ICED
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Guidance Note:

Using cost indicators for better VFM infrastructure

Value for Money of Infrastructure in Fragile and Conflict Affected States

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Contents

1. Introduction

1.1 Purpose of this guidance note

This guidance note is intended to assist practitioners with effective use of cost indicators in donor programmes with an infrastructure component; with a focus on the challenges experienced in Fragile and Conflict Affected States (FCAS). It explains how to use cost indicators at each stage of the infrastructure investment lifecycle; as a tool to better understand and improve a programme's value for money (VFM). Recommendations are based on good practice economic principles, and are also of use in non-FCAS contexts.

Selecting appropriate and useful cost indicators, and collecting the relevant data to measure them requires action from donors and implementing partners. It is recommended that this document or extracts from it be incorporated into programme documents prepared for service providers, to ensure a joint understanding of donor approach and requirements for information to inform decision making.

1.2 Purpose of Cost Indicators for VFM

Cost indicators provide a convenient normalisation for project costs against a measure that is of particular interest or relevance (i.e. cost per unit of output/unit of outcome/beneficiary). They allow costs to be compared within and between projects, and can be used to support decision making about VFM. Computing and analysing these indicators at each stage of the project lifecycle, and across different stages of the lifecycle, provides programme managers with better visibility of the relative economy, efficiency, or effectiveness of an investment. It helps to show where further analysis or investigation should be undertaken to avoid poor VFM, and improve and/or maximise good VFM. For example, if the cost per km of road built on one project was 10 times more expensive than the average of 100 other similar road building projects – it would be useful to investigate why this is the case, and whether the extra expense is justified in VFM terms.

Cost indicators are often harder to implement well in FCAS environments, though there are also additional benefits in using them in these contexts because they can provide detailed information to inform the trade-off between cost and the goals of a programme in FCAS. They can also help to control higher fiduciary risk in FCAS.[1] Benchmarking cost differences in FCAS contexts can help to identify and in some ways quantify the trade-off between pursuing an FCAS programme, compared to one in a less fragile area (all other things – i.e. programme outcomes – being equal).

Use of all types of cost indicators will not always be feasible in FCAS programming contexts; and there is no 'fixed set' of indicators that should be used to measure VFM in every FCAS infrastructure programme. Rather, a flexible approach is advised: balancing the resource cost and feasibility of collecting the data needed for cost indicator analysis; against the benefit from better tracking of VFM. It is not necessary to implement all measures described in this document to create a useful process and set of indicators.

1.3 Limitations of benchmarking costs

Cost indicators should be used carefully, and any comparisons between projects need to be made within the wider context. Benchmarking of cost indicators is only meaningful when certain considerations are taken into account:

[1] While identifying corruption and mismanagement is not the primary goal of using cost indicators, it can be a VFM concern and cost indicators may help with the discovery of such issues when irregularities are investigated.

(1) **Scope/specification of the infrastructure intervention:** The cost of road construction per km is lower for a rural road than for a highway. This is due to differences in the scope of the road project, which in this case is the functional standard of the asset and relates to factors such as traffic, travel speed, safety and terrain, which can raise the cost per unit of length by a factor up to 100. If looking at cost/outcome, (i.e. cost per vehicle km travelled per year), the cost on a rural road will be many times greater than that for a highway.

(2) Where costs are not a linear function of the base unit, **economies of scale** and **economies of scope** must be taken into account when selecting the base unit and evaluating cost indicators at any VFM stage. An example illustrates this point:[2]

- **Scale:** The cost per kWH of energy produced is lower for a large state than for a small state. The main factor here is scale. The efficiency of the production only becomes apparent in the unit cost when like is compared with like. It would not be useful to compare the cost per unit of energy between the small and large states for VFM purposes, without taking into account the ability of the large state to achieve economies of scale.

(3) **Differences in costs based on local/geographic factors.** It is possible to control for differences in certain cost drivers. For example, if you are comparing a project in a remote place to one in an easy to reach place then you either need to exclude transport costs or normalise them. Similarly, it can be possible to control for *some* of the difference in cost between projects in FCAS and those in non-FCAS environments. Where underlying project costs are similar, controls can be put in place for FCAS factors that can be consistently estimated (e.g. known security costs).

(4) It is very important to recognise in any benchmarking exercise that there may be very valid reasons for cost differences such as partners targeting hard to reach areas associated with higher costs. This does not make an investment poor VFM.

(5) **Unit input costs have a very short shelf life,** particularly in an FCAS environment where market conditions are influenced by ongoing security and stability concerns. Input cost data needs to be updated regularly – bi-annual update is recommended. ***The resource cost of doing this may outweigh the benefits achieved from the results of cost indicator analysis. This should be considered on a portfolio wide basis by assessing whether collecting and maintaining up-to-date input unit costs represents good VFM across the portfolio.*** Where there are high resource costs, it may be possible to spread these across a portfolio by choosing benchmarks or methods which apply across several projects and types of intervention.[3]

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[2] Adam Smith International, 14 August 2012. Measuring and Maximising Value for Money in Infrastructure Programmes, pg. 38, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/194319/measure-maximize-VfM-infrastructure.pdf

[3] Examples of this include aligning targeting of beneficiary communities, so that household surveys can measure the outputs and outcomes of more