



Australian Government

Department of Infrastructure and Regional Development

Bureau of Infrastructure, Transport and Regional Economics

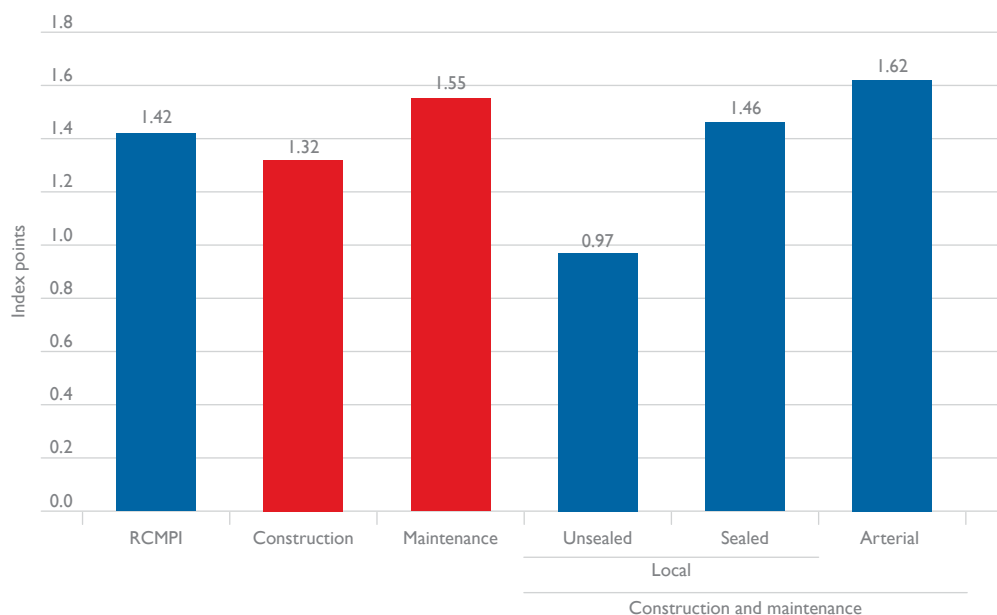


## BITRE Road Construction and Maintenance Price Index and Sub-Indexes—2013 update

### At a glance

- This information sheet presents the 2013 re-calibrated BITRE Road Construction and Maintenance Price Index (RCMPI). The revised index is an indicator of the change in input costs faced by the road construction and maintenance industry in Australia.
- The RCMPI monitors price changes in the following eight major inputs:
  - (1) site-based labour; (2) office-based labour; (3) bituminous materials; (4) cement and concrete;
  - (5) quarry products; (6) other materials; (7) plant hire/ depreciation; and (8) fuel.
- The re-calibrated RCMPI is now presented on a quarterly basis. In addition, the RCMPI is now calculated on an index reference period of 2011–12 = 100.0. Prior to the 2013 re-calibration, the RCMPI was referenced on 1998–99 = 100.0. This change simplifies comparison of price movements between the RCMPI and the Australian Bureau of Statistics' producer price indexes.
- The input per cent shares for road construction and maintenance were re-estimated using survey data collected from 8 state/ territory road authorities, 233 local governments and 36 private sector contractors.
- The input per cent shares have changed over the 16 years since the last review:
  - Labour costs have increased to 33.9 per cent of total costs in 2013, from 25.8 per cent of total costs in 1997;
  - Materials costs have decreased to 37.1 per cent in 2013, from 47.7 per cent in 1997; and
  - Equipment costs have increased to 29.0 per cent in 2013, from 26.5 in 1997.
- The role of the private sector in road construction and maintenance projects within Australia has increased to 56.4 per cent, compared to 40.4 per cent in 1997.
- On the basis of the re-calibrated RCMPI, the cost of road construction and maintenance have increased by 1.42 percentage points between 2011–12 and 2012–13. The most significant contributors to the index increase were rises in 'site-based labour' and 'bituminous materials' costs. They were counterbalanced, to a limited extent, by falls in 'plant hire/ depreciation', 'other materials' and 'fuel' costs over the same period.
- This Information sheet introduces two new sub-indexes by major activity: construction and maintenance, and three new sub-indexes by road type: arterial, sealed local and unsealed local roads.
- Figure S1 shows that between 2011–12 and 2012–13, the costs for road works changed at different rates depending on the type of works activity and type of road.

Figure S1 The changes in RCMPI and the sub-indexes from 2011–12 to 2012–13



In certain situations it may be more appropriate to use the new sub-indexes instead of the RCMPI.

Between 2011–12 and 2012–13, the maintenance sub-index increased at a greater rate than the construction sub-index, as the cost of 'site-based labour' and 'bituminous materials' rose faster than other inputs over the same period and the input per cent shares of these components are higher within the maintenance sub-index.

## I Introduction

The BITRE road construction and maintenance price index (RCMPI) is an input-price index which has a number of applications. It is used as a deflator to convert nominal (current prices) road expenditure into real (constant price) values. It also provides a means for calculating real changes in road expenditures and government road funding levels (e.g. BITRE 2008, 2009).

In addition, it is used to measure the rate of change in the prices of goods and services, which are purchased by suppliers of road construction and maintenance services. It is intended to reflect trends in prices of major input components of road construction and maintenance.

More recently, the RCMPI served as one of the inputs in the National Transport Commission's determination of road charges for heavy freight vehicles (NTC 2012).

The contribution of each input to the overall cost of road construction and maintenance work is determined by two factors: the unit price of the input and the input's per cent share in the total cost of road works.

The RCMPI is updated each quarter to reflect shifts in the price of inputs. The updates relied on quarterly data compiled by the Australian Bureau of Statistics (ABS) on input price changes and the Australian Institute of Petroleum on prices of diesel fuel.

However, the quarterly updates do not account for changes in the relative quantities of inputs used. Over time changes to industry practice, input prices and technological advances will inevitably alter the input mix, and hence the relativities in the quantities used for both material and non-material inputs. The changes result in the index gradually deviating from the actual prices for road works experienced by government and industry. The input per cent shares change at a slow pace and do not require frequent re-calibration.

Over the last 30 years the road construction and maintenance industry has changed in a number of ways, including: increased use of contractors for both road construction and maintenance; improved technology in road building; and greater use of capital equipment as a substitute for labour, which has generally become more expensive in response to greater competition from the mining sector. These industry changes are the motivations behind the 2013 RCMPI re-calibration.

Along with BITRE there were two other contributors to literature on road indexes in Australia. In the past state road agencies have produced road construction and maintenance price indexes (BTCE 1997). However, none of them have publicly released their road price indexes in recent times. ABS is the other contributor to literature on road indexes (see Box 1).

### Box 1 Comparing the BITRE RCMPI with the ABS Road and bridge construction output price index

From 2002, the ABS has published an output producer price index for the general construction industry in the Australian and New Zealand Standard Industrial Classification 1993 (ANZSIC93 subdivision 41). This index includes a component for 'Road and bridge construction' (ANZSIC93 subdivision 4121). Since 2005 this index has been published at both the national and state/territory levels. The ABS index and the BITRE index are conceptually different because the 'Road and bridge' index is an output price index whereas the RCMPI is an input price index. The ABS 'Road and bridge' index takes into account the selling prices and includes changes in profit margins received by suppliers of road construction products. Despite the differences in scope between the ABS and RCMPI indexes, the two indexes do not diverge significantly when compared. The differences between the two indexes are as follows:

	BITRE RCMPI	ABS Road and bridge index
Type of index	It is an input price index that measures changes in the prices of inputs.	It is an output price index measuring changes in the prices (revenues) received by businesses undertaking road and bridge construction less any direct tax paid.
Question being asked and answered	What is the rate of change in the prices of the inputs used in road construction and maintenance in Australia?	What is the rate of change in the prices of outputs of road and bridge construction sold in the period in question?
Basis of the index	There are two key pillars: (a) Input per cent shares collected from surveys of local governments, state/territory road authorities and private sector contractors. These shares are updated irregularly; (b) ABS producer price indexes for the inputs recognised in the index. These are updated quarterly.	The value weights are derived from data on a selection of representative main road and highway projects in New South Wales, Victoria, Queensland, South Australia and Western Australia.  Prices for the outputs are collected quarterly, and they are collected as work in place. This is an all-inclusive price for a service or product.
Scope	It covers both new road construction and road maintenance. It excludes cost of land acquisition	It covers only new road construction. The output price excludes cost of land acquisition

The rest of the Information sheet is structured as follows:

- Section 2 provides a brief history of the RCMPI.
- Section 3 discusses the methodology used in re-calibrating the RCMPI.
- Section 4 discusses the methodology used in calibrating the five new sub-indexes. Two of the sub-indexes are classified by type of major activity: construction and maintenance, and three are classified by road type: arterial, sealed local roads and unsealed local roads.
- Section 5 presents the results and summarises the findings from this study.
- Section 6 recaps the outcomes of this Information sheet.



Road grader.  
Image courtesy of Caterpillar Inc.

## 2 History of the RCMPI

One of the earliest Commonwealth contributions in this area was by the Commonwealth Bureau of Roads (CBR). After the amalgamation of the CBR and the Bureau of Transport Economics (BTE) in 1976, the BTE and its successors continued to publish road construction price indexes (BTE (1978), BTCE (1997), BITRE (2012, 2011a)).

BITRE's road construction and maintenance index has evolved over many years. Key dates in this evolution are: 1981, 1997 and 2013.

### 1981

In 1981, the Bureau of Transport Economics (BTE) introduced a new input-price index (with no adjustment for productivity) and it was based on inputs purchased by the industry (for example, labour, materials and plant). It was when the RCMPI was created and the basic methodology has remained the same ever since. Up to 1997 the RCMPI included six components to represent the inputs used in constructing and maintaining roads. The six inputs were: (1) salaried labour (2) other labour (3) bitumen (4) other materials (5) plant acquisition or depreciation and (6) fuel. The input per cent shares for the six factors were the same from 1981 to 1997. Survey data to estimate input per cent shares were collected from state/ territory road authorities and local governments, but not contractors.

