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## Working Paper on Construction

DRAFT

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## WORKING PAPER 1: WORKED EXAMPLE OF THE PROPOSED NEW APPROACH TO INTERNATIONAL CONSTRUCTION PRICE COMPARISONS

### 1 Introduction

This paper extends and develops the worked example included as section 3.4 of the Consultants' report of January 2010. Its purpose is to demonstrate how the proposed approach would work in practice, using an extended list of items and six, rather than two, countries. The items used, value weights, item prices and grossing up factors are all preliminary figures so the results are still not entirely reliable, however, the paper gives greater confidence that the methodology is practical. There are six parts, including this introduction.

- Part 2 illustrates and describes the proposed approach.
- Part 3 lists the information requirements and discusses the sources and reliability of the information.
- Part 4 presents the worked example.
- Part 5 provides a summary and conclusions on the approach and the results.
- Part 6 identifies areas for further work.

### 2 The proposed approach

Construction works, and the ICP basic headings of residential building, non-residential building and civil engineering work, are not homogenous. Within each there are enormous differences in size and complexity; there is new work and renovation and improvement of existing works; there is a wide range of types of projects for all kinds of clients constructed by all types and sizes of firms; there is prestige work and ordinary commonplace work; and, nowadays, there are significant proportions of construction work in some countries carried out under service, rather than supply, contracts – DBFO, BOT, PPP and the like. The idea of representative projects or parts of projects is difficult to sustain. What construction has, however, that is more or less universal is a common palette of materials and products – concrete, steel, bricks, timber, etc. And these materials and products make up a significant proportion of the inputs to construction. That is the rationale behind the approach proposed; it is not just because it is simple, it also more closely reflects the reality of the sector.

The approach treats construction in each country at the industry level. Other methods use construction projects or parts of construction projects as their basis<sup>1</sup>. This has the advantage of being able to conceptualise what is being surveyed, but, because construction is so heterogeneous, has the difficulty of **credibly** scaling up from project or work items level to national industry level. There is also a tendency to focus on new construction work at the expense of refurbishment and improvement work (which can represent over 50% of total output in developed economies).

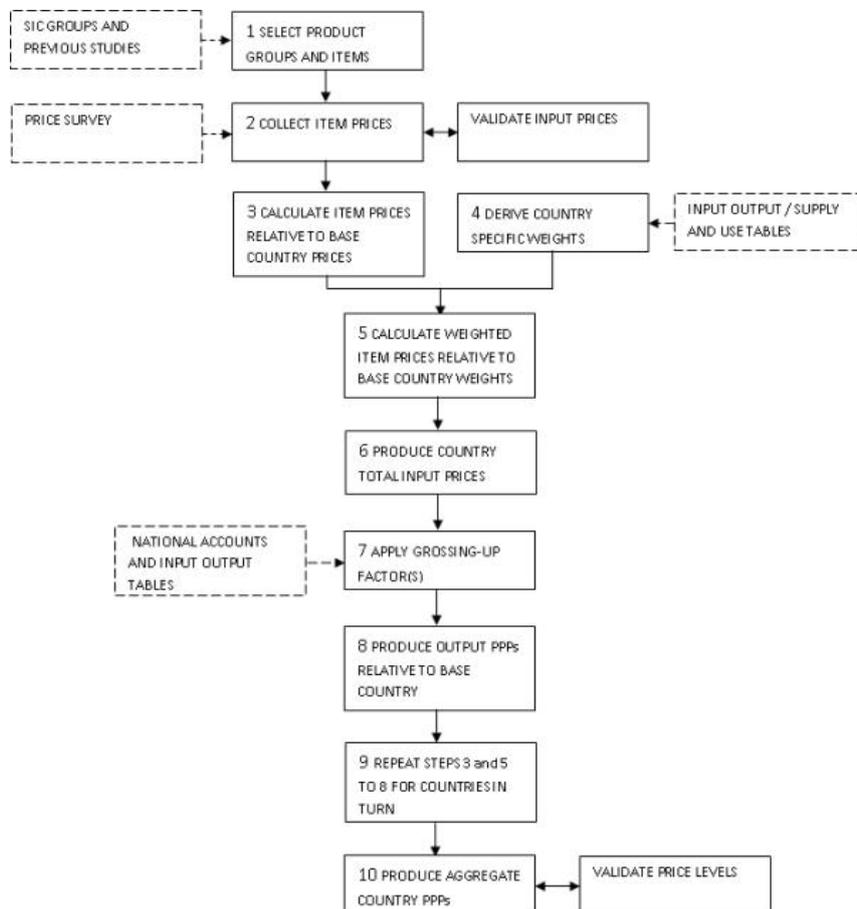
Figure 1 below illustrates the main stages of the proposed approach. It starts with the identification of broad groups of materials and products used in construction – Standard Industrial Classification (SIC) groups used in national accounts. Within groups, individual materials and products are selected that are common in use across countries and significant in terms of the value used; the selection

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<sup>1</sup> A working paper is being compiled **that** summarises the advantages and the disadvantages of the various existing comparison methodologies.

should also be extensive enough to separately represent the main broad types of construction output – residential and non-residential buildings and civil engineering work. The materials and products selected are grouped under the SIC categories and are taken to represent these categories.<sup>2</sup>

**Figure 1: OUTLINE OF THE PROPOSED APPROACH**



Prices for the items are then collected from price surveys in each participating country. Prices will be derived from a survey of national construction experts using a standard (electronic) format with detailed pricing guidelines. The prices collected will be average prices for all types of construction work and all locations in the country; they should also be annual averages for the survey year – typically assumed to be mid-year prices.<sup>3,4</sup> The prices should represent the prices of materials and products purchased by the construction industry, the input prices of construction. Once prices are validated, they are recalculated as amounts relative to a base country.

<sup>2</sup> The list of items needs to be reviewed to ensure that all three basic headings are adequately represented; the current list looks to have a ‘building’ bias.

<sup>3</sup> The Consultants have considered the collection of a range of different prices in each country representing different sizes and types of work but have concluded that this would tend to complicate a relatively simple survey and reduce data quality. It is believed that a process of price validation will help to identify inconsistent prices.

<sup>4</sup> A pilot survey is planned for July and August 2010 that will test, *inter alia*, survey instruments, the selection of experts, the survey process and price validation procedures.

Weights for industry groups and, where possible, for individual items will be derived from national Input Output or Supply and Use tables (or other sources of construction resource breakdowns). Weights for the base country will then be applied to the price relatives and the totals for each country will represent aggregate input price levels. These are then grossed-up to construction output prices by multiplying them by a factor for each country representing construction value added, the contribution of the construction industry to gross output. The factor is derived by dividing gross output by intermediate consumption. The main elements of value added are 'compensation of employees' and 'gross operating surplus' – crudely, the contributions of labour and firms' management to gross output. The grossing-up factor incorporates the combined effects of labour productivity and other operating characteristics particular to national construction industries.

The grossed-up total price levels are PPPs relative to the base country; they are based on national prices, base country weights and national grossing-up factors. PPPs are then produced using each country's weights in turn and the result is a matrix with every country having a column of PPPs representing different national mixes of construction inputs and every row representing PPPs for each country based on the mix of the first country in the row but each box in a row using the grossing-up factor appropriate for that country. The row PPPs are, therefore, for identical mixes of construction inputs; they are comparable. The column PPPs are for the same value of construction inputs but the composition of that value varies in line with national mixes of inputs; they are representative of each country's construction, but not identical.

