR)^{1,2} and its successor, the Department for Business, Innovation and Skills (BIS)³, and in an assessment by the UK Statistics Authority^{4,5}. While some issues have been addressed, there remain concerns relating to sample sizes, revisions, coverage and transparency. This article reports on work to develop and test improvements to both the methodology and the reporting of the indices.

ONS have published a related article *How construction price statistics are used* available at www.ons.gov.uk. A consultation on possible methods for the production of the output price indices will be launched shortly.

2. Background to the construction price and cost indices

The construction price and cost indices are published by BIS⁶ and are primarily used by ONS to deflate its estimates of construction output, which comprise about 6.3% of Gross Domestic Product (GDP) when measured from the output approach. ONS also use the indices to deflate gross capital formation data. The indices are also widely used by both the

¹ [Davis Langdon Review of BERR/BIS Construction Price and Cost Indices](#)

² [BIS response to Davis Langdon review](#)

³ [Results of BIS consultation on the uses of construction price and cost indices](#)

⁴ [UK Statistics Authority assessment of construction price and cost indices](#)

⁵ [UK Statistics Authority letter of confirmation as National Statistics](#)

⁶ [Construction Price and Cost Indices](#)

public and private sector to adjust construction contracts, by utilities regulators, and also by analysts as a measure of construction inflation.

Responsibility for data collection and calculation of the indices has been outsourced since the privatisation of the Property Services Agency in 1993. The current contract was let in July 2013 to AECOM⁷, and included a requirement to develop and introduce improvements to the methodology of the indices.

The construction price and cost indices currently comprise three sets of indices, tender prices, resource costs and output prices. Each set includes indices relating to several construction subsectors, such as public housing and infrastructure.

3. Development of an improved methodology

The award of the new contract in 2013 included a requirement to develop the PCI series in response to changes in the construction market place and other trends affecting the integrity of the indices. The objectives for the development are to provide:

- More robust – and transparent – methodologies
- Alignment with National Accounts/SIC codes
- Faster and more reliable results
- More explanation of results
- Using secondary data, wherever possible
- Working at sector or industry, not project, level

AECOM have developed and tested a new set of input cost indices and are developing a new approach to the output price indices. The intention is to have published the new series by the end of November 2014, which will include data for Q3 2014.

3.1 Proposed new methodology for input cost indices

After extensive research and testing of alternatives AECOM have concluded that it is essential to update the methodology for both input cost indices and output price indices. The preference is for methods that are transparent and explanatory, and based on data that is reasonably readily available and reliable. The focus is on types of work rather than projects to avoid sample size problems and to improve representivity. PCIs will be provided at the following breakdowns:

New Work

Public Housing
Private Housing
Infrastructure
Public Non-housing
Private Industrial
Private Commercial

Repair and Maintenance

Public Housing
Private Housing
Non-housing

⁷ <http://www.aecom.com/>

3.2 Basket of goods for input cost indices

AECOM have developed a basket of goods approach for input cost estimation. This approach:

- Aims to produce different cost trends for the diverse types of construction output (market based not construction projects related)
- Aligns with other price index and price comparison methodologies
- Provides linkages to national accounts
- Is relatively easy to collect data, with respondents required to provide purchase costs for items that can be reasonably easily specified
- Uses a manageable but comprehensive basket of items as a proxy for all construction
- Provides the opportunity to assign items to different baskets that represent different types of work
- Allows for the measurement of changes over time in materials and products and other items

For the basket of goods method, costs for selected inputs are collected for:

- Typical materials and products
- Types of labour
- Items of construction equipment hire

Much of the data collection is informed by AECOM's work on compiling the Spon's Price Books series⁸.

In late 2013 AECOM validated a master list of construction inputs to test the proposed approach. The list currently comprises 220 resources, grouped into 20 resource sub-groups, and the number and selection of resources is expected to change in-line with industry changes. Input selection was based on AECOM's expertise as construction consultants, BIS building materials statistics, and analysis of ONS input/output tables (supply and use).