### 1997

In 1997, after consultation with a number of state/ territory road authorities and local governments, and taking into consideration data availability, two additional input components were added to the previous index: (7) concrete; and (8) quarry products. Their addition provided a better representation of materials used in road construction and maintenance. Together they contributed about 52 per cent of the total materials component. Furthermore, in 1997 it was acknowledged that the proportion of road construction and maintenance works that local governments and state/ territory road authorities were contracting out to private sector contractors was increasing. Therefore private sector contractors were explicitly included in the survey of the industry to establish the input per cent shares applicable in the road construction and maintenance sector.

### 2013

The 2013 re-calibration of the RCMPI introduced changes that affected three inputs. Up until 2013, two separate labour inputs were used in the RCMPI: 'salaried labour' and 'other labour'. The wage costs for the two inputs were monitored using average weekly earnings for males in all industries, Australia-wide.

In an effort to accurately label the labour inputs, they were renamed as 'site-based labour' (previously 'other labour') and 'office-based labour' (previously 'salaried labour') in 2013.

Moreover, in order to monitor changes in the cost of 'site-based labour', the ABS series on hourly rates of pay in the construction sector were introduced. The ABS producer price indexes for engineering design and engineering consulting were also introduced to monitor changes in the cost of 'office-based labour'. The new indexes provided a better representation of labour costs involved in road construction and maintenance.

'Other materials' captured the cost of residual inputs, the type of inputs used in road construction and maintenance which were not explicitly named in the RCMPI. Up until 2013, the ABS producer price index for 'all groups' inputs to the house construction industry was used to monitor changes in the cost of 'other materials'.

In the 2013 re-calibration, the ABS producer price index for reinforcing steel was introduced to monitor changes in input costs of 'other materials' to replace the ABS 'all groups' house construction input index. The reason being reinforcing steel was one of the most important inputs not explicitly listed in the RCMPI. They are used for reinforcing concrete pavements and road furniture.

### 3 Methodology: An overview of the RCMPI re-calibration

The steps involved in re-calibrating the RCMPI are illustrated in Figure 1.

Figure 1 A schematic overview of the RCMPI re-calibration



### 3.1 Review of the RCMPI

As part of the RCMPI re-calibration, BITRE reviewed the component inputs of the index used in the 16 years to 2013. BITRE also examined the extent to which the inputs were aligned with the corresponding producer price indexes. Table 1 summarises the results of the review and shows that the re-alignment between inputs and the variables used to measure price change is unchanged for five of the eight variables in the re-calibrated BITRE RCMPI, which means they remain the same as in the pre-2013 BITRE RCMPI.

**Table 1 Description of inputs in the RCMPI and measures of change in the price of inputs**

Aspect	Input	Input description	Measures of price change used in 2013 re-calibration of the RCMPI	Measures of price change used in BTCE (1997)
1	Site-based labour	Site-based labour refers to mainly manual occupations such as labourers, technicians, drivers, equipment operators, and tradespersons. People in these occupations are often paid an hourly rate.	<u>Description:</u> ABS quarterly index for total hourly rates of pay (excluding bonuses) earned by all workers in the private and public construction sectors from ABS catalogue 6345.0 Wage Price Index, Australia, ID A2603589K.	Previously described as 'other labour' but it forms a larger share of total cost. <u>Description:</u> ABS estimates of average weekly earnings (excluding bonuses) in all industries Australia-wide for males; employed as full time on adult pay rates from ABS catalogue 6302.0, Average Weekly Earnings, series ID A2734021V.
2	Office-based labour	Office-based labour refers to mainly non-manual occupations such as administrators, project managers, engineers, lawyers, and accountants. People in these occupations are typically paid a fixed annual salary.	<u>Description:</u> ABS quarterly index for engineering design and engineering consulting services from ABS catalogue 6427.0, Producer price indexes, series ID A2314202T.	Previously described as 'Salaried labour' and series ID A2734021V was used to monitor price change for the input.
3	Bituminous materials	Cost of asphaltic concrete (including bitumen, mineral aggregate, sand, rock dust, and other additives).	This input is unchanged because it is accurately describing the changes of input prices	<u>Description:</u> Weighted Average of 6 Capital Cities; Asphalt placed from ABS Producer Price Indexes (6427.0), series ID 2314822F.
4	Cement and concrete	Cost of Portland or blended cement concrete (including mineral aggregate and additives, excluding steel for reinforcement).	Unchanged: same reason as input 3	<u>Description:</u> Index Number; Ready-mixed concrete; Weighted Average of 6 Capital Cities from ABS Producer Price Indexes (6427.0), series ID A2389358J.
5	Quarry products	This refers to materials such as gravel and sands excluding materials used as a component of asphaltic concrete.	Unchanged: same reason as input 3	<u>Description:</u> Index Number; Sand; Weighted Average of 6 Capital Cities from ABS Producer Price Indexes (6427.0), series ID A2389412K.
6	Other materials (reinforcing steel)	All other inputs (the most important of which is steel) used as reinforcing for concrete pavements and for road furniture.	<u>Description:</u> Index Number; Reinforcing steel; Weighted Average of 6 Capital Cities from ABS Producer Price Indexes (6427.0), series ID A2389361W.	<u>Description:</u> Input to the House construction industry; Weighted Average of 6 Capital Cities from ABS Producer Price Indexes (6427.0), A2390558X.
7	Hire/ depreciation	Costs of hire or ownership of plant and equipment.	Unchanged: same reason as input 3	<u>Description:</u> Index Numbers; 663 Other goods and equipment rental and hiring from ABS Producer Price Indexes (6427.0), series ID A2314181T.
8	Fuel	Diesel fuel used to run equipment.	Unchanged: same reason as input 3	<u>Description:</u> Australian Institute of Petroleum Weekly Diesel Prices report, "Retail: Diesel Pump Price (National Average)"—Average for the quarter from the Australian Institute of Petroleum at <a href="http://www.aip.com.au/pricing/">http://www.aip.com.au/pricing/</a>

Note: The shaded rows highlight the inputs which use new variables to monitor price changes in the re-calibrated RCMPI. The diesel fuel prices are retail prices which includes retail profit, however, they are the best data available for this input. Diesel fuel accounts for approximately 6% of the total road construction and maintenance costs.

#### 3.1.1 Distinguishing between labour input types

One of the issues identified by the review was that in recent versions of the RCMPI, the two different labour inputs 'salaried labour' and 'other labour' used the same indicator of price change. The solution to the issue was to assign two new ABS indexes to monitor price changes in 'site-based labour' (previously 'other labour') and 'office-based labour' (previously 'salaried labour').



The two types of labour inputs have different training requirements, skill levels and remuneration. 'Site-based labour' includes technicians, drivers, equipment operators, and tradespersons and makes up the largest proportion of total labour input in road projects. 'Office-based labour' is made up of occupations such as administrators, project managers, engineers, lawyers, and accountants. Up until 2013, the changes in the cost of the two types of labour were monitored using the ABS estimates of average weekly earnings (excluding bonuses). It included all industries Australia-wide for males employed as full time on adult pay rates (using data from ABS catalogue 6302.0, series ID A2734021V).

In order to accurately describe the two labour inputs, the re-calibrated index now monitors movements in the wage costs of 'site-based labour' using the ABS quarterly index for total hourly rates of pay (excluding bonuses) earned by all workers (male and female) in the private and public construction sectors (using data from ABS catalogue 6345.0, Wage price index, Australia, series ID A2603589K).

'Office-based labour' requires different skills and they are paid at a different rates, therefore the re-calibrated index uses a quarterly index for engineering design and engineering consulting services (from ABS catalogue 6427.0, Producer price indexes (PPI), series ID A2314202T) to monitor changes in the wage costs of 'office-based labour'.

**Figure 2 Comparing the price indicators for labour inputs**

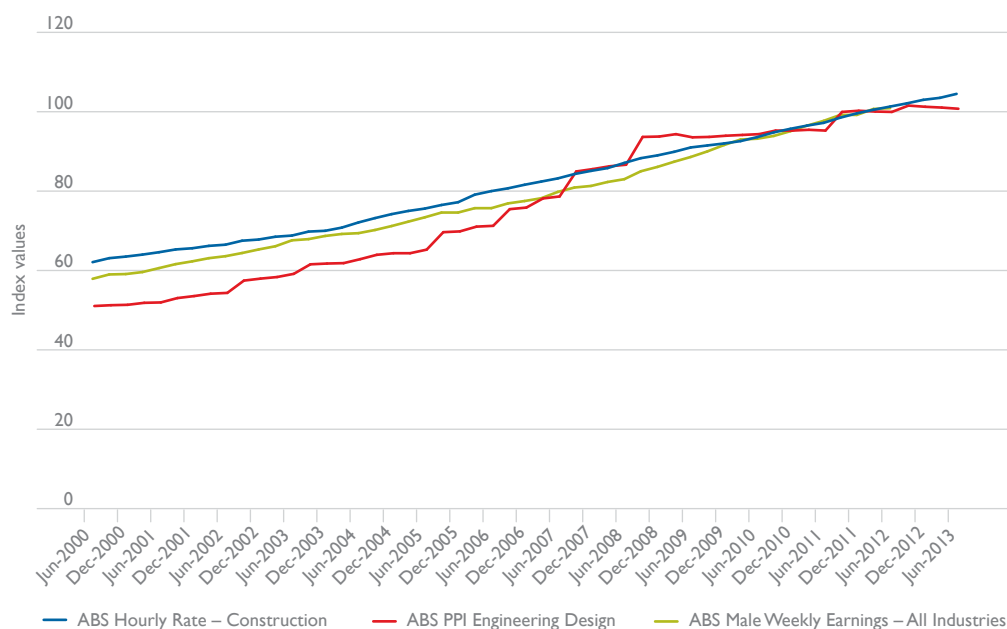


Figure 2 compares the two new indicators for labour inputs with the indicator used up to 2013. The indicators for hourly rate – construction and engineering design are preferred because they distinguish between the two labour inputs with different remuneration structures.