Section 3, following, describes and discusses the information requirements of the approach. Section 4, following that, presents a worked example of the approach for six countries. A number of variants on, and refinements to, the approach are discussed in sections 3 and 4.

### **3 Information and Sources**

The principal information requirements are:

- a list of construction inputs;
- prices from each country for the construction inputs;
- value weights for each country for the input groups and, where possible, individual inputs; and
- grossing up factors for each country to convert construction input prices into construction output prices.

These are each discussed in turn below.

#### **3.1 The list of construction inputs**

Three types of construction inputs are discussed here: materials and products, construction equipment and other purchases. In value terms, materials and products are the most significant. At this stage, construction labour is not considered an input, it is a component of value-added and is, therefore, included in the grossing up factor. The construction price survey, however, will include a number of types of construction workers so data on the price of labour will be collected.

Variants on the approach include a two-stage grossing up procedure and treating labour as an input rather than a component of value-added. The two-stage grossing-up procedure would involve one factor to take materials and products to all intermediate consumption and another to take

intermediate consumption to gross output. Taking labour as an input would also involve adjusting grossing-up factors.

### Materials and products

The main selection criteria for inclusion in the list of materials and products are that items should be:

- common across most countries in terms of use in the construction sector;
- significant in terms of value used in construction in most countries; and
- simple to describe and likely to be understood in most countries.

PPPs are not only required for ‘all construction’, they are also required for the main types of construction: Residential and Non-residential building and Civil engineering work. Within the ICP these three construction types are known as basic headings. It is important to select materials and products that are not only common and significant to all construction but also to include materials and products that meet these criteria for the basic headings.

The Consultants have reviewed the various lists of construction materials and products used in different international construction price comparison exercises, including ICP related methodologies, academic studies and commercial publications. The current list comprises 36 materials and products that fit into five out of nine industry groups. More work needs to be done on the selection and matching of items to industry groups and, possibly, extension of the groups. It is relatively simple to identify one or two items to fit each of ‘petroleum products’ and ‘chemicals’ but more difficult to identify items for the ‘machinery’ and ‘construction equipment’ groups.<sup>5</sup> The list of items will be reviewed and revised in the next stage of the work; attention will be paid to ensuring inclusion of an adequate number of items overall and in each of the three basic headings. Table 1 allocates the selected materials and products to the selected industry groups.

**Table 1: SELECTED INDUSTRY GROUPS AND MATERIALS AND PRODUCTS**

SIC code	Industry group	Selected materials and products
14	<b>Other mining and quarrying</b>	Aggregates for concrete (2 items)
20	<b>Wood and wood products</b>	Softwood for carpentry, exterior plywood, interior plywood, chipboard sheet, softwood window, softwood internal door
23	<b>Petroleum products</b>	<i>will include petrol and diesel</i>
24	<b>Chemicals</b>	<i>will include different types of paint</i>
25	<b>Rubber and plastic products</b>	Vinyl floor tiles, plastic pipe, PVC insulated cable
26	<b>Glass, ceramic, clay and cement products</b>	Ordinary Portland cement, ready mix concrete (2 items), precast concrete slabs, common bricks, facing bricks, hollow concrete blocks, solid concrete blocks, clay roof tiles, concrete roof tiles, float/ sheet glass, double glazing units, ceramic wall tiles, plasterboard, white WC, white WHB, clay drain pipe
27/28	<b>Metal products</b>	High yield steel reinforcement, mild steel reinforcement, structural steel sections, cast iron drain pipe, copper pipe
29-31	<b>Machinery</b>	<i>will include mechanical and electrical items including pumps, compressors, air-</i>

<sup>5</sup> A possible alternative approach for construction equipment is to add the value of renting equipment to value added and, thereby, include equipment hire in the grossing-up, rather than as an input. This has the merit of bringing labour and equipment together and combining equipment hire with equipment purchase (amortisation of purchased equipment will be included in value added).

		<i>conditioning equipment</i>
71	<b>Renting equipment</b>	<i>Will include types of excavators, lifting equipment, etc.</i>

The actual survey forms will contain specifications for all materials and products (and other items). In general, item descriptions should be clear and simple but not too specific (eg in terms of proprietary brands) – the more precise the specification, the more country-specific it tends to become and, consequently, the more difficult to price in other countries.

The worked example in section 4 below uses some, but not all, of the selected materials and products. This is because the item selection process and the methodology development were undertaken in parallel and time did not permit using a single list in the worked example. And, in any case, the list is still under review. Survey instruments for the price survey are currently being developed, as are plans for a pilot exercise to test both the content and the implementation of the proposed survey. The outcome of this will also influence the content of the final item list.

Materials and products are presented in the industry groups because, typically, data on significance at the individual material or product level is not available in all countries. The selected items, therefore, are taken to represent these industry groups. Where they are available, weights for individual item will be used. The industry groups selected are Standard Industrial Classification (SIC) categories because they are universally recognised and are used for various sets of material and product production, consumption, trade, price and other data. Work is needed on the appropriate weightings of materials and products within groups; useful information is likely to come from extended/ detailed input output tables and other construction resource analysis data.

### **Construction equipment**

The contribution of construction equipment to construction work is difficult to determine on a reliable and comparable basis. It is not recorded in one place in any set of data and construction experts are typically unable to give reliable estimates of the percentage share that construction equipment takes up of typical construction project values or of construction work generally.<sup>6</sup>

Equipment hire can be included as part of the construction industry - if hire companies are registered to construction<sup>7</sup> - or as an input to construction - a purchase from another industry; the depreciation of equipment purchased by construction companies will be included in construction value-added. There are, therefore, two main methods of incorporating construction equipment in the approach: as an input along with materials and products or as part of a grossing-up factor. In most developed countries, there are well developed equipment hire companies and most construction contractors largely rely on these for their equipment needs. In other countries, contractors often have to purchase their own equipment.

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<sup>6</sup> The author has tested this in EU funded construction price surveys in the West Balkans in 2009 and 2010 and, despite detailed explanation and discussion of what is required with local construction experts, has been unable to establish credible values for construction equipment.

<sup>7</sup> Data from Eurostat suggests that, in Europe (EU27), SIC 45.5, renting of construction or demolition equipment with an operator, represents on average less than 1% of total construction output. The proportions, of course, vary from country to country.

Analysis of construction purchases from construction will indicate a construction equipment element and this can be added to the equipment hire row in intermediate consumption. It will normally, however, be difficult, if not impossible, to identify equipment amortisation in value added. Inclusion with materials and products will, therefore, be partial at best. If equipment hire can be identified and added to value-added, and hence to the grossing-up multiplier, then all types of construction equipment will be included in the analysis, but not explicitly. This approach also brings together labour and equipment (and their productivities) in the same place.

### **Other inputs**

Construction materials and products and construction equipment are not the only components of construction output. There are a range of others, including:

- wholesale and retail services, transport and communications;
- business services, including finance, insurance and real estate;
- consultancy services, including IT, legal, marketing, accountancy and technical;
- other manufacturing;
- utilities (electricity, gas and water); and
- public services.

Input-output/ Supply and use tables will provide proportions that these elements represent in different countries. It is important that at least some of them are included – somehow - in the total list of construction inputs.