The purpose of the master list is to represent the main inputs to all kinds of construction work and to permit the selection of sub-sets of the list for particular types of work:

- Residential
- Non-residential
- Civil engineering

Purchasers' prices for items on the list will be reviewed and updated each quarter. The aim is to obtain national and period (quarterly/annual) average prices paid by contractors for their inputs:

⁸ [Spon's price books](#)

- Material/product cost data will be collected from major materials/products manufacturers
- Equipment hire cost data will be collected from major equipment hire providers
- Labour cost data will be taken from the ONS Average Weekly Earnings series (Construction specific: AWE K57Y)

4. Constructing input cost indices

To construct the index series a price relative approach has been adopted. Price differences from period to period for each item of materials and products, and each item of labour and equipment, are calculated as percentage changes and expressed as factors (an increase from one period to another of 3.5% would be expressed as 1.035). For construction work types the un-weighted arithmetic mean of price changes in each sub-group or subset provides the aggregate price change for materials, labour and equipment for that work type:

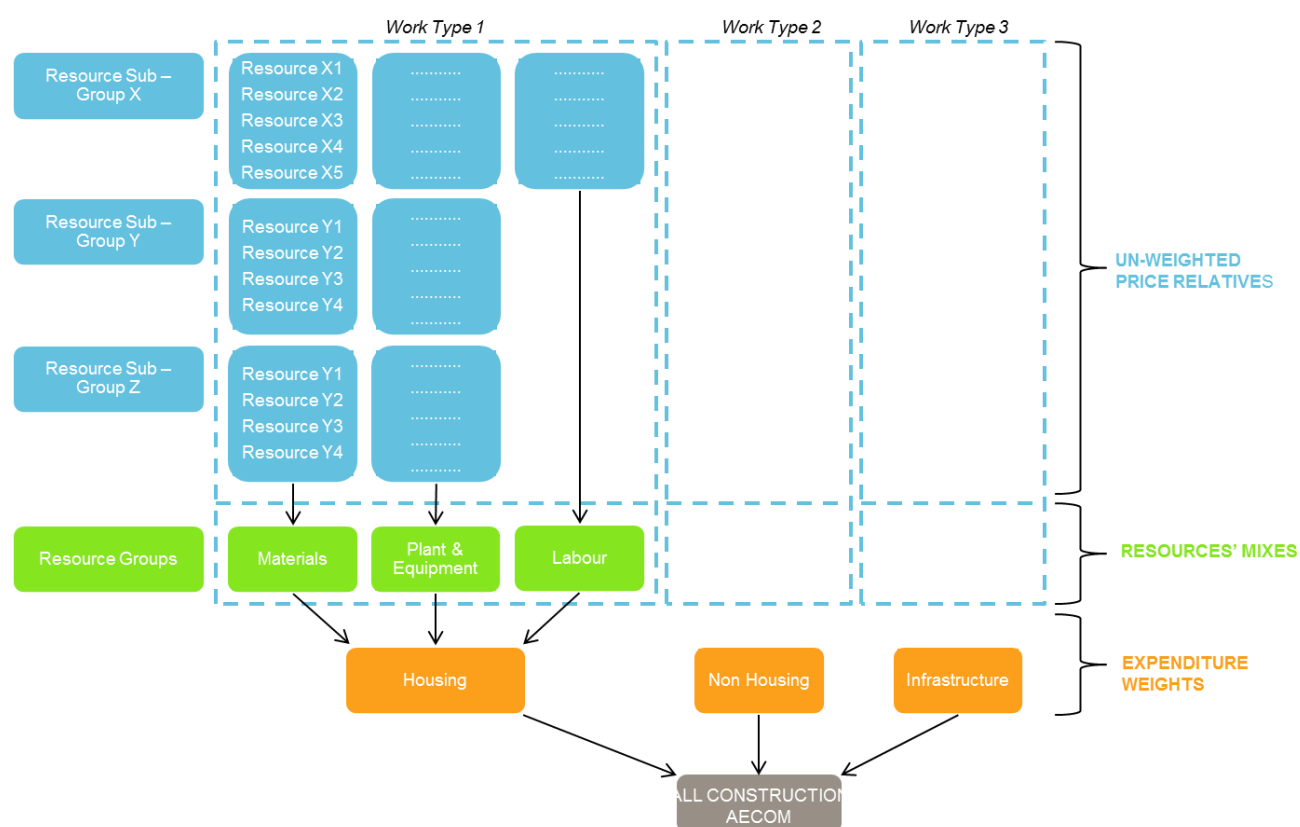
- The aggregate price change for that work or project type in each period is calculated using appropriate **resource mixes**
- The aggregate price change for all construction in each period is calculated using appropriate **expenditure weights** for that type of work in that period