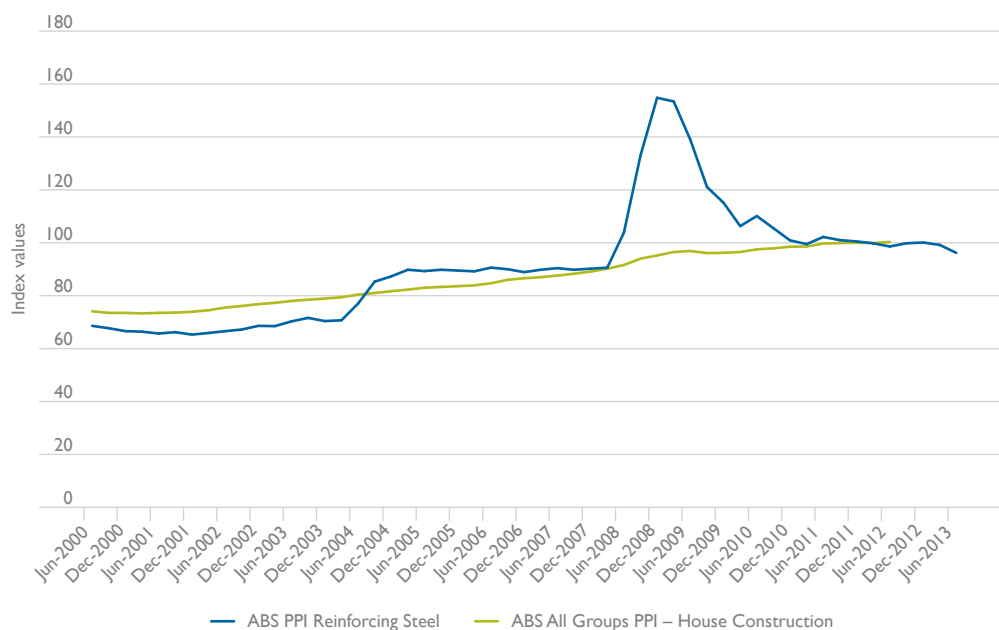
### 3.1.2 A new indicator for price changes in 'other materials'

The second issue identified by the review was that following a recommendation by BTCE (1997), recent versions of the RCMPI used the weighted average of six Australian capitals for the 'All groups' index for materials used in house building as an approximation to price changes for 'other materials'. The review noted that the aforementioned index was not a good approximation of 'other materials' in road construction and maintenance.

The 2013 re-calibration of the RCMPI introduced the producer price index for reinforcing steel to monitor price changes in 'other materials'. The PPI for reinforcing steel has replaced the indicator for house construction because it reflects the cost pressure on the 'other materials' inputs more accurately.

Figure 3 compares the new indicator for 'other materials' with the price indicator used up to 2013.

**Figure 3 Comparing the price indicators for 'other materials'**



### 3.2 The surveys

In step 2 (Figure 1) surveys were used to collect information for re-calibrating the RCMPI. The questionnaires used were very similar to the ones used in BTCE (1997). The major difference was that the respondents were explicitly requested to estimate input per cent shares by activity type: construction versus maintenance, and by road type: arterial, unsealed local roads and sealed local roads.

#### *State/ territory road authorities*

Survey forms were sent to all (8) state/ territory road authorities and the surveys collected data on:

- The input per cent shares of inputs used in the construction and maintenance of the National Highway system, state highways and arterial roads;
- The length of roads under their jurisdiction by road type: local roads (sealed and unsealed) and arterial roads (including national highways);
- The total road infrastructure expenditure sub-divided by road type: arterial versus local roads; by activity type: construction versus maintenance and by road type: local roads (sealed and unsealed) and arterial roads (including national highways); and
- The extent of road works outsourcing to local governments and private sector contractors.

Appendix A provides a summary of the input per cent shares estimates used in projects implemented (funded and undertaken in-house) by state/ territory road authorities.

#### *Local governments*

Survey forms were distributed to all (558) local governments in Australia.

Local governments are responsible for the construction and maintenance of local roads, some arterial roads, and to lesser extent state highways. Their involvement in different types of road varies between states and even within states. The main purpose of the survey of local governments was to obtain:

- Data on input per cent shares that apply in the construction and maintenance of local roads as well as arterial roads and state highways;
- The length of roads under their jurisdiction by road type: local roads (sealed and unsealed) and arterial roads (including national highways); and
- Information on the percentage of construction and maintenance works they contracted out to private sector firms.

Appendix A shows the estimates of input per cent shares for projects undertaken in-house by local governments.



### Private contractors

BITRE commissioned Arup, a private sector consulting firm, to collect data via a survey about the input per cent shares used in the private sector. BITRE provided Arup with a sample survey questionnaire. In addition, Arup collected further supplementary data from respondents, including total value of construction and maintenance cost of road projects delivered in 2011–12, and the number of kilometres a company constructed or maintained in 2011–12 per state for each road type - arterial, sealed local and unsealed local.

The majority of the firms contacted are listed in Austroads (2013). Semi-structured interviews were undertaken with estimators, business development managers and accountants of these firms. Table 2 shows the distribution of responding firms by annual average size of company turnover. The input per cent shares used by the private sector contractors are summarised in Appendix A.

**Table 2 Private sector firms responded to the surveys, sorted by turnover**

Annual turnover (\$ millions)	Number of firms that responded	Per cent of respondents
0 to 50	16	44.44
51 to 100	4	11.11
101 to 150	6	16.67
150 plus	7	19.44
Unstated	3	8.33
Total	36	100

Note: Components may not necessarily add up to the totals due to rounding.  
Source: Arup (2013).

### 3.3 Road expenditure and the roles played in road works projects

A key element in re-calibrating the RCMPI was to determine the input mixes used by the agencies that construct and maintain roads in Australia. Step 3 (Figure 1) identified the roles among the three major suppliers of road works services. The roles are different from those related to funding of road works. For example, the private sector's contribution represents a small percentage of the total road expenditure, however, the sector plays a major role as a supplier of road construction and road maintenance services. In contrast, Table 3 shows that the Australian (commonwealth) government does not provide road works services, despite being a significant contributor to total road expenditure (see BITRE 2013).

Data on road expenditure by levels of government: Commonwealth, state/ territory, local and also the private sector are in BITRE (2013).

Table 3 combines the BITRE surveys data collected from the three major suppliers of road construction and maintenance services in Australia: state/ territory departments of main roads; local governments and private sector contractors.

Table 3 shows that in 2013, about 56 per cent of total road construction and maintenance expenditure were expended on projects implemented by the private sector. Some of these were projects for the private sector, but the majority of the projects were outsourced to the private sector and funded by either state/ territory governments or local governments.

Table 3 The roles in the supply of road construction and road maintenance services: 1997 and 2013

Supplier of services	Units	1997	2013	Change from 1997 to 2013
State/ territory road authorities <sup>a</sup>	%	26.06	16.23	-9.83
Local governments <sup>b</sup>	%	33.58	27.36	-6.22
Private sector <sup>c</sup>	%	40.36	56.41	16.05
Total	%	100.00	100.00	0.00
Total road expenditure <sup>d</sup>	\$ Million	5 725.60	19 459.40	13 733.80

Notes:

- Funds on projects implemented by state/ territory road authorities = gross state/ territory road expenditure from ABS data on Government Finance Statistics LESS expenditure on projects outsourced to local governments and private sector contractors.
- Funds on projects implemented by local governments = gross local government road expenditure from ABS Government Finance Statistics LESS expenditure on projects outsourced to private sector contractors.
- Funds on projects implemented by private sector contractors equal gross private sector road expenditure from ABS data on Government Finance Statistics PLUS projects outsourced to private sector contractors by local governments and state/ territory road authorities.
- The data on total road expenditure for 2013 are from BITRE (2013).

Source: Based on BITRE (2013) and BITRE surveys of state/ territory departments of main roads, local governments and private sector contractors.

### 3.4 Estimating input per cent shares

At the end of step 5 (Figure 1) the unit record data set includes information from:

- Each of 3 responding state road authorities on input shares;
- Each of 36 responding private sector firms on input shares; and
- Each of 233 responding local governments on input shares.

Each respondent to the survey provided at most six sets of input per cent shares related to:

- The construction of arterial roads, sealed local roads and unsealed local roads; and
- The maintenance of arterial roads, sealed local roads and unsealed local roads.

Steps 6, 7, and 8 (in Figure 1) relate to the aggregation of these input shares into the *national* input per cent shares. These national input per cent shares are summarised in Appendix B. The input per cent shares are scaled to sum to one (or 100 per cent), and therefore they can be interpreted as each input's proportion within the total price of road construction and maintenance. This scaling has no effect on the calculation. The shaded columns (within Tables in Appendix B) are the aggregated input per cent shares used in the computations of the re-calibrated RCMPI and various sub-indexes.

### 3.5 Computing the re-calibrated RCMPI

Step 9a (Figure 1) is the computation of the re-calibrated RCMPI using the national input per cent shares in Appendix B. Each input is associated with a price indicator. The index value for a point in time (in this case a quarter) is calculated as the sum of the product of the inputs' price indicator multiplied by its input per cent share.

An index reference period is chosen for the index and it is typically assigned an index value of 100. The index reference period for the re-calibrated RCMPI is 2011–12 which, for a quarterly index, means that the average of the index values for the four quarters in the financial year is 100. The results section presents the re-calibrated RCMPI in graphical and tabular form. Furthermore, it provides a comparison between the re-calibrated RCMPI and the RCMPI based on 1997 input per cent shares.

## 4 Methodology: Computing the input per cent shares for the sub-indexes

A key strength of the RCMPI is that it estimates the input price changes in the construction of an 'average' road in Australia. However, it is not possible to 'unpack' the BITRE index, and reveal how the input prices differ by class/category of road or by type of activity. In response, this information sheet provides estimates of the sub-indexes which show how the cost of road works changes by three categories of road and two types of road works activity.