## **3.2 Prices for inputs**

### **Prices for construction inputs**

Prices for the selected material and product items for six countries (Australia, New Zealand, Singapore, South Africa, the UK and the USA) were collected in late 2009/ early 2010 by personal contacts of the Consultants (mostly firms of construction cost consultants/ quantity surveyors). The prices were reviewed for consistency and any gaps filled by estimating 'neutral' prices for missing items. In the survey, gaps will be filled using established ICP methods.

The construction experts apparently did not experience any major difficulties in pricing the listed items although there are some apparent errors and inconsistencies. The Consultants intend discussing with the experts these and which, if any, of the items was not common, not cost significant, difficult to price, or inadequately described. Survey instruments are currently being developed and a pilot survey is planned for July and August 2010. This is intended to test all aspects of price collection.

The TAG was keen that prices should be sought for different quantities of materials and products so that bulk purchase discounts and the like are reflected in prices. This will be included in the survey but, from experience, the consultants do not believe that useful data will be obtained in all countries.

### **Prices for other inputs**

As with labour, mentioned above, a sample of construction equipment will be included as items in the construction price survey and rental charges, with and without operators, will be asked for. The capital purchase of construction equipment is included in the ICP Equipment goods survey and purchase prices, if required will be taken from that source. Prices for some other inputs (eg. Utilities) can be included in the survey; prices for services may be able to be obtained from other

parts of the ICP <sup>8</sup>; and some items (eg. Other manufacturing and Public services) can probably be ignored.

### 3.3 Value weightings

Construction resource weightings can be established at project, enterprise or industry level. Project data is not generally available for many types of work and is difficult and time consuming to collect; it is also typically biased to new work since quantities and values of inputs to work to existing buildings are even less available than those for new work and are very variable. Purchases by construction enterprises are recorded in some countries and can provide quantities or value weights and, sometimes, both. These will tend to have a bias to larger projects as surveys are usually of larger firms but they can be useful. There will, however, be problems of availability.

Analyses of resource consumption at industry level are occasionally available in special studies at national level (eg. A study of the building materials sector in the UK) but these are rare. Input-output and Supply and use tables, however, provide a useful source of resource input weightings for construction. The proposed approach uses value weightings of industry groups derived from input output tables. Table 2 is based on analysis of the most recent tables published by the relevant national statistical offices and, in many cases, more detail is available (below the SIC two digit level).

**Table 2: VALUE WEIGHTINGS OF INDUSTRY GROUPS IN SELECTED COUNTRIES**

SIC code	Industry group	Value weightings					
		US	AU	NZ	Sing	SA	UK
14	Other mining and quarrying	4	1	2	0	5	10
20	Wood and wood products	15	17	30	8	6	12
23	Petroleum products	11	7	7	1	6	3
24	Chemicals	to follow	to follow	to follow	to follow	to follow	to follow
25	Rubber and plastic products	9	8	10	4	3	14
26	Glass, ceramic, clay and cement products	20	29	22	48	35	32
27/28	Metal products	23	30	14	30	23	19
29-31	Machinery	18	7	16	8	27	10
71	Renting equipment	to follow	to follow	to follow	to follow	to follow	to follow
All selected groups		100	100	100	100	100	100
Selected industry groups as a proportion of intermediate consumption		46.5%	59.5%	76.9%	39.5%	81.4%	77.8%

The proportions that the selected items represent of total intermediate consumption vary from 40 to 80%. Some of this variation is due to the extent of subcontracting and some to the structure and operation of the industry. More work is needed on this, in particular, looking at construction purchases from construction, and those countries where there are multiple columns and rows.

It would be useful to obtain broad resource input breakdowns for construction work in different countries (and for work in basic headings), for example, the percentages of value that are taken by materials and products, labour and construction equipment. But experience suggests that this kind of information is generally not available and, when it is, it is often unreliable.

<sup>8</sup> There are doubts about the feasibility of doing this.

In the absence of input output tables, data on resource input mixes to construction may be available from weights for construction cost or price indices or from resource analysis studies. Work is required on this aspect, particularly for less developed countries. It is likely that the indices and studies that are available will generally be for countries where other data, including input-output tables, are of reasonable quality. Sources of value weights for other inputs will also be investigated but the main source is likely to be input-output tables.

### 3.5 Grossing-up factors

The principal grossing-up factor considered here is obtained by dividing gross construction output by intermediate consumption. It is, therefore, available for all countries that have national accounts and data for gross construction output; it is also available from input-output/ supply and use tables.

The following grossing-up factors are derived from the latest available full input output tables obtained from national statistical office websites. They present factors not only for all construction but also for a range of subsets of construction output. The subsets are available in those countries that have multiple columns and rows for construction in their input-output tables. Appendix A summarises the consultants' current state of knowledge on input output tables internationally.

**Table 3: GROSSING-UP FACTORS FOR DIFFERENT TYPES OF CONSTRUCTION WORK**

	Columns and rows	Australia	New Zealand	Singapore	South Africa	UK	USA
1	Residential buildings	1.29	1.26				1.81
2	Non-residential buildings		1.19				
3	Buildings (1 + 2)		1.23	3.43	1.24		
4	Other construction (civil engineering)		1.56	2.89	1.46		
5	Non- residential construction (2 + 4)	1.33	1.31				2.09
6	Construction trade services	1.65	1.71				
7	Repair and maintenance						2.45
8	All construction	1.43	1.44	3.30	1.32	1.63	2.00

There are no simple direct moves from 'all construction' to the ICP's three basic headings but there are some preliminary indications from the grossing-up factors in the table. Construction trade services (specialist contracting) and repair and maintenance tend to have higher factors – perhaps because they are more labour intensive, or because labour is more expensive, or because they are more profitable than general construction; civil engineering has higher grossing-up factors than all construction in New Zealand and South Africa and lower factors than all construction in Singapore – perhaps because it tends to be labour intensive and the low figure in Singapore reflects the use of cheap migrant labour. More work is required to collect and analyse this kind of data. Other grossing-up factors have been suggested and the need for these needs to be discussed.

## 4 Worked example

This section presents the results of a worked example of the proposed approach. It is based on 36 materials and products in five industry groups and six countries (Australia, New Zealand, Singapore, South Africa, the UK and the USA). For the time being, it ignores machinery and equipment, including construction equipment, and all kinds of services; and the number and content of industry

groups is still under consideration. The model is based on linked Excel spreadsheets designed to accommodate as many countries as necessary and follows the steps set out in the Proposed approach diagram in Section 2, above. A set of supporting tables for each step is included in Appendix B.

Table 4, overleaf, summarises the results for the worked example for the six countries against the USA as the base country (the first row) and then with the other five countries as base countries (rows 2 to 6).

**Table 4: CONSTRUCTION PPPs AS CALCULATED**

Base	USA US \$	Australia AU \$	New Zealand NZ \$	Singapore S \$	South Africa Rand	UK £
USA	1.000	2.146	1.990	1.808	7.040	0.882
Australia	0.896	1.000	1.456	1.259	4.065	0.506
New Zealand	0.603	1.117	1.000	0.944	3.484	0.439
Singapore	0.715	1.053	1.055	1.000	3.399	0.467
South Africa	0.363	0.556	0.599	0.516	1.000	0.306
UK	1.745	2.561	2.901	2.772	9.613	1.000

Table 5 reworks the data in the previous table so that all rows have a base of USA = 1.000. The values in the rows are all still in the same relationship to each other as before; the values in the columns, however, are now comparable. For example, the values in the Australia column represent the amounts in AU\$ that are equivalent to 1.000 US\$ of construction in each row country. Each column total is a geometric mean and represents a PPP for construction in the heading country.