The following diagrams show how this works:

Figure 1: Price relative approach



Figure 2: Process flow chart



7.3 Calculating construction input cost indices

Price changes for sub-groups of materials, sub-sets of labour and equipment, work types and all construction are calculated by adding aggregate period percentage changes to a base period value of 100 in period 1 and then to add the next period percentage change to the result of the first calculation, and so on. The approach chosen is an un-weighted chain-linked Laspeyres index:

$$P_L = \frac{\sum(p_{c,t_n}) * (q_{c,t_0})}{\sum(p_{c,t_0}) * (q_{c,t_0})}$$

The process of adjusting the sample of priced items in each period will to an extent reflect quality and composition changes in the resource inputs to construction work. Resource mixes will also be kept under review and these will help reflect productivity changes over time

5. Testing the input cost indices

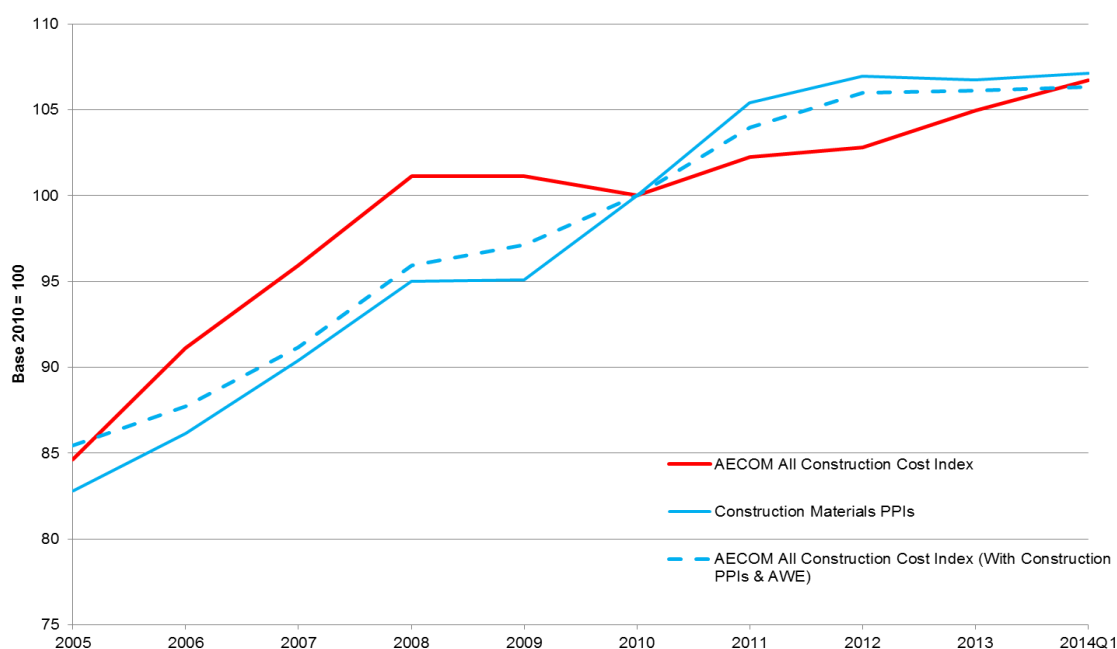
AECOM have constructed a time series based on the new approach going back ten-years to allow proof of concept testing. The proof of concept for this approach has been tested using historic (back to 2005) resource cost data gathered from:

- Materials and products – Spon’s price books
- Labour – ONS Average Weekly Earnings in Construction
- Equipment hire – Spon’s price books

The results have been tested against those published by BIS and differences were found. It is believed that the primary reason for these differences is the use of PPIs in the existing BIS series (the results produced using PPIs appear counter intuitive and don’t accord with what is known of recent history).