### 4.1 Sub-indexes by type of activity

Step 9b (Figure 1) classified the main activities into two categories: construction and maintenance. Road construction includes construction of a new road, bridge, or tunnel where none previously existed; major widening or replacement, e.g. replacement of a two-lane road with a four-lane road; upgrades to intersections, e.g. changes to intersection layout or installation of new traffic signals; large-scale heavy patching or pavement rehabilitation, and minor improvements in alignment; and replacement of an unsealed road with a sealed road.

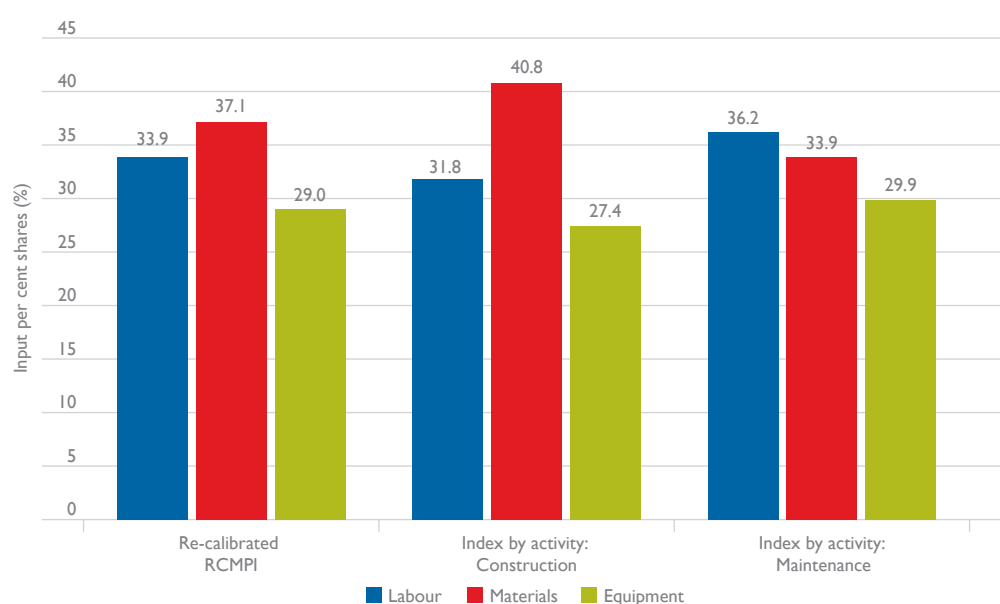
Road maintenance includes restoring edge wear; repairing potholes and small-scale pavement rehabilitation; re-sheeting of gravel roads and resealing of bitumen-surfaced roads; line-marking; minor bridge and tunnel repairs; repairs to guardrails or traffic signs and signals; cleaning of road drains and culverts; and road-side landscaping.

One of the main reasons for creating a sub-index for road construction, separate from that for maintenance, is because the two activities differ in terms of input requirements. The input per cent shares for construction activity and maintenance activity aggregated over road type are shown in Appendix B.

Figure 4 shows that for the road construction sub-index, the input per cent share for materials is *higher* by 3.7 percentage points than in the re-calibrated RCMPI. This is counter-balanced by the value of the input per cent share for labour; which in the construction index is *lower* by about 2.1 percentage points than in the re-calibrated RCMPI.

On the other hand, the road maintenance sub-index in Figure 4 shows that the input per cent share for labour is higher by 2.3 percentage points than in the re-calibrated RCMPI. This is counter-balanced by the value of the input per cent share for materials, which in the maintenance index is *lower* by 3.2 percentage points than in the re-calibrated RCMPI.

Figure 4 Input per cent shares: RCMPI, Construction and Maintenance activity sub-indexes



Source: BITRE estimates based on data in Table B1, B2 and B3 in Appendix B.

## 4.2 Sub-indexes by type of road

Step 9c (Figure 1) computes the sub-indexes by road type.

Figure 5 summarises data on the input per cent shares in the sub-indexes and the re-calibrated RCMPI. The sub-indexes for arterial roads, sealed local roads, and unsealed local roads encompass the costs of both construction and maintenance works.

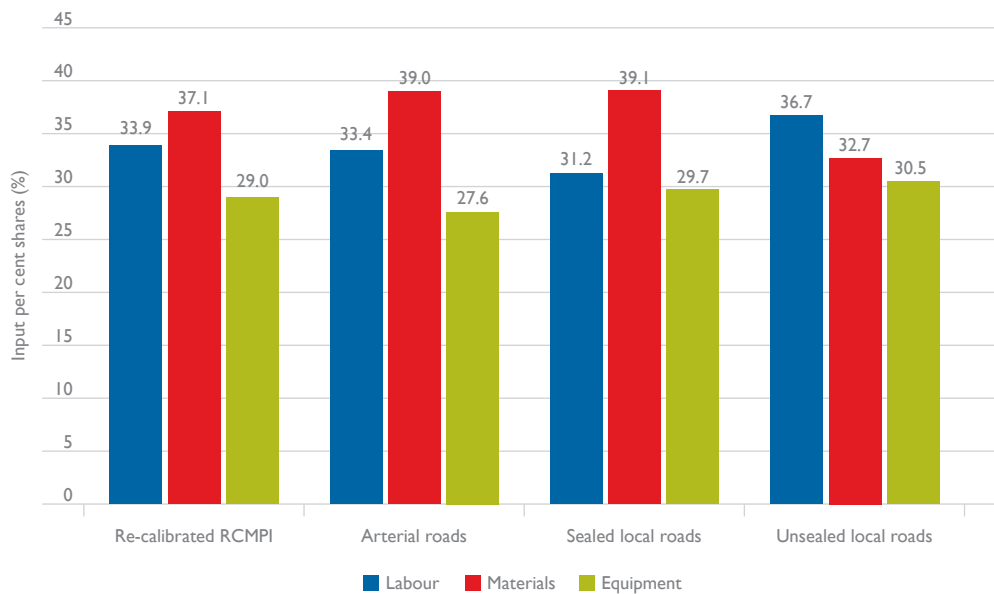
The following differences between the indexes by road type and the re-calibrated RCMPI are worth noting.

The sub-index for sealed local roads: The input per cent share for materials in the sealed local roads sub-index is *higher* by 2 percentage points than in the re-calibrated RCMPI, and the input per cent share for equipment in the sealed local roads index is *higher* by about 0.7 percentage points. This is counter-balanced by the value of the input per cent share for labour, which in the sealed local roads index is 2.7 percentage points *lower* than in the re-calibrated RCMPI.

The sub-index for unsealed local roads: The input per cent share for materials in the unsealed local roads sub-index is *lower* by 4.4 percentage points than in the re-calibrated RCMPI. This is counter-balanced by the value of the input per cent share for equipment, which in the unsealed local roads index is *higher* by 1.5 percentage points, and for labour 2.8 percentage points *higher* than in the re-calibrated RCMPI.

The above mentioned relationships suggest for sealed local roads projects, the RCMPI would overstate the impact of changes in labour costs, but it would also understate the impact of changes in materials and equipment costs. For these projects it might be appropriate to use the sealed local roads sub-index. On the other hand, for unsealed local roads projects the RCMPI would understate the impact of changes in labour and equipment costs, but overstate the impact of changes in materials costs. For these projects it might be appropriate to use the unsealed local roads sub-index.

**Figure 5** Input per cent shares: RCMPI, Arterial, Sealed local and Unsealed local roads sub-indexes



Note: Components may not necessarily add up to the totals due to rounding.  
 Source: BITRE estimates based on data in Table B1, B4, B5 and B6 in Appendix B.

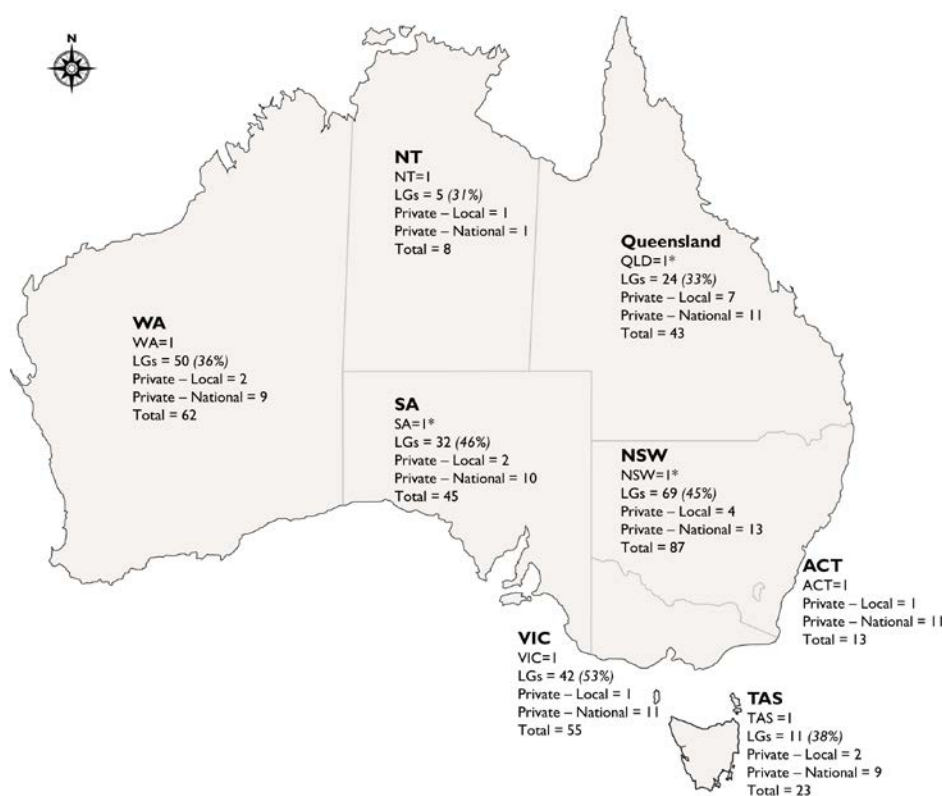
## 5 Results

This section summarises the key results of this study.