**Table 5: CONSTRUCTION PPPs NORMALISED TO USA = 1.000**

Base	USA US \$	Australia AU \$	New Zealand NZ \$	Singapore S \$	South Africa Rand	UK £
USA	1.000	2.146	1.990	1.808	7.040	0.882
Australia	1.000	1.116	1.626	1.405	4.538	0.564
New Zealand	1.000	1.852	1.658	1.565	5.777	0.728
Singapore	1.000	1.473	1.475	1.398	4.753	0.612
South Africa	1.000	1.530	1.649	1.421	2.755	0.842
UK	1.000	1.468	1.663	1.589	5.509	0.573
EKS	1.000	1.565	1.670	1.525	4.868	0.689

Table 6 presents, on the first line, the PPPs from the final row of table 1.5. The next two lines show construction PPPs from the ICP 2005 round and from the latest OECD round.

**Table 6: PPPs COMPARED**

	USA	Australia	New Zealand	Singapore	South Africa	UK
PPPs as calculated	1.000	1.565	1.670	1.525	4.868	0.689
ICP PPPs, 2005, construction	1.000	1.39	1.80	0.62	4.08	0.64
OECD PPPs, 2008, All construction*	1.000	1.491	1.754	--	--	0.641

\* The OECD PPPs, 2008 are provisional.

There is a significant difference in base dates between the calculated PPPs and the ICP PPPs (2005/06 to 2009/10) but the results are not discouraging. Singapore demonstrates significant differences, but South Africa is quite consistent with the 2005-2010 inflation rates. Since we do not know which data set is more reliable, it is difficult to comment usefully on Singapore data. OECD

data is closer in time but is not available for Singapore and South Africa but, again, the comparisons between the calculated PPPs and the OECD PPPs are not discouraging.

## **5 Summary and conclusions**

As indicated earlier, this worked example is intended to illustrate how the proposed approach would work. The product list is not final and no account is taken of machinery and equipment and business services. More work is required to address these issues and to cross check results using other methods. The approach allows for a number of methods of aggregating price data that will produce reasonably comparable results. Some general conclusions that emerge from the work so far include that:

- the approach works and produces credible results and can be improved over time;
- the approach addresses as well as, if not better than, many of the issues that are common to all international construction comparisons;
- the list of items selected will be a useful basis for any 'basket of goods' approach to international construction cost/ price comparisons;
- reliable prices are the key to reliable results. Good prices with a poor method can still provide adequate results; poor prices, regardless of method, will produce poor results;
- input output and supply and use tables, despite limitations in availability and reliability, provide useful information on the structure of construction industries
- there are sufficient multiple column and row input-output tables to begin to produce at least some reliable PPPs at basic heading level;
- grossing-up factors can be derived from national accounts as well as input output tables;
- development and implementation of the methodology requires close collaboration between construction experts and statisticians and this should be established as soon as possible for as many countries as possible;
- providing accurate/reliable construction prices is difficult and should not be delegated to junior personnel. The challenge is to make either the exercise or the results sufficiently important to attract the attention of appropriately qualified and experienced individuals;
- useful linkages can be made between work on construction PPPs and work on temporal construction prices indices and construction productivity and resource planning studies; and
- linkages should be established between the proposed approach and other ICP approaches, particularly the Eurostat/OECD and the CIS methods.

## **6 Next steps**

- Finalising complementary working papers including reviews of other comparison methodologies and the use and reliability of m2 rates, proposals for a pilot survey, including survey instruments, and a larger worked example using published price data and standardised input output tables;
- Finalising the list of materials and products;
- Undertaking the pilot survey;
- Resolving problem areas in the proposed approach, including dealing with construction purchases from construction in input output tables, inclusion of machinery and

equipment for mechanical and electrical equipment, and treatment of construction equipment;

- Considering whether and, if so, how to deal with non construction (business and technical) services, including construction professional services;
- Continuing the collection, collation and analysis of Input Output/ Supply and Use tables;
- Undertaking the characterisation and grouping of countries by input mixes and grossing up factors and reviewing how these change over time;
- Developing procedures for the calculation of PPPs for basic headings; and
- Developing validation procedures for item prices and PPPs.

JLM, 30 May 2010

## Input output tables

The proposed approach uses input output/ supply and use tables as the main source for deriving value weightings for industry groups and materials and products. The main problem with this is the availability, reliability and level of detail of input output tables – availability is a matter of fact; reliability can be a result of the size, structure, frequency of tables and other factors. Full input output tables – with 100 or more columns and rows - have the greatest level of detail but are not usually prepared to a standard format.

The Consultants have identified over 50 sets of input output tables in standard formats, published by the EU and the OECD.<sup>9</sup> Other tables are apparently available, at a cost, from the Global Trade Analysis Project (GTAP) database at Purdue University but their consistency, size and dates are varied. Table A1 lists the countries with tables that have been identified thus far. Using these three databases, input output data is available for over 90 countries in total. It seems reasonable to assume that if some form of input output tables are available on such databases, more detailed tables are likely to be available from national statistical offices. Initial contact has been made with regional offices and national statistical offices but this needs to be followed up. There are other possible sources of information on input output tables, including the World Input-Output Database [[www.wiod.org](http://www.wiod.org)] and the International Input Output Association [[www.iioa.org](http://www.iioa.org)]. Again, these need to be followed up.

**Table A1: AVAILABILITY OF INPUT OUTPUT/ SUPPLY AND USE TABLES**

Country	ICP region	OECD dataset	EU dataset	GTAP dataset	Country set
Albania	Europe			X	
Argentina	LAC	X		X	
Armenia	CIS			X	
Australia	OECD	X		X	X
Austria	Europe	X	X	X	
Azerbaijan	CIS			X	
Bangladesh	Asia			X	
Belarus	CIS			X	
Belgium	Europe	X	X	X	
Bolivia	LAC			X	
Botswana	Africa			X	
Brazil	LAC	X		X	
Bulgaria	Europe		X	X	
Cambodia	Asia			X	
Canada	OECD	X		X	
Chile	LAC	X		X	
China	Asia	X		X	X
Colombia	Latin America/ Caribbean			X	
Costa Rica	Latin America/ Caribbean			X	
Croatia	Europe			X	
Cyprus	Europe			X	
Czech Republic	Europe	X	X	X	
Denmark	Europe	X	X	X	
Ecuador	Latin America/ Caribbean			X	
Egypt	West Asia/Africa			X	
Estonia	Europe	X	X	X	
Ethiopia	Africa			X	
Finland	Europe	X	X	X	

<sup>9</sup> The OECD and EU databases cover 43 and 30 countries respectively, 52 in total [*web references*]. The OECD tables have 48 standard columns and rows; the EU tables have 60.