More specifically, since the PPIs used in the existing BIS series measure factory gate prices, they capture the price received by a manufacturer for a final product. This price may not represent the actual price paid by a construction company purchasing these products and therefore may not capture the impact of supplier’s discounts. The PPIs currently used in the BIS series appear to display a constant upward trend in price movement, which is unlikely to have been the case during the most recent recession. In contrast, the AECOM input cost indices exhibit a flat-line in price growth through 2008-2009 followed by a period of absolute decline through to 2010 when a period of slow and steady price recovery is evident through to 1Q2014 (see Figures 3, 4 and 5 below).

Figure 3: Explanation for differences between input cost indices



6. Results – new input cost indices time series

Figures 4 and 5 below provide a time series of the AECOM input cost indices by type of work i.e. housing, non-housing and infrastructure (Figure 4) and main components i.e. materials, labour and plant (Figure 5) back to 2005. The results are encouraging, with sensible turning points and trends evident that match our understanding of recent history.

Figure 4: Input cost indices – time series

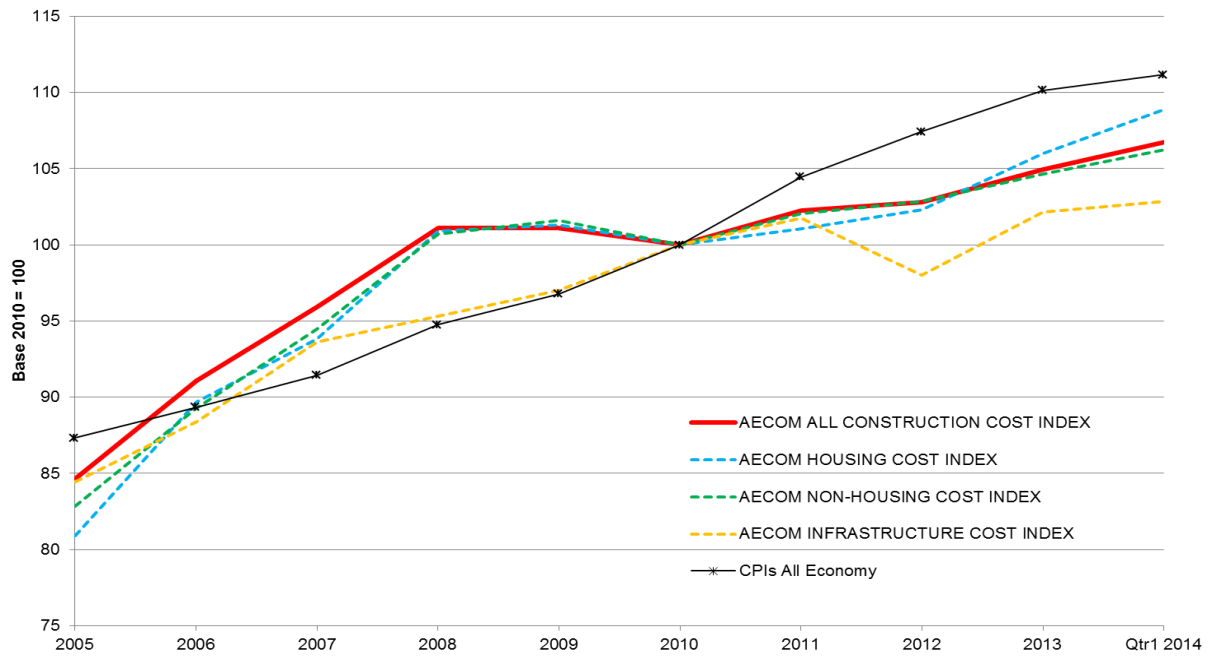
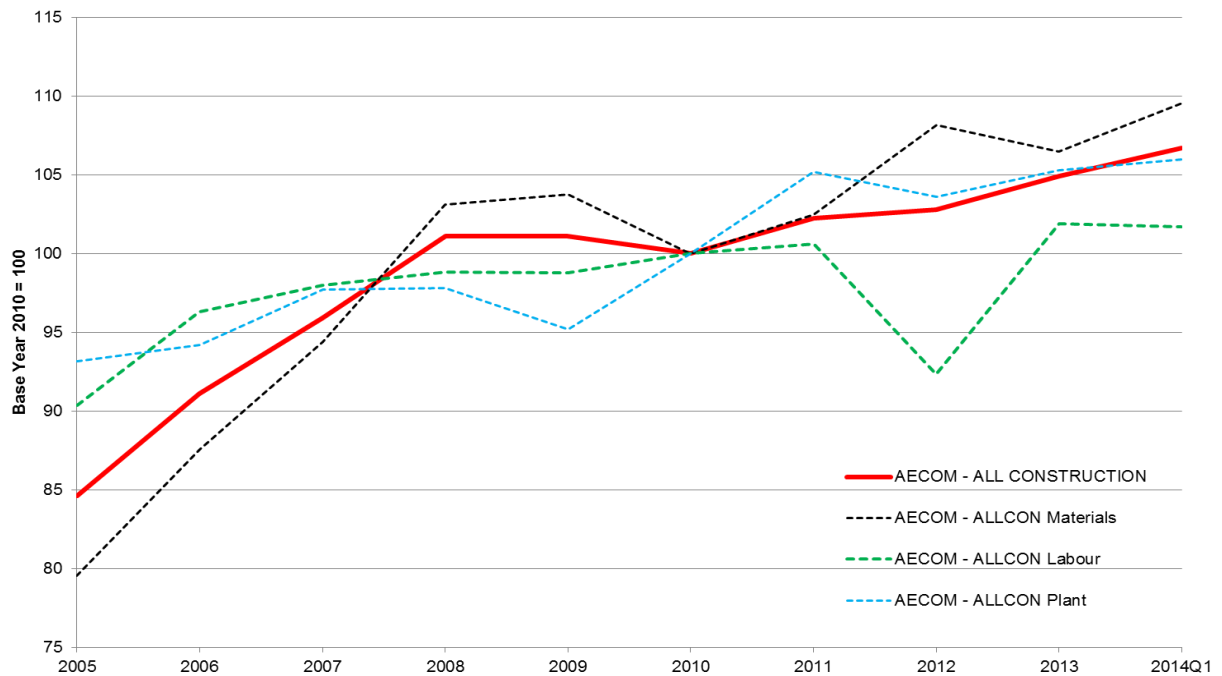