### 5.1 Sample surveys

BITRE directly surveyed state/ territory road authorities and local governments. A survey was also commissioned for Arup to collect data from private sector contractors. Map 1 shows the geographical distribution of the sample observations on which new estimates are based.

Map 1 Sample observations<sup>a,b,c</sup> for RCMPI by state and territory, 2013.



Notes:

- All state/ territory road authorities responded to the survey and supplied data on road expenditure. They also provided the extent they outsource projects to local governments and private sector contractors. NSW, Qld and SA, in addition, supplied data on input per cent shares (denoted by a \* on the map).
- The percentage figure represents the percentage of local governments in the state or territory that responded to the survey. A total of 233 out of 558 local governments responded, giving an overall response rate of 41.8% for all local governments within Australia.
- 36 private sector companies responded to the survey. Of these 16 have a national presence in Australia and, in 2011–12, had road projects in all states and territories. They are shown as 'Private-National' on the map. The rest were local companies operating in only one state or territory, and they are shown as 'Private-Local'.

Source: BITRE surveys.

### 5.2 Role of the private sector has increased

The 2013 survey data show that the role of the private sector in road construction and maintenance projects in Australia has increased to 56 per cent from 40 per cent in 1997. The roles of state/ territory road authorities and of local governments, as suppliers of road works services, are estimated to have decreased to 16 per cent (from 26 per cent in 1997) and 27 per cent (from 34 per cent in 1997) respectively. The role of the private sector is estimated by the value of projects the sector undertakes for private sector clients, plus the value of projects outsourced to the private sector contractors by either state/territory governments or by local governments as a percentage of the total road expenditure. This percentage does not relate to who pays for road projects, rather it relates to who physically undertakes the road construction and maintenance activities.

### 5.3 Input per cent shares for labour, materials and equipment have changed

Survey data show that over the 16 years to 2013, there have been changes in the three categories of inputs used in road construction and maintenance:

- Labour costs have increased to 33.9 per cent of total costs in 2013 from 25.8 per cent of total costs in 1997;
- Materials costs have decreased to 37.1 per cent in 2013 from 47.7 per cent in 1997; and
- Equipment costs have increased to 29 per cent in 2013 from 26.5 in 1997.

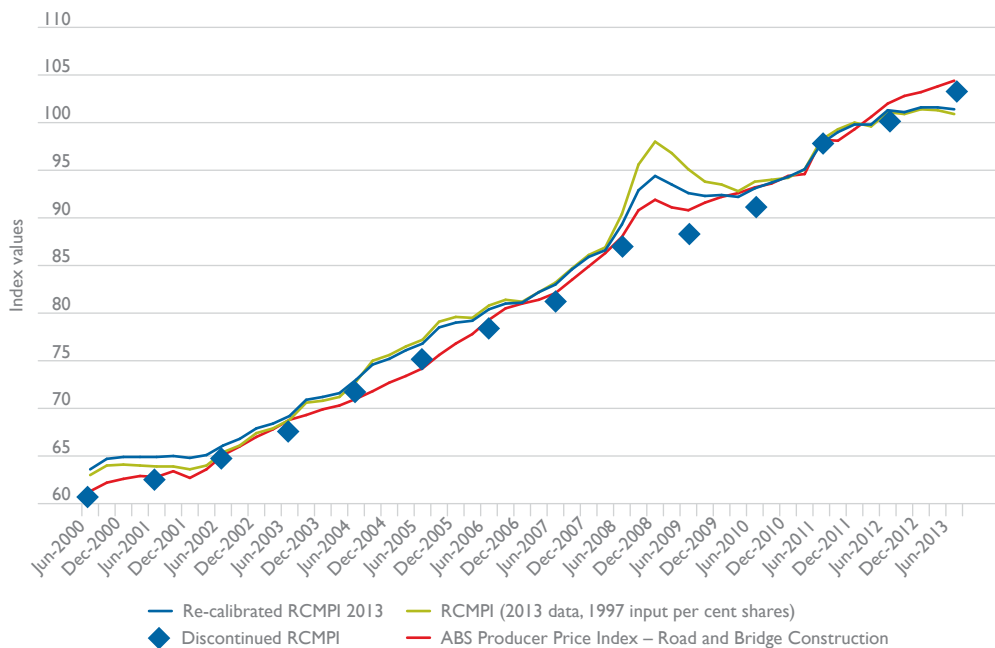
### 5.4 A re-calibrated Road Construction and Maintenance Price Index (RCMPI)

The 2013 re-calibrated BITRE Road Construction and Maintenance Price Index (RCMPI) takes into account the following eight major inputs used in road construction and maintenance: (1) site-based labour (2) office-based labour (3) bituminous materials (4) cement and concrete (5) quarry products (6) other materials (7) plant hire/ depreciation and (8) fuel.

Figure 6 below compares the four indexes:

- Re-calibrated RCMPI (2013 data, 2013 input per cent shares) — the index to be used from 2013 onwards. It utilises the most recent data on producer price indexes and adopts the new 2013 input per cent shares.
- RCMPI (2013 data, 1997 input per cent shares) — an index created to illustrate the impact of the new input per cent shares. It has no formal status.
- Discontinued RCMPI (old methodology: pre-2013 inputs and 1997 input per cent shares) — the official index used up to 2012 (BITRE, 2012). The index values are averages of the four quarters within the financial year. They are not the June quarter values of the index.
- ABS Road and Bridge construction output price index.

**Figure 6** Re-calibrated RCMPI (2013 data, 2013 input per cent shares), RCMPI (2013 data, 1997 input per cent shares), discontinued RCMPI and ABS output price index for Road and Bridges Construction (2011–12 = 100)



Source: BTCE (1997), ABS (2013a, c), BITRE (2012) and BITRE estimates.

The re-calibrated index and the discontinued RCMPI generally track one another very closely. The exception was the period between September 2008 to March 2010, when a gap opens up before trending back together. There are two main reasons as to why the movement occurred.

First, the new price indicator (reinforcing steel) introduced to monitor prices of 'other materials' was significantly impacted between September quarter 2008 and March quarter of 2010. As shown in Figure 3, the new price indicator



(reinforcing steel) rose by 59.5 percentage points, whereas the indicator for 'other materials' (all groups house construction) in the discontinued RCMPI went on at the same rate. Therefore the re-calibrated RCMPI and RCMPI (2013 data, 1997 input per cent shares) are higher than the discontinued RCMPI during that period.

Secondly, the input per cent share for 'other materials' has decreased significantly to 5.85 per cent in the re-calibrated RCMPI, compared to 10.8 per cent in the RCMPI (2013 data, 1997 input per cent shares). Therefore during that period, the rise of the price indicator for 'other materials' (reinforcing steel) has a bigger impact in the RCMPI (2013 data, 1997 input per cent shares), since its input per cent share is higher.

These factors particularly impact on the comparisons of

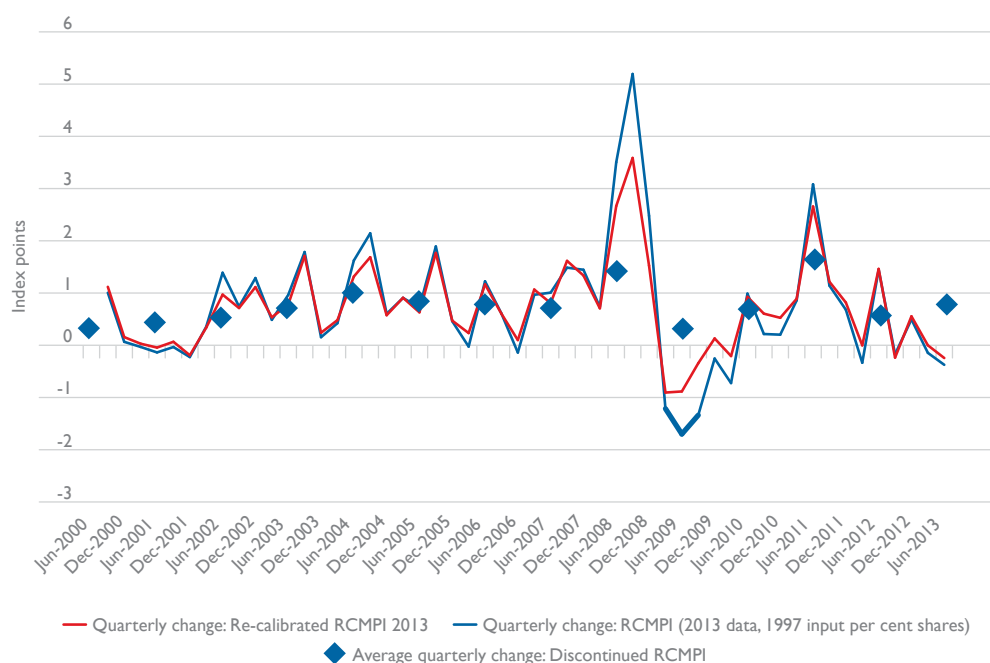
- The re-calibrated RCMPI and the RCMPI (2013 data, 1997 input per cent shares) (Figure 7 and 8);
- The re-calibrated RCMPI and the new sub-indices on Road Construction and Maintenance (Figures 9 and 10);
- The re-calibrated RCMPI against the discontinued RCMPI.

### 5.5 The change in the Indices between 2011–12 and 2012–13

Figure 7 compares the quarter-on-quarter percentage change between the re-calibrated RCMPI (2013 data, 2013 input per cent shares), RCMPI (2013 data, 1997 input per cent shares) and the discontinued RCMPI.

The discontinued RCMPI is on a financial year basis, therefore in Figure 7, the average quarterly change in the index is equal to the difference between the index values for two consecutive financial years divided by four. This conversion allows the different indices to be compared on the same basis.