France	Europe	X	X	X	
Germany	Europe	X	X	X	
Greece	Europe	X	X	X	
Hong Kong	Asia			X	
Hungary	Europe	X	X	X	
India	Asia	X		X	X
Indonesia	Asia	X		X	X
Ireland	Europe	X	X	X	
Israel	OECD	X		X	
Italy	Europe	X	X	X	
Japan	Asia	X		X	
Kazakhstan	CIS			X	
Korea	Asia	X		X	
Kyrgystan	CIS			X	
Laos	Asia			X	
Latvia	Europe		X	X	
Lithuania	Europe		X	X	
Luxembourg	Europe	X	X	X	
Macedonia	Europe		X		
Madagascar	Africa			X	
Malawi	Africa			X	
Malaysia	Asia	X		X	X
Maldives	Asia				X
Malta	Europe		X	X	
Mauritius	Africa			X	
Mexico	Latin America/ Caribbean	X		X	
Morocco	Africa			X	
Mozambique	Africa			X	
Myanmar	Asia			X	
Netherlands	Europe	X	X	X	
New Zealand	OECD	X		X	X
Nicaragua	Latin America/ Caribbean			X	
Nigeria	Africa			X	
Norway	Europe	X	X	X	
Pakistan	Asia			X	
Panama	Latin America/ Caribbean			X	
Paraguay	Latin America/ Caribbean			X	
Peru	Latin America/ Caribbean			X	
Philippines	Asia			X	
Poland	Europe	X	X	X	
Portugal	Europe	X	X	X	
Romania	Europe		X	X	
Russia	CIS	X		X	
Senegal	Africa			X	
Singapore	Asia	X		X	X
Slovak Republic	Europe	X	X	X	
Slovenia	Europe	X	X	X	
South Africa	Africa	X		X	
Spain	Africa	X	X	X	
Sri Lanka	Asia			X	
Sweden	Europe	X	X	X	
Switzerland	Europe	X	X	X	
Taiwan	Asia	X		X	X
Tanzania	Africa			X	
Thailand	Asia			X	X
Tunisia	Africa			X	
Turkey	Europe	X	X	X	
Uganda	Africa			X	
Ukraine	CIS			X	
UK	Europe	X	X	X	X
USA	OECD	X		X	X
Venezuela	Latin America/ Caribbean			X	
Vietnam	Asia			X	
Zambia	Africa			X	
Zimbabwe	Africa			X	

The ICP website lists 182 participating countries. Table A2, below, lists the regions, the number of participating countries in each region, the number of input output tables identified and the coverage in each region.

**Table A2: AVAILABILITY OF INPUT OUTPUT TABLES**

Region	Number of countries in region	Number of I/O tables identified	Coverage in each region
Africa	52	15	29%
Asia Pacific	31	19	61%
CIS	9	7	78%
Latin America and Caribbean	34	13	38%
OECD/ Eurostat	44	37	84%
Western Asia	12	1*	8%
<b>Total</b>	<b>182</b>	<b>92</b>	<b>51%</b>

\* this is, in fact, Egypt which is also included in Africa.

The most extensive coverage is in the OECD/ Eurostat and CIS states and the Asia Pacific region; there is poor but possibly adequate coverage in the Latin America and Caribbean and African regions; the poorest coverage is the Western Asia region, the Middle East.

Input output tables sometimes include multiple columns and rows for construction and, interestingly, apart from the UK, the countries selected for the worked example have between two and four columns and rows. Table A3, below, lists the countries and the types of work that are either published or can be derived.

**Table A3: MULTIPLE COLUMNS AND ROWS IN SELECTED INPUT OUTPUT TABLES**

	Columns and rows	Australia	New Zealand	Singapore	South Africa	UK	USA
1	Residential buildings	X	X				X*
2	Non-residential buildings		X				
3	Buildings (1 + 2)		XX	X	X		
4	Other construction (civil engineering)		X	X	X		
5	Non- residential construction (2 + 4)	X	XX				X*
6	Construction trade services		X				
7	Repair and maintenance						X
8	All construction	XX	XX	XX	XX	X	XX

X indicates published data

XX indicates derived data

\* indicates new work only

Multiple columns and rows are only likely to be available in full tables produced by national statistical offices. They are not available in the EU and OECD datasets and almost certainly not in the GTAP dataset. Depending on the number of countries with multiple columns and rows, rules should be able to be developed that will allow the characterisation of different types of work.

**Appendix B**  
**Worked Example Tables**

**Table B1: Materials and products price database (collected from country surveys)**

				Data inputs in highlighted cells					
				material and product prices per unit					
SIC	Industry groups	Selected materials or products	unit	USA \$	AUS \$	NZ \$	SING \$	SA Rand	UK £
				All construction 2010 Q1					
14	Other mining and quarrying	Aggregates for concrete (40mm)	m3	35.00	35.00	32.00	25.00	221.93	61.47
		Aggregates for concrete (10mm)	m3	17.00	55.00	35.00	17.00	221.93	77.69
20	Wood and wood products, except furniture	Softwood sections for carpentry	m3	120.00	1,200.00	1,200.00	347.76	4,783.00	336.93
		Exterior quality plywood (18mm)	m2	7.00	90.00	30.00	10.80	104.14	13.83
		Plywood for interior joinery (6mm)	m2	5.00	40.00	16.00	4.44	65.51	4.14
		Chipboard sheet flooring (18mm)	m2	4.00	13.00	27.00	6.29	86.67	4.41
		Softwood window (900 x 900mm), opening light, complete with ironmongery and double glazing	each	300.00	240.00	600.00	139.05	407.55	161.66
		Softwood internal door (826 x 2040 x 40mm) hardboard faced complete with frames and ironmongery	each	50.00	165.00	345.00	62.16	512.60	34.83
23	Refined petroleum products	Gloss (oil based) paint	litre	4.20	13.70	11.00	7.00	101.95	3.82
25	Rubber and plastic products	Emulsion (water based) paint	litre	3.80	8.00	9.00	3.50	107.98	4.10
		Vinyl floor tiles, 300 x 300 x 2.0mm thick	m2	10.00	36.00	18.00	8.43	73.13	4.93
		Plastic pipe, 15mm diameter, suitable for cold water	m	1.50	0.40	4.90	0.59	1.34	0.97
26	Glass, ceramic, clay, cement, lime and concrete products	Ordinary portland cement	tonne	103.00	300.00	340.00	93.00	1,499.00	109.36
		Ready mixed concrete (10N/mm2)	m3	126.00	192.00	170.00	87.00	801.32	74.70
		Ready mixed concrete (25N/mm2)	m3	135.00	200.00	190.00	95.00	877.10	76.64
		Precast concrete paving slabs (600 x 600 x 50mm)	m2	7.00	55.00	28.00	10.39	119.72	5.14
		Common bricks (215 x 65 x 100mm thick)	each	0.35	0.55	0.80	0.17	0.99	0.22
		Good quality facing bricks (215 x 65 x 100mm thick)	each	0.38	1.20	0.70	0.60	3.85	0.48
		Hollow dense aggregate concrete blocks (7N/mm2, 440 x 215 x 140mm thick)	each	1.30	3.45	2.26	1.02	9.69	0.97
		Solid dense aggregate concrete blocks 97N/mm2, 440 x 215 x 140mm thick)	each	1.37	2.50	3.04	1.24	9.70	1.01
		Clay plain roof tiles (265 x 165mm)	each	2.20	1.50	8.00	2.50	17.00	0.31
		Concrete interlocking roof tiles (420 x 330mm)	each	1.50	1.20	1.47	0.72	5.72	0.70
		Float/sheet glass (6mm)	m2	52.00	47.00	35.00	24.00	184.21	20.83
		Sealed double glazing units, 900 x 750mm, 6mm glass with 12mm air space	m2	155.00	260.00	315.28	400.00	631.58	83.21
		Average quality ceramic wall tiles (150 x 150 x 5.5mm thick)	m2	35.00	22.00	35.00	22.50	58.60	10.51
		Plasterboard (9.5mm thick)	m2	3.00	6.00	7.00	2.61	42.27	1.82
		Clay floor tiles, 150 x 150 x 12.5mm thick	each	1.60	0.68	0.95	0.62	2.30	0.70
		White glazed domestic WC suite	each	220.00	460.00	500.00	550.00	4,500.00	136.27
		White glazed domestic wash hand basin	each	280.00	320.00	275.00	150.00	4,250.00	110.67
		Clay drain pipes, 100mm diameter, with socket joints	m	11.99	18.00	35.00	20.00	65.37	8.41
27/28	Iron and steel products including structural steel products and products of non-ferrous metals	High yield steel reinforcing bars (12mm)	tonne	1,007.00	1,800.00	1,600.00	800.00	7,068.00	607.98
		Mild steel reinforcing bars (12mm)	tonne	1,008.00	2,000.00	1,700.00	850.00	7,068.00	547.18
		Structural steel sections, universal beams (457 x 152mm, 67kg/m)	tonne	900.00	1,800.00	2,450.00	1,150.00	16,674.63	832.38
		Cast iron drain pipes, 150mm diameter, with mechanical coupling joints	m	16.00	84.00	40.00	19.25	65.37	41.19
		Copper pipe, 15mm diameter	m	6.50	7.00	8.50	6.75	21.91	2.57
29-31	Machinery including general purpose machinery and electrical equipment	PVC insulated and PVC sheathed cable suitable for domestic power circuits	m	0.50	1.30	1.40	0.43	1.28	0.66