Figure 5: Input cost indices – main components



7. Converting input costs to output prices

Input costs are the prices paid by contractors to their suppliers, not the prices charged to their customers which is what is required for output price estimation. However, it is possible with adjustments to derive estimates of output prices:

- Input cost indices can be adjusted in line with market conditions to produce output price indices
- Adjustment from costs to prices can involve using mark-ups as additions to input costs, or applying market indicators as adjustment factors to input costs

The aim is to identify market indicators that best reflect market conditions and reflects estimates of other costs (i.e. preliminaries, overheads, profit and taxes).

To derive robust market indicators a number of options are being examined. The starting point for the research was the OECD manual *Sources and Methods Construction Price Indices*⁹, which outlines sources and methods used by OECD and European Union Member countries in the compilation of price indices for construction activity, and indicates best practice.

These options have been tested these against new work output and new work orders series at current prices to ascertain the best-fit. The current price series has been used to avoid any uncertainty regarding the deflators used for deriving the constant price series. Essentially, the aim is to find for a proxy for “tender prices” that will allow us to arrive at “market prices” or the price paid by the client for construction work without using Bills of Quantities. This proxy should reflect measures of contractors’ profit margins, prelims and overheads, and productivity.

7.3 Market proxy for new construction work

Market prices in construction are influenced by both the nominal level of prices and capacity levels within the industry. For new work, a market indicator has been developed which aims to capture both these effects using new orders¹⁰ as a proxy for tender prices and an employment index (lagged by one year) as a proxy for industry capacity.

$$\text{Employment Index (EI)} = \frac{\text{Number of construction employees}}{\text{Number of people employed in the whole economy}}$$

The “best fit” for a new-work market indicator is expressed as

$$\text{Market Indicator (MI)} = \frac{\text{New Work Orders at current prices (by sector)}}{\text{Employment Index (Base 2010=100)}}$$

