Costing sustainable services
Module 3

3.3   Preparing data for analysis; cost conversion

In general, preparing life-cycle costs for analysis takes place in two steps[1].

Step 1   Convert all life-cycle costs into values that can be compared for the same year, removing the effects of inflation.

Step 2   Convert all life-cycle costs into the same currency.

Converting life-cycle costs into the same year

Life-cycle costs data are often collected and reported in different years and in several currencies. These nominal costs have to be transformed into current costs so that they can be compared, with the same year, currency and unit of analysis. This is required for a financial analysis, like life-cycle costing, where all calculations are based on current (inflation-adjusted) costs. In an economic analysis, in contrast, present costs are used instead to assist in understanding the likely future costs of new projects. Box 1 explains the differences among nominal, current and present costs.

Box 1   Financial versus economic analysis

Financial analysis
▸   **Nominal costs** are the actual amount of currency on a specific date. For example, the cost to buy an apple in 2009 was US$ 1.
▸   **Current costs** bring past expenditures to today's values by removing the effects of inflation. For example, the cost of the apple bought in 2009 is US$ 1.40 in 2010 prices.

Economic analysis
▸   **Present costs** bring future costs to today's values by discounting against the time value of money (and ignoring future inflation). For example, we estimate that the present cost of buying an apple in 2020 is US$ 0.50.

To compare expenditures made in different years, all nominal costs across different years need to be transformed into a level relative to a single year (based on current costs). For example, to calculate the average operations and minor maintenance expenditure in 2011 for ventilated improved pit (VIP) latrines

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[1] The Costing Sustainable Services Training Package contains a currency conversion tool for training participants. See 3.7: Currency conversion of this training package.

based on costs incurred in Ghana between 2003 and 2008, costs from those years must be converted to today's cost by using the gross domestic product (GDP) deflator.

Box 2 shows the steps for making costs comparable over time.

Box 2   Sample exercise comparing costs over time[2]

You have collected operations and minor maintenance expenditures for a VIP latrine in Ghana cedi in 2005 (GH₵ 32) and in 2008 (GH₵ 40). What is the expected average operating expense for a VIP latrine today?

To know the expense today, convert past costs (for 2005 and 2008) to current costs (e.g., 2011) by using the GDP deflator.

1.   Look up the GDP deflator for your currency in the World Bank Databank[3].
2.   Multiply the local currency in Year X times the GDP deflator for that same year. The formula is as follows:

*Cost at current prices = Cost (Year X) * GDP deflator (Year X)*

2005 cost in Ghana cedi =	32
Ghana DP deflator to convert 2005 cost to current (2011) prices =	1.13
Calculation:	32 x 1.13
Cost in Ghana cedi in current prices =	36.16

2008 cost in Ghana cedi =	40
Ghana DP deflator to convert 2008 cost to current (2011) prices =	1.05
Calculation:	40 x 1.05
Cost in Ghana cedi in current prices =	42

Expected average operating expense in current prices for a VIP latrine in Ghana is (GH₵ 36.16 + GH₵ 42) / 2 = GH₵ 39.08.

In Box 2, the GDP deflator was used to bring all costs to their value in the year 2011. Such price indices are based on "baskets" of goods and services. Because people's consumption and investment patterns are not fixed–people respond to changing prices by buying alternatives–it may be helpful to look at expenditure patterns using the GDP deflator. The GDP deflator measures changes in both price and the changing composition of the basket: as prices and consumer preferences change, the GDP deflator adjusts accordingly. For this reason, the GDP deflator is a more accurate measure of price changes in the overall economy. GDP deflators are available for most currencies at the World Bank Databank.

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[2] All calculations found in this handout are based on 2011 GDP deflator, nominal exchange rates and purchasing power parity.
[3] Available at: www.databank.worldbank.org/ddp/home.do?Step=1&id=4.