**Table B2: Material and product relative prices**

		Material and product prices divided by prices from base country							
SIC	Industry groups	Selected materials or products	Base Price						
			USA \$	USA \$	AUS \$	NZ \$	SING \$	SA Rand	UK £
				All construction					
14	Other mining and quarrying	Aggregates for concrete (40mm)	35.00	1.00	1.00	0.91	0.71	6.34	1.76
		Aggregates for concrete (10mm)	17.00	1.00	3.24	2.06	1.00	13.05	4.57
20	Wood and wood products, except furniture	Softwood sections for carpentry	120.00	1.00	10.00	10.00	2.90	39.86	2.81
		Exterior quality plywood (18mm)	7.00	1.00	12.86	4.29	1.54	14.88	1.98
		Plywood for interior joinery (6mm)	5.00	1.00	8.00	3.20	0.89	13.10	0.83
		Chipboard sheet flooring (18mm)	4.00	1.00	3.25	6.75	1.57	21.67	1.10
		Softwood window (900 x 900mm), opening light, complete with ironmongery and double glazing	300.00	1.00	0.80	2.00	0.46	1.36	0.54
		Softwood internal door (826 x 2040 x 40mm) hardboard faced complete with frames and ironmongery	50.00	1.00	3.30	6.90	1.24	10.25	0.70
23	Refined petroleum products	Gloss (oil based) paint	4.20	1.00	3.26	2.62	1.67	24.27	0.91
25	Rubber and plastic products	Emulsion (water based) paint	3.80	1.00	2.11	2.37	0.92	28.42	1.08
		Vinyl floor tiles, 300 x 300 x 2.0mm thick	10.00	1.00	3.60	1.80	0.84	7.31	0.49
		Plastic pipe, 15mm diameter, suitable for cold water	1.50	1.00	0.27	3.27	0.39	0.89	0.65
26	Glass, ceramic, clay, cement, lime and concrete products	Ordinary portland cement	103.00	1.00	2.91	3.30	0.90	14.55	1.06
		Ready mixed concrete (10N/mm <sup>2</sup> )	126.00	1.00	1.52	1.35	0.69	6.36	0.59
		Ready mixed concrete (25N/mm <sup>2</sup> )	135.00	1.00	1.48	1.41	0.70	6.50	0.57
		Precast concrete paving slabs (600 x 600 x 50mm)	7.00	1.00	7.86	4.00	1.48	17.10	0.73
		Common bricks (215 x 65 x 100mm thick)	0.35	1.00	1.57	2.29	0.49	2.83	0.64
		Good quality facing bricks (215 x 65 x 100mm thick)	0.38	1.00	3.16	1.84	1.58	10.13	1.27
		Hollow dense aggregate concrete blocks (7N/mm <sup>2</sup> , 440 x 215 x 140mm thick)	1.30	1.00	2.65	1.74	0.78	7.45	0.75
		Solid dense aggregate concrete blocks 97N/mm <sup>2</sup> , 440 x 215 x 140mm thick)	1.37	1.00	1.82	2.21	0.90	7.06	0.74
		Clay plain roof tiles (265 x 165mm)	2.20	1.00	0.68	3.64	1.14	7.73	0.14
		Concrete interlocking roof tiles (420 x 330mm)	1.50	1.00	0.80	0.98	0.48	3.81	0.47
		Float/sheet glass (6mm)	52.00	1.00	0.90	0.67	0.46	3.54	0.40
		Sealed double glazing units, 900 x 750mm, 6mm glass with 12mm air space	155.00	1.00	1.68	2.03	2.58	4.07	0.54
		Average quality ceramic wall tiles (150 x 150 x 5.5mm thick)	35.00	1.00	0.63	1.00	0.64	1.67	0.30
		Plasterboard (9.5mm thick)	3.00	1.00	2.00	2.33	0.87	14.09	0.61
		Clay floor tiles, 150 x 150 x 12.5mm thick	1.60	1.00	0.43	0.60	0.39	1.44	0.44
		White glazed domestic WC suite	220.00	1.00	2.09	2.27	2.50	20.45	0.62
		White glazed domestic wash hand basin	280.00	1.00	1.14	0.98	0.54	15.18	0.40
Clay drain pipes, 100mm diameter, with socket joints	11.99	1.00	1.50	2.92	1.67	5.45	0.70		
27/28	Iron and steel products including structural steel products and products of non-ferrous metals	High yield steel reinforcing bars (12mm)	1,007.00	1.00	1.79	1.59	0.79	7.02	0.60
		Mild steel reinforcing bars (12mm)	1,008.00	1.00	1.98	1.69	0.84	7.01	0.54
		Structural steel sections, universal beams (457 x 152mm, 67kg/m)	900.00	1.00	2.00	2.72	1.28	18.53	0.92
		Cast iron drain pipes, 150mm diameter, with mechanical coupling joints	16.00	1.00	5.25	2.50	1.20	4.09	2.57
		Copper pipe, 15mm diameter	6.50	1.00	1.08	1.31	1.04	3.37	0.39
29-31	Machinery including general purpose machinery and electrical equipment	PVC insulated and PVC sheathed cable suitable for domestic power circuits	0.50	1.00	2.60	2.80	0.85	2.56	1.31