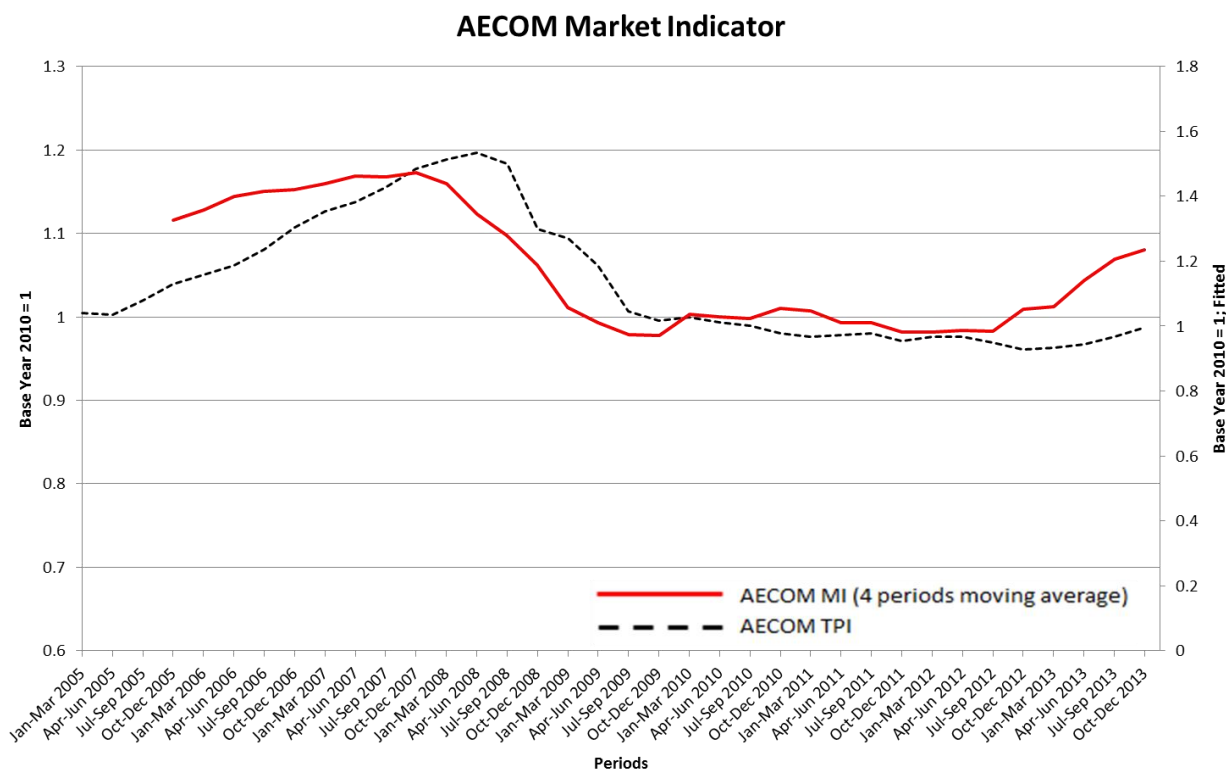
⁹ [OECD Manual](#)

¹⁰ [Statistics on construction new orders are published quarterly by ONS](#)

Figure 6 shows a comparison between the Market Indicator and the existing Tender Price Index.

One advantage of this approach is that all data are derived from official series. In addition, both measures have the advantage of being regionalised allowing for regional breakdowns. A suitable proxy still needs to be found for repair and maintenance work.

Figure 6: Market Indicator (New work) vs Tender Price Index



7.2 Output price indices testing

To arrive at output prices, i.e. the price a client would pay for a constructed asset, the Market Indicator has been applied as an adjustment factor to the input cost series. The proof of concept for this approach is being tested using time-series data going back 10 years. The results are encouraging, with sensible turning points and trends evident that match our understanding of recent history.

7.3 Consultation

We will be launching a consultation shortly to gather views on aspects such as the proposed approach to deriving input costs and market indicators to adjust input costs to output prices.

If you would like to be notified when the consultation is launched, please email construction.statistics@ons.gsi.gov.uk

8. Work still to be done

The following issues remain to be addressed:

- Agree proof of concept for OPI
- Complete testing
- Provide regional PCI
- Draft methodology and supporting documentation
- Develop first published series of AECOM PCI indices late 2014 (3Q14)
- Develop/agree template for providing explanatory commentary
- Agree practicalities of publication

Copyright

© Crown copyright 2014

You may use or re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit www.nationalarchives.gov.uk/doc/open-government-licence/ or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email@ psi@nationalarchives.gsi.gov.uk

This document is also available on our website at <https://www.gov.uk/government/collections/price-and-cost-indices>