Converting life-cycle costs into the same currency

Once current costs have been calculated for the year of choice, costs can be compared across countries that use different currencies. For instance, to compare costs in capital maintenance expenditure for a borehole and handpump in 2011 in India in Indian rupees (INR 2,000) with a similar borehole installation in Burkina Faso reported in CFA francs (XOF 50,000), both currencies need to be converted to the same currency as US dollar (US$) using the nominal exchange rate or the purchasing power parity (PPP).

The WASHCost project uses the US dollar as the yardstick for comparison because it is the most commonly used currency for trading between nations.

The PPP between two countries is the exchange rate at which an amount of money in the currency of one country represents the same volume of goods and services in the other country. PPP is used because nominal exchange rates can be misleading. Exchange rates are based on short-term factors and are subject to substantial distortions from speculative movements and government interventions. Thus comparisons based on exchange rates, even when averaged over a period of time (such as a year), can yield misleading results.

Box 3 shows, step-by-step, how to make costs comparable from country to country, using both PPP and nominal exchange rates.

Box 3   Sample exercise comparing costs for different currencies

You have collected capital maintenance expenditure for a borehole and handpump in 2011 in India in Indian rupees (INR 2,000) and for a similar installation in Burkina Faso in CFA francs (XOF 50,000). Which country has a lower capital maintenance expense based on PPP (in US$)? Which country has a lower expenditure when the nominal exchange rate (in US$) is considered?

1. Look up the nominal exchange rate and the PPP exchange rate for your currency in the World Bank Databank[4] or use 3.7: Currency conversion (Excel) of the Costing Sustainable Services Training package.
2. Convert all figures into a single currency; use the nominal exchange rate or the PPP exchange rate (in US$) to compare the relative price levels of the two countries.
3. Convert all figures into US$ by dividing the local currency with the PPP or the nominal exchange rate conversion factor. The formulae for both, the exchange rate or the PPP exchange rate, are as follows: US$ PPP (Year X) = local currency (Year X) / PPP conversion factor (Year X). *Cost at current prices = Cost (Year X) * GDP deflator (Year X)*.

India's capital maintenance expense using US$ PPP

2005 cost in Indian rupees in 2011 =	INR 2.000
PPP conversion factor for India for 2011 =	19.53
Calculation:	2000 / 19.53
Cost in US$ PPP =	US$ 102.40

[4] Available at: www.databank.worldbank.org/ddp/home.do?Step=1&id=4.

India's capital maintenance expense using US$ market rates

Cost in Indian rupees in 2011 =	INR 2.000
Market exchange rate for India for 2011 =	46.67
Calculation:	2000 / 46.67
Cost in US$ =	US$ 42.85

Burkina Faso's capital maintenance expense using US$ PPP

Cost in Burkina Faso francs in 2011 =	XOF 50.000
PPP conversion factor for Mozambique for 2011 =	216.34
Calculation:	50.000 / 216.34
Cost in US$ =	US$ 231.12

Cost in Burkina Faso francs in 2011 =	XOF 50.000
Market exchange rate for Burkina Faso for 2011 =	471.87
Calculation:	50.000 / 471.87
Cost in US$ =	US$ 105.96

The relative price, whether figured according to the market exchange rate or the PPP approach, indicates that spending on capital maintenance, in international comparison terms, is less in India (US$ 102.40 PPP and US$ 42.85) than in Burkina Faso (US$ 231.11 PPP and US$ 105.96). However, this does not necessarily mean that India is more efficient than Burkina Faso since the expenditure in Indian might not be delivering the same level of on-going services.

The imbalance in water expenditures between many African countries and India (as shown in Box 3) is partly explained by the following reasons:

- The likely undervaluation of the Indian rupee, perhaps by a factor of almost three (though the PPP analysis is designed to remove any such effect).
- The sophistication of the Asian supply chain, which reduces costs.
- The considerably lower wage rates in South Asia.
- The dependence of the African supply chain on expensive foreign imports.

PPP is used because exchange rates can yield misleading results. The PPP conversion factors are available from the World Bank Databank or use 3.7: Currency conversion (excel) of the Costing Sustainable Services Training package.