**Table B3: Weightings database (calculated from input output tables)**

SIC	Industry groups	Relative weights of industry groups					
		USA	AUS	NZ	SING	SA	UK
		All construction 2002	2005-6	2002-3	2000	2002	2007
14	Other mining and quarrying	4.1%	1.4%	1.9%	0.0%	5.1%	10.2%
20	Wood and wood products, except furniture	15.0%	16.6%	29.7%	8.2%	5.7%	12.0%
23	Refined petroleum products	10.9%	7.2%	6.6%	0.6%	5.6%	3.4%
25	Rubber and plastic products	9.4%	8.4%	10.2%	4.4%	2.6%	13.5%
26	Glass, ceramic, clay, cement, lime and concrete products	19.7%	29.3%	22.0%	48.4%	31.6%	31.7%
27/28	Iron and steel products including structural steel products and products of non-ferrous metals	23.2%	30.3%	13.9%	30.4%	22.7%	19.0%
29 - 31	Machinery including general purpose machinery and electrical equipment	17.8%	6.8%	15.8%	7.9%	26.8%	10.3%
	Total	100.0%	100.0%	100.0%	100.0%	100%	100%

**Table B4: Calculation of material and product weightings**

SIC	Industry groups	Selected materials or products	Group weightings	Material and product weightings						
				USA	AUS	NZ	SING	SA	UK	
				All construction						
			Split equally across items							
14	Other mining and quarrying	Aggregates for concrete (40mm)	50.00%	2.05%	0.68%	0.94%	0.00%	2.54%	5.11%	
		Aggregates for concrete (10mm)	50.00%	2.05%	0.68%	0.94%	0.00%	2.54%	5.11%	
20	Wood and wood products, except furniture	Softwood sections for carpentry	16.67%	2.50%	2.76%	4.95%	1.37%	0.94%	1.99%	
		Exterior quality plywood (18mm)	16.67%	2.50%	2.76%	4.95%	1.37%	0.94%	1.99%	
		Plywood for interior joinery (6mm)	16.67%	2.50%	2.76%	4.95%	1.37%	0.94%	1.99%	
		Chipboard sheet flooring (18mm)	16.67%	2.50%	2.76%	4.95%	1.37%	0.94%	1.99%	
		Softwood window (900 x 900mm), opening light, complete with ironmongery and double glazing	16.67%	2.50%	2.76%	4.95%	1.37%	0.94%	1.99%	
		Softwood internal door (826 x 2040 x 40mm) hardboard faced complete with frames and ironmongery	16.67%	2.50%	2.76%	4.95%	1.37%	0.94%	1.99%	
23	Refined petroleum products	Gloss (oil based) paint	100.00%	10.91%	7.22%	6.61%	0.64%	5.63%	3.38%	
25	Rubber and plastic products	Emulsion (water based) paint	33.33%	3.12%	2.81%	3.40%	1.47%	0.87%	4.50%	
		Vinyl floor tiles, 300 x 300 x 2.0mm thick	33.33%	3.12%	2.81%	3.40%	1.47%	0.87%	4.50%	
		Plastic pipe, 15mm diameter, suitable for cold water	33.33%	3.12%	2.81%	3.40%	1.47%	0.87%	4.50%	
26	Glass, ceramic, clay, cement, lime and concrete products	Ordinary portland cement	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Ready mixed concrete (10N/mm <sup>2</sup> )	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Ready mixed concrete (25N/mm <sup>2</sup> )	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Precast concrete paving slabs (600 x 600 x 50mm)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Common bricks (215 x 65 x 100mm thick)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Good quality facing bricks (215 x 65 x 100mm thick)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Hollow dense aggregate concrete blocks (7N/mm <sup>2</sup> , 440 x 215 x 140mm thick)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Solid dense aggregate concrete blocks (9.7N/mm <sup>2</sup> , 440 x 215 x 140mm thick)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Clay plain roof tiles (265 x 165mm)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Concrete interlocking roof tiles (420 x 330mm)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Float/sheet glass (6mm)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Sealed double glazing units, 900 x 750mm, 6mm glass with 12mm air space	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Average quality ceramic wall tiles (150 x 150 x 5.5mm thick)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Plasterboard (9.5mm thick)	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Clay floor tiles, 150 x 150 x 12.5mm thick	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		White glazed domestic WC suite	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		White glazed domestic wash hand basin	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
		Clay drain pipes, 100mm diameter, with socket joints	5.56%	1.09%	1.63%	1.22%	2.69%	1.75%	1.76%	
27/28	Iron and steel products including structural steel products and products of non-ferrous metals	High yield steel reinforcing bars (12mm)	20.00%	4.64%	6.06%	2.77%	6.08%	4.53%	3.79%	
		Mild steel reinforcing bars (12mm)	20.00%	4.64%	6.06%	2.77%	6.08%	4.53%	3.79%	
		Structural steel sections, universal beams (457 x 152mm, 67kg/m)	20.00%	4.64%	6.06%	2.77%	6.08%	4.53%	3.79%	
		Cast iron drain pipes, 150mm diameter, with mechanical coupling joints	20.00%	4.64%	6.06%	2.77%	6.08%	4.53%	3.79%	
		Copper pipe, 15mm diameter	20.00%	4.64%	6.06%	2.77%	6.08%	4.53%	3.79%	
29-31	Machinery including general purpose machinery and electrical equipment	PVC insulated and PVC sheathed cable suitable for domestic power circuits	100.00%	17.77%	6.78%	15.76%	7.88%	26.83%	10.30%	

**Table B5: Build up of total input prices**

Select base country

USA

Base Weight Weightings from base country applied to item prices from all countries