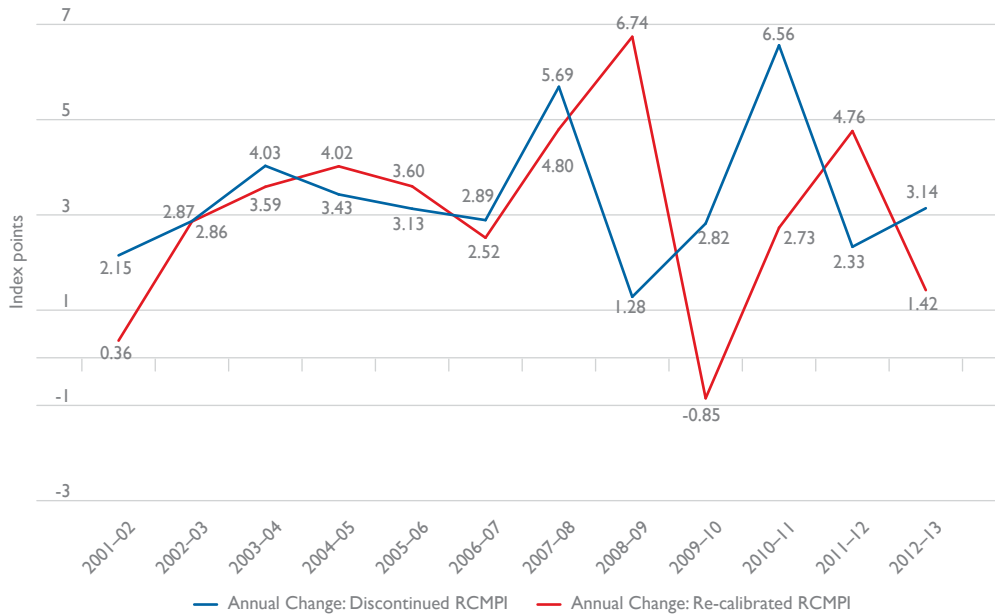
**Figure 7** Quarter-on-Quarter percentage changes: the re-calibrated RCMPI (2013 input per cent shares) compared to RCMPI (2013 data, 1997 input per cent shares) and average quarterly changes in the discontinued RCMPI



Source: BTCE (1997), ABS (2013a, c), BITRE (2012) and BITRE estimates.

The re-calibrated quarterly index can be converted to a financial year index as shown in Table 4. Figure 8 compares the year-on-year percentage change between the re-calibrated RCMPI (2013 data, 2013 input per cent shares) and the discontinued RCMPI.

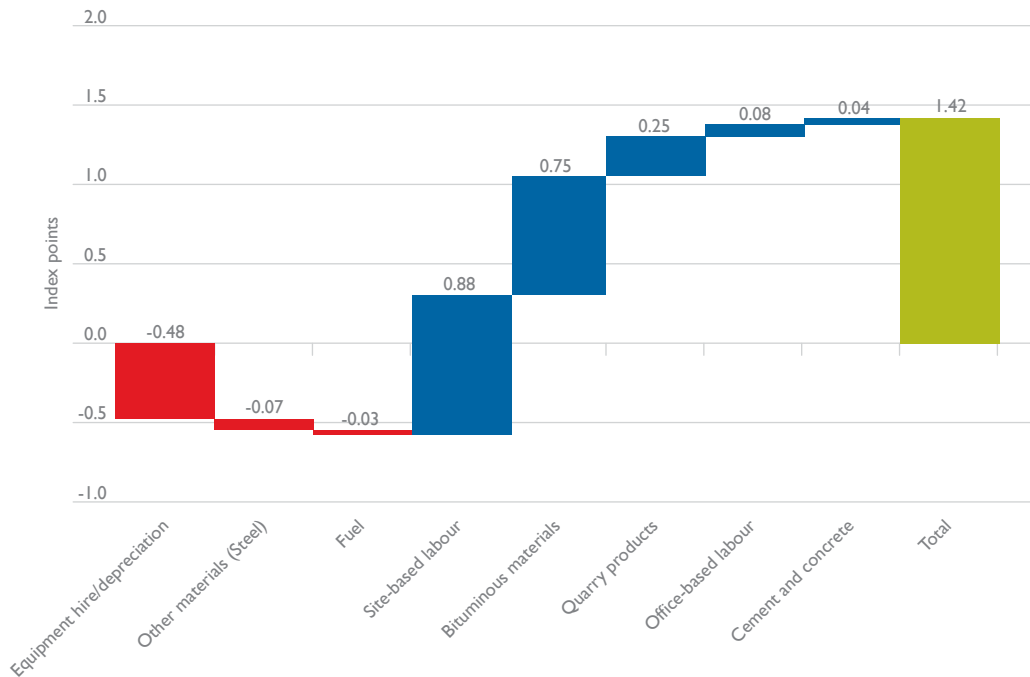
Figure 8 Year-on-year percentage changes: the re-calibrated RCMPI (2013 input per cent shares) compared to the discontinued RCMPI



Source: BITRE estimates.

Figure 9 shows that the re-calibrated RCMPI increased by 1.42 percentage points between 2011-12 and 2012-13. The most significant contributors to the index increase were rises in 'site-based labour' and 'bituminous materials' costs. They were counterbalanced, to a limited extent, by falls in 'plant hire/ depreciation', 'other materials' and 'fuel costs' over the same period.

Figure 9 Contributions by inputs to the change in the BITRE RCMPI (2013 data, 2013 input per cent shares) between 2011-12 and 2012-13.



Source: BITRE estimates.

## 5.6 Five new RCMPI sub-indexes

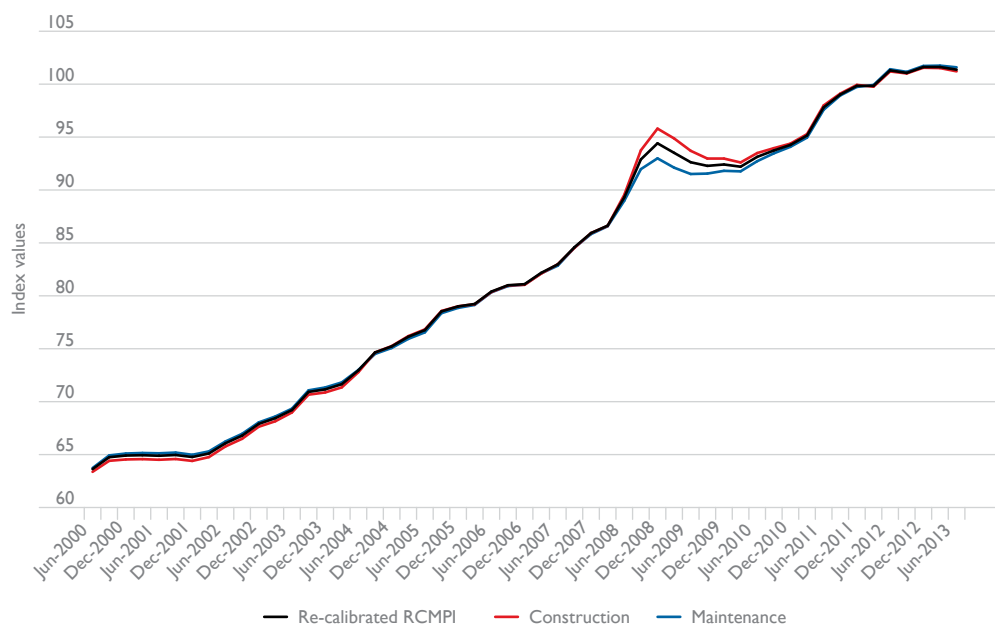
The computation of the sub-indexes relies on the same methodology as the RCMPI. However, the corresponding input per cent shares were collected explicitly and separately by surveys on major suppliers of road works services in Australia, and they are different from those in the RCMPI.

Figure 10 presents in graphical form the two new sub-indexes by type of activity and it shows they have slopes similar to that of the RCMPI.

Figure 11 presents in graphical form the three new sub-indexes by road type. As for the sub-indexes by activity type, a simple comparison of the sub-indexes with the re-calibrated RCMPI shows similarity in the slopes between the indexes.

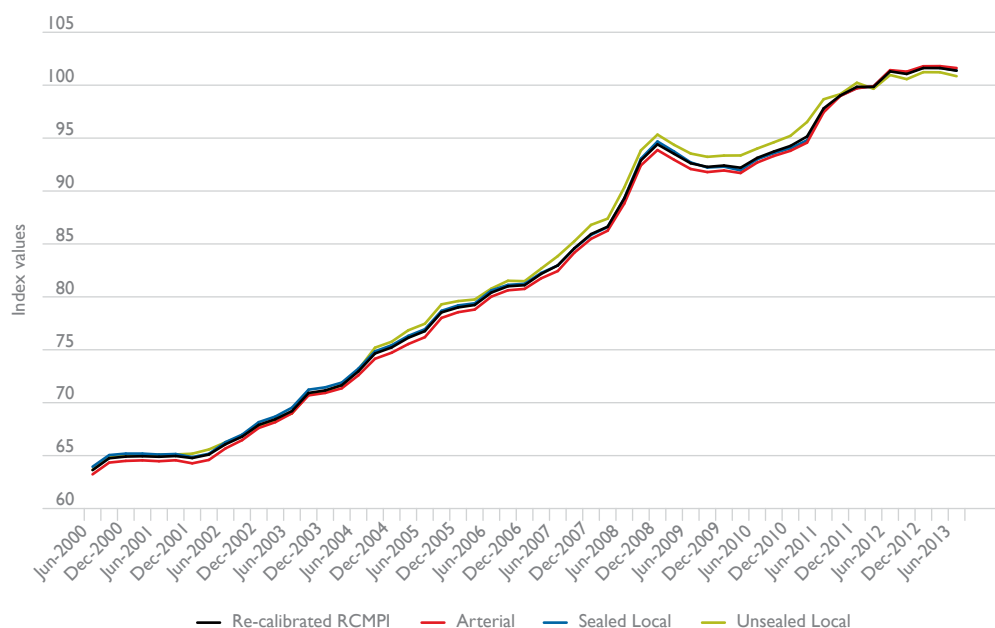
Table 4 shows the time series data of the sub-indexes.