SIC	Industry groups	Selected materials or products	unit	USA	All construction					
					USA \$ 2002	AUS \$ 2005-6	NZ \$ 2002-3	SING \$ 2000	SA Rand 2002	UK £ 2007
14	Other mining and quarrying	Aggregates for concrete (40mm)	m3	2.05%	0.0205	0.0205	0.0187	0.0146	0.1298	0.0359
		Aggregates for concrete (10mm)	m3	2.05%	0.0205	0.0662	0.0421	0.0205	0.2672	0.0935
20	Wood and wood products, except furniture	Softwood sections for carpentry	m3	2.50%	0.0250	0.2497	0.2497	0.0724	0.9953	0.0701
		Exterior quality plywood (18mm)	m2	2.50%	0.0250	0.3211	0.1070	0.0385	0.3715	0.0493
		Plywood for interior joinery (6mm)	m2	2.50%	0.0250	0.1998	0.0799	0.0222	0.3272	0.0207
		Chipboard sheet flooring (18mm)	m2	2.50%	0.0250	0.0812	0.1686	0.0392	0.5411	0.0276
		Softwood window (900 x 900mm), opening light, complete with ironmongery and d	each	2.50%	0.0250	0.0200	0.0499	0.0116	0.0339	0.0135
		Softwood internal door (826 x 2040 x 40mm) hardboard faced complete with fram	each	2.50%	0.0250	0.0824	0.1723	0.0310	0.2560	0.0174
23	Refined petroleum products	Gloss (oil based) paint	litre	10.91%	0.1091	0.3559	0.2858	0.1819	2.6489	0.0992
25	Rubber and plastic products	Emulsion (water based) paint	litre	3.12%	0.0312	0.0658	0.0740	0.0288	0.8877	0.0337
		Vinyl floor tiles, 300 x 300 x 2.0mm thick	m2	3.12%	0.0312	0.1125	0.0562	0.0263	0.2285	0.0154
		Plastic pipe, 15mm diameter, suitable for cold water	m	3.12%	0.0312	0.0083	0.1021	0.0122	0.0278	0.0203
26	Glass, ceramic, clay, cement, lime and concrete products	Ordinary portland cement	tonne	1.09%	0.0109	0.0318	0.0361	0.0099	0.1591	0.0116
		Ready mixed concrete (10N/mm2)	m3	1.09%	0.0109	0.0167	0.0147	0.0075	0.0695	0.0065
		Ready mixed concrete (25N/mm2)	m3	1.09%	0.0109	0.0162	0.0154	0.0077	0.0710	0.0062
		Precast concrete paving slabs (600 x 600 x 50mm)	m2	1.09%	0.0109	0.0859	0.0437	0.0162	0.1869	0.0080
		Common bricks (215 x 65 x 100mm thick)	each	1.09%	0.0109	0.0172	0.0250	0.0053	0.0309	0.0070
		Good quality facing bricks (215 x 65 x 100mm thick)	each	1.09%	0.0109	0.0345	0.0201	0.0173	0.1107	0.0138
		Hollow dense aggregate concrete blocks (7N/mm2, 440 x 215 x 140mm thick)	each	1.09%	0.0109	0.0290	0.0190	0.0086	0.0815	0.0082
		Solid dense aggregate concrete blocks (9N/mm2, 440 x 215 x 140mm thick)	each	1.09%	0.0109	0.0199	0.0242	0.0099	0.0772	0.0081
		Clay plain roof tiles (265 x 165mm)	each	1.09%	0.0109	0.0075	0.0397	0.0124	0.0845	0.0016
		Concrete interlocking roof tiles (420 x 330mm)	each	1.09%	0.0109	0.0087	0.0107	0.0053	0.0417	0.0051
		Float/sheet glass (6mm)	m2	1.09%	0.0109	0.0099	0.0074	0.0050	0.0387	0.0044
		Sealed double glazing units, 900 x 750mm, 6mm glass with 12mm air space	m2	1.09%	0.0109	0.0183	0.0222	0.0282	0.0445	0.0059
		Average quality ceramic wall tiles (150 x 150 x 5.5mm thick)	m2	1.09%	0.0109	0.0069	0.0109	0.0070	0.0183	0.0033
		Plasterboard (9.5mm thick)	m2	1.09%	0.0109	0.0219	0.0255	0.0095	0.1540	0.0066
		Clay floor tiles, 150 x 150 x 12.5mm thick	each	1.09%	0.0109	0.0046	0.0065	0.0042	0.0157	0.0048
		White glazed domestic WC suite	each	1.09%	0.0109	0.0229	0.0248	0.0273	0.2236	0.0068
		White glazed domestic wash hand basin	each	1.09%	0.0109	0.0125	0.0107	0.0059	0.1659	0.0043
		Clay drain pipes, 100mm diameter, with socket joints	m	1.09%	0.0109	0.0164	0.0319	0.0182	0.0596	0.0077
27/28	Iron and steel products including structural steel products and products of non-ferrous metals	High yield steel reinforcing bars (12mm)	tonne	4.64%	0.0464	0.0829	0.0737	0.0368	0.3256	0.0280
		Mild steel reinforcing bars (12mm)	tonne	4.64%	0.0464	0.0920	0.0782	0.0391	0.3252	0.0252
		Structural steel sections, universal beams (457 x 152mm, 67kg/m)	tonne	4.64%	0.0464	0.0928	0.1263	0.0593	0.8594	0.0429
		Cast iron drain pipes, 150mm diameter, with mechanical coupling joints	m	4.64%	0.0464	0.2435	0.1160	0.0558	0.1895	0.1194
		Copper pipe, 15mm diameter	m	4.64%	0.0464	0.0500	0.0607	0.0482	0.1564	0.0183
29-31	Machinery including general purpose machinery and electrical equipment	PVC insulated and PVC sheathed cable suitable for domestic power circuits	m	17.77%	0.1777	0.4621	0.4976	0.1512	0.4550	0.2330
<b>Total price (sum of weighted item prices)</b>					<b>1.0000</b>	<b>2.9872</b>	<b>2.7475</b>	<b>1.0952</b>	<b>10.6593</b>	<b>1.0832</b>

**Table B6: Grossing up factors (calculated from input output tables)**

Country	USA	AUS	NZ	SING	SA	UK
	All construction					
I/O table date	2002	2005-6	2002-3	2000	2002	2007
Individual grossing up factors						
Overall Grossing up factor	2.00	1.43	1.44	3.30	1.32	1.63

**Table B7: PPPs**

	Base	USA \$	USA \$	AUS \$	NZ \$	SING \$	SA Rand	UK £
Input prices (from Table 5)			1.0000	2.9872	2.7475	1.0952	10.6593	1.0832
Grossed up input prices		1.9955	1.9955	4.2816	3.9701	3.6086	14.0482	1.7610
<b>Output PPPs</b>			<b>1.0000</b>	<b>2.1456</b>	<b>1.9895</b>	<b>1.8084</b>	<b>7.0400</b>	<b>0.8825</b>

**Table B8: PPP MATRIX for All Construction**

Equivalent purchasing powers for a fixed weighting of construction components in different locations

	USA \$	AUS \$	NZ \$	SING \$	SA Rand	UK £		
Alternative weightings for national construction characteristics	USA	1.000	2.146	1.990	1.808	7.040	0.882	
	AUS	0.896	1.000	1.456	1.259	4.065	0.506	
	NZ	0.603	1.117	1.000	0.944	3.484	0.439	
	SING	0.715	1.053	1.055	1.000	3.399	0.438	
	SA	0.363	0.556	0.599	0.516	1.000	0.306	
	UK	1.745	2.561	2.901	2.772	9.613	1.000	

**Table B9: PPP matrix converted to alternative bases**

**US base**

	PPPs	Construction locations and currencies					
	Base PPP USA \$= 1.000	USA \$	AUS \$	NZ \$	SING \$	SA Rand	UK £
Alternative weightings for national construction characteristics	USA	1.000	2.146	1.990	1.808	7.040	0.882
	AUS	1.000	1.116	1.626	1.405	4.538	0.564
	NZ	1.000	1.852	1.658	1.565	5.777	0.728
	SING	1.000	1.473	1.475	1.398	4.753	0.612
	SA	1.000	1.530	1.649	1.421	2.755	0.842
	UK	1.000	1.468	1.663	1.589	5.509	0.573
	Geometric mean		1.000	1.565	1.670	1.525	4.868

**NZ base**

	PPPs	Construction locations and currencies					
	Base PPP NZ \$= 1.000	USA \$	AUS \$	NZ \$	SING \$	SA Rand	UK £
Alternative weightings for national construction characteristics	USA	0.503	1.078	1.000	0.909	3.539	0.444
	AUS	0.615	0.687	1.000	0.864	2.791	0.347
	NZ	0.603	1.117	1.000	0.944	3.484	0.439
	SING	0.678	0.999	1.000	0.948	3.223	0.415
	SA	0.607	0.928	1.000	0.862	1.671	0.511
	UK	0.601	0.883	1.000	0.955	3.313	0.345
	Geometric mean		0.599	0.937	1.000	0.913	2.915