**Figure 10 Two new sub-indexes by type of major activity: construction and maintenance**



Source: BITRE estimates.

**Figure 11 Three new sub-indexes by road type: arterial, sealed local and unsealed local roads**



Source: BITRE estimates.

Table 4 BITRE Road Construction and Maintenance Price Indexes and five sub-indexes:  
(Quarterly, 2011–12=100)

Year	Quarter	All roads				Sub-index by activity type		Sub-index by road type		
		Re-calibrated RCMPI (2013 data, 2013 input per cent shares)	Re-calibrated RCMPI (Financial year basis)	Discontinued RCMPI (Financial year basis, 2011–12 =100) <sup>b</sup>	RCMPI (2013 data, 1997 input per cent shares) <sup>c</sup>	Road Construction	Road Maintenance	Arterial Roads	Sealed Local Roads	Unsealed Local Roads
		Index reference period, 2011–12 =100 <sup>a</sup>				Index reference period, 2011–12 =100		Index reference period, 2011–12 =100		
2004	March	71.65			71.21	71.35	71.82	71.36	71.90	71.67
	June	72.96	71.67	71.90	72.83	72.79	73.00	72.59	73.22	73.13
	September	74.65			74.97	74.65	74.51	74.15	74.85	75.20
	December	75.22			75.58	75.25	75.07	74.72	75.43	75.76
2005	March	76.13			76.48	76.19	75.93	75.54	76.31	76.84
	June	76.76	75.69	75.30	77.21	76.83	76.55	76.19	76.94	77.46
	September	78.53			79.10	78.57	78.36	78.01	78.68	79.29
	December	79.00			79.56	79.01	78.86	78.55	79.19	79.60
2006	March	79.23			79.53	79.21	79.14	78.80	79.39	79.75
	June	80.40	79.29	78.46	80.76	80.36	80.33	80.02	80.61	80.78
	September	81.00			81.36	80.98	80.92	80.62	81.13	81.52
	December	81.10			81.22	81.04	81.06	80.75	81.23	81.48
2007	March	82.17			82.19	82.10	82.12	81.75	82.26	82.67
	June	82.97	81.81	81.32	83.20	82.99	82.85	82.44	82.97	83.85
	September	84.59			84.68	84.53	84.54	84.18	84.59	85.26
	December	85.93			86.13	85.93	85.83	85.48	85.85	86.80
2008	March	86.63			86.86	86.61	86.57	86.25	86.59	87.39
	June	89.30	86.61	86.99	90.37	89.54	88.98	88.81	89.31	90.33
	September	92.89			95.56	93.75	91.97	92.42	93.05	93.84
	December	94.41			98.04	95.80	92.99	93.87	94.68	95.33
2009	March	93.51			96.82	94.87	92.11	92.95	93.73	94.36
	June	92.62	93.36	88.31	95.12	93.70	91.51	92.08	92.70	93.54
	September	92.28			93.79	92.97	91.55	91.79	92.22	93.23
	December	92.41			93.53	92.97	91.81	91.94	92.30	93.35
2010	March	92.20			92.81	92.60	91.76	91.70	91.95	93.36
	June	93.13	92.50	91.11	93.80	93.49	92.72	92.69	93.00	94.01
	September	93.73			94.01	93.95	93.46	93.31	93.57	94.60
	December	94.26			94.21	94.38	94.08	93.80	94.04	95.21
2011	March	95.15			95.07	95.28	94.95	94.57	94.79	96.52
	June	97.81	95.24	97.67	98.15	97.99	97.58	97.44	97.65	98.67
	September	99.02			99.30	99.11	98.93	98.98	99.01	99.15
	December	99.84			99.98	99.93	99.74	99.71	99.73	100.23
2012	March	99.84			99.64	99.76	99.92	99.90	99.88	99.66
	June	101.30	100.00	100.00	101.09	101.20	101.41	101.42	101.38	100.96
	September	101.06			100.92	101.01	101.16	101.28	101.14	100.57
	December	101.62			101.41	101.55	101.72	101.79	101.66	101.23
2013	March	101.62			101.27	101.52	101.75	101.80	101.64	101.22
	June	101.37	101.42	103.14	100.89	101.21	101.59	101.62	101.40	100.85

## Notes:

- Using 2011–12 as the Index reference period means that the average of the indexes for September quarter 2011, December quarter 2011, March quarter 2012 and June quarter 2012 is 100.
- In the future the discontinued RCMPI will not be available beyond June quarter 2013. It is subsumed by the re-calibrated RCMPI based on 2013 expenditure weights and input per cent shares.
- The RCMPI (2013 data, 1997 input per cent shares) and the discontinued RCMPI are now calculated on an Index reference period of 2011–12 = 100.0.

Source: BITRE estimates

## 6. Conclusions

This information sheet presents the 2013 re-calibrated BITRE Road Construction and Maintenance Price Index (RCMPI). The revised index monitors price changes in the eight major inputs used in road construction and maintenance. This is the most recent re-calibration of the RCMPI. Re-calibrations have been undertaken every 16 years in the last 32 years.

The 2013 re-calibration of the RCMPI involved three major tasks: the road projects expenditure weights which reflect the relative roles in major suppliers of road works have been re-estimated; the input per cent shares have also been re-estimated, and three of the inputs have been associated with new producer price indexes in order to measure the price changes more accurately.

Furthermore, the information paper introduces two new sub-indexes by major activity: construction and maintenance, and three new sub-indexes by road type: arterial, sealed local and unsealed local roads. These sub-indexes are underpinned by the same methodology as the RCMPI, however, they are based on input per cent shares for the relevant activities or road types.

The RCMPI estimated changes in the cost of constructing and maintaining roads in Australia. For a given year, the sub-indexes show the range of possible outcomes, which depend on the type of road works (construction versus maintenance) and the type of roads (arterial, sealed local or unsealed local roads).

## Appendix A: Input mix by supplier of road works services

The figures in Table A1 are weighted averages of the input per cent shares, reported by state/ territory road authorities that provided data in their survey responses on substantial road works undertaken in-house. The weights used are based on the road distances in Table A2.

The weights are calculated using road distances because they provide an accurate reflection of the construction and maintenance costs on Australian roads. They are not based on road expenditure since it places greater emphasis towards more costly road works, such as tunnels, bridges and major road projects, and therefore less likely to provide an exact representation of regular road works.

In this study, road authorities in NSW, Qld and SA responded with data on input shares. The other states reported that their road works were outsourced to either local governments in the state/territory, to private sector contractors or both.

**Table A1 State/ territory road authorities: Input per cent shares for in-house projects**

	Arterial roads <sup>a,b</sup>		Sealed local roads <sup>a,b</sup>	
	Construction	Maintenance	Construction	Maintenance
<b>LABOUR</b>				
Site-based	29.55	37.20		23.18
Office-based	6.95	6.35		1.42
All labour	36.50	43.55		24.60
<b>MATERIALS</b>				
Bituminous materials	29.57	27.47		15.39
Cement and concrete	3.11	3.05		0.00
Quarry products	0.00	0.00		0.00
Other materials (reinforcing steel)	3.11	3.05		2.56
All materials	35.80	33.58		17.95
<b>EQUIPMENT</b>				
Hire/ depreciation	26.91	21.35		55.56
Fuel	0.79	1.53		1.88
All equipment	27.70	22.88		57.44
<b>ALL INPUTS<sup>c</sup></b>				
	100.00	100.00		100.00
Sample size	3	3		2

Notes:

- The input shares in the table are 'length of road' weighted averages of the data from states that responded to the survey.
  - The 'length of road' weights are computed using data in Table A2 as (the length of arterial roads in a state or territory/ the total length of road in all the states/ territories responded to the survey with data on input per cent shares). Responses with estimates of input per cent shares were received from departments of main roads in New South Wales, Queensland and South Australia. Victoria indicated that majority of their road projects were outsourced.
  - Components may not necessarily add up to the totals due to rounding.
- Source: BITRE estimates.

**Table A2 Length of road in kilometres, by state and territory, by class of road, 2011–12**

State/ Territory	Arterial roads (kilometres)	Local roads (kilometres)	Total (kilometres)
NSW	86 225	120 462	206 687
Vic	44 457	101 323	145 780
Qld	34 986	194 186	229 172
SA	19 285	78 711	97 996
WA	29 328	140 266	169 594
Tas	5 521	25 701	31 222
NT	18 499	3 264	21 763
ACT	476	2 931	3 407
Other	19	161	180
Total	238 796	667 005	905 801

Source: BITRE estimates.



Table A3 Local governments: Input per cent shares in projects undertaken in-house

	Arterial roads <sup>a,b</sup>		Sealed local roads <sup>a,b</sup>		Unsealed local roads <sup>a,b</sup>	
	Construction	Maintenance	Construction	Maintenance	Construction	Maintenance
LABOUR						
Site-based	28.44	35.31	24.18	34.48	26.05	34.92
Office-based	8.20	7.12	6.26	7.61	4.47	5.63
All labour	36.64	42.43	30.44	42.09	30.52	40.55
MATERIALS						
Bituminous materials	14.84	13.99	17.02	12.33	1.57	1.45
Cement and concrete	3.45	2.70	5.64	3.12	2.78	0.99
Quarry products	14.29	7.02	16.42	7.73	26.75	14.21
Other materials (reinforcing steel)	5.08	5.45	7.90	7.37	5.76	3.87
All materials	37.66	29.15	46.97	30.56	36.86	20.52
EQUIPMENT						
Hire/ depreciation	18.09	19.56	15.33	19.18	23.32	27.57
Fuel	7.61	8.86	7.26	8.18	9.30	11.35
All equipment	25.70	28.42	22.59	27.35	32.62	38.93
ALL INPUTS <sup>c</sup>						
	100.00	100.00	100.00	100.00	100.00	100.00
Sample size	67	85	130	172	49	88

## Notes:

- a. The input shares in the table are length of road weighted averages of the data from states that responded to the survey. The weights used are in Table A4.
- b. The length of road weights are computed as (the length of a given road type (e.g. arterial roads) in a local governments/ the total length of the road type in all the local governments that responded to the survey with data on input per cent shares).
- c. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.

Table A4 Length of road in kilometres reported by local governments that responded, by state/ territory, 2011–12

	Road length <sup>a</sup>	Road weights <sup>b</sup>
NSW	125 816	0.3120
VIC	90 508	0.2244
QLD	76 301	0.1892
SA	43 545	0.1080
WA	59 102	0.1466
TAS	7 012	0.0174
NT	977	0.0024
TOTAL <sup>b</sup>	403 262	1.0000

## Note:

- a. This is the total road length reported by local governments that responded to the survey with data on input per cent shares.
- Road weight is calculated as (road length in local governments that responded with data on input per cent shares in a state or territory) divided by (total road length in all local governments that responded with data on input per cent shares).
- b. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.

Table A5 Private sector contractors: Input per cent shares used in projects

	Arterial roads <sup>a</sup>		Sealed local roads <sup>a</sup>		Unsealed local roads <sup>a</sup>	
	Construction	Maintenance	Construction	Maintenance	Construction	Maintenance
LABOUR						
Site-based	18.10	20.57	21.55	23.90	25.36	33.14
Office-based	10.84	7.44	7.02	8.80	7.36	8.71
All labour	28.94	28.01	28.57	32.70	32.71	41.86
MATERIALS						
Bituminous materials	11.12	24.89	12.01	26.20	0.14	0.00
Cement and concrete	5.81	7.62	7.76	8.00	1.71	0.00
Quarry products	15.17	9.22	15.64	7.20	27.29	26.29
Other materials (reinforcing steel)	8.51	3.63	11.24	2.60	10.57	3.43
All materials	40.61	45.37	46.65	44.00	39.71	29.71
EQUIPMENT						
Hire/ depreciation	25.02	21.49	19.01	17.90	20.57	23.29
Fuel	5.43	5.13	5.77	5.40	7.00	5.14
All equipment	30.46	26.62	24.78	23.30	27.57	28.43
ALL INPUTS <sup>b</sup>						
	100.00	100.00	100.00	100.00	100.00	100.00
Sample size	21	9	18	10	7	7

## Notes:

a. The input shares in the table are averages of the data from 36 companies that responded to the survey.

b. Components may not necessarily add up to the totals due to rounding.

Source: Arup (2013).

## Appendix B: National aggregated input per cent shares used in RCMPI and sub-indexes

Table B1 RCMPI: input per cent shares—2013

	State / territory road authorities' input per cent shares	Local governments' input per cent shares	Private sector contractors' input per cent shares	Road <sup>a</sup> expenditure weighted input per cent shares	Road expenditure weighted input per cent shares	Change between 1997 & 2013
				2013	1997	
LABOUR						
Site-based	29.98	30.56	23.77	26.64	17.00	9.64
Office-based	4.91	6.55	8.36	7.31	8.90	-1.59
All labour	34.88	37.11	32.13	33.94	25.80	8.14
MATERIALS						
Bituminous materials	24.14	10.20	12.39	13.70	12.00	1.70
Cement and concrete	2.06	3.11	5.15	4.09	9.70	-5.61
Quarry products	0.00	14.41	16.80	13.42	15.30	-1.88
Other materials (reinforcing steel)	2.91	5.90	6.66	5.85	10.80	-4.95
All materials	29.11	33.62	41.01	37.06	47.70	-10.64
EQUIPMENT						
Hire/ depreciation	34.61	20.51	21.21	23.19	19.60	3.59
Fuel	1.40	8.76	5.65	5.81	6.80	-0.99
All equipment	36.01	29.27	26.86	29.00	26.50	2.50
ALL INPUTS <sup>a</sup>	100.00	100.00	100.00	100.00	100.00	na
Expenditure weights (From Table 4 of this IS)	0.1623	0.2736	0.5641	1.00	na	na

Note:

a. The data in the shaded column represent the input per cent shares used in the re-calibrated RCMPI 2013.

na: not applicable

b. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.

Table B2 Construction sub-index: input per cent shares—2013

	State / territory road authorities' input per cent shares	Local governments' input per cent shares	Private sector contractors' input per cent shares	Road expenditure <sup>a</sup> weighted input per cent shares
LABOUR				
Site-based	29.55	26.22	21.67	24.19
Office-based	6.95	6.31	8.41	7.60
All labour	36.50	32.53	30.07	31.79
MATERIALS				
Bituminous materials	29.57	11.14	7.76	12.23
Cement and concrete	3.11	3.95	5.10	4.46
Quarry products	0.00	19.16	19.36	16.16
Other materials (reinforcing steel)	3.11	6.24	10.11	7.92
All materials	35.80	40.50	42.32	40.77
EQUIPMENT				
Hire/ depreciation	26.91	18.91	21.53	21.69
Fuel	0.79	8.05	6.07	5.76
All equipment	27.70	26.97	27.60	27.44
ALL INPUTS <sup>a</sup>	100.00	100.00	100.00	100.00
Expenditure weights (From Table 4 of this IS)	0.1623	0.2736	0.5641	1.00

Note:

a. The data in the shaded column represent the input per cent shares used in the 2013 road construction sub-index.

b. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.

Table B3 Maintenance sub-index: input per cent shares—2013

	State / territory road authorities' input per cent shares	Local governments' input per cent shares	Private sector contractors' input per cent shares	Road expenditure <sup>a</sup> weighted input per cent shares
LABOUR				
Site-based	30.19	34.90	25.87	29.04
Office-based	3.89	6.79	8.32	7.18
All labour	34.08	41.69	34.19	36.22
MATERIALS				
Bituminous materials	21.43	9.26	17.03	15.62
Cement and concrete	1.53	2.27	5.21	3.81
Quarry products	0.00	9.66	14.24	10.67
Other materials (reinforcing steel)	2.81	5.56	3.22	3.79
All materials	25.76	26.74	39.69	33.89
EQUIPMENT				
Hire/ depreciation	38.46	22.10	20.89	24.07
Fuel	1.70	9.46	5.23	5.81
All equipment	40.16	31.57	26.12	29.89
<b>ALL INPUTS<sup>b</sup></b>				
	100.00	100.00	100.00	100.00
Expenditure weights (From Table 4 of this IS)	0.1623	0.2736	0.5641	1.00

Note:

a. The data in the shaded column represent the input per cent shares used in the 2013 road maintenance sub-index.

b. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.

Table B4 Arterial roads sub-index: input per cent shares—2013

	State / territory road authorities' input per cent shares	Local governments' input per cent shares	Private sector contractors' input per cent shares	Road expenditure <sup>a</sup> weighted input per cent shares
LABOUR				
Site-based	33.37	31.88	19.33	25.04
Office-based	6.65	7.66	9.14	8.33
All labour	40.02	39.54	28.47	33.37
MATERIALS				
Bituminous materials	28.52	14.41	18.00	18.73
Cement and concrete	3.08	3.07	6.72	5.13
Quarry products	0.00	10.66	12.19	9.79
Other materials (reinforcing steel)	3.08	5.26	6.07	5.37
All materials	34.69	33.40	42.99	39.02
EQUIPMENT				
Hire/ depreciation	24.13	18.83	23.26	22.19
Fuel	1.16	8.23	5.28	5.42
All equipment	25.29	27.06	28.54	27.61
ALL INPUTS <sup>b</sup>	100.00	100.00	100.00	100.00
Expenditure weights (From Table 4 of this IS)	0.1623	0.2736	0.5641	1.00

Note:

a. The data in the shaded column represent the input per cent shares used in 2013 arterial roads sub-index.

b. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.

Table B5 Sealed local roads sub-index: input per cent shares—2013

	State / territory road authorities' input per cent shares	Local governments' input per cent shares	Private sector contractors' input per cent shares	Road expenditure <sup>a</sup> weighted input per cent shares
LABOUR				
Site-based	23.18	29.33	22.73	24.61
Office-based	1.42	6.94	7.91	6.59
All labour	24.60	36.26	30.64	31.20
MATERIALS				
Bituminous materials	15.39	14.67	19.11	17.29
Cement and concrete	0.00	4.38	7.88	5.64
Quarry products	0.00	12.08	11.42	9.75
Other materials (reinforcing steel)	2.56	7.64	6.92	6.41
All materials	17.95	38.76	45.33	39.09
EQUIPMENT				
Hire/ depreciation	55.56	17.25	18.45	24.15
Fuel	1.88	7.72	5.59	5.57
All equipment	57.44	24.97	24.04	29.72
ALL INPUTS <sup>b</sup>	100.00	100.00	100.00	100.00
Expenditure weights (From Table 4 of this IS)	0.1623	0.2736	0.5641	1.00

Notes:

a. The data in the shaded column represent the input per cent shares used in the the 2013 sealed local roads sub-index.

b. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.

Table B6 Unsealed local roads sub-index: input per cent shares—2013

	Local governments' input per cent shares	Private sector contractors' input per cent shares	Road expenditure weighted <sup>a</sup> input per cent shares
LABOUR			
Site-based	30.49	29.25	29.65
Office-based	5.05	8.04	7.06
All labour	35.54	37.29	36.71
MATERIALS			
Bituminous materials	1.51	0.07	0.54
Cement and concrete	1.88	0.86	1.19
Quarry products	20.48	26.79	24.73
Other materials (reinforcing steel)	4.81	7.00	6.29
All materials	28.69	34.71	32.75
EQUIPMENT			
Hire/ depreciation	25.45	21.93	23.08
Fuel	10.33	6.07	7.46
All equipment	35.77	28.00	30.54
ALL INPUTS <sup>b</sup>	100.00	100.00	100.00
Expenditure weights (From Table 4 of this IS)	0.3266	0.6734	1.00

Note:

- a. The data in the shaded column represent the input per cent shares used in the 2013 unsealed local roads sub-index.  
b. Components may not necessarily add up to the totals due to rounding.

Source: BITRE estimates.



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Cover photo: Road grader. Image courtesy of Caterpillar Inc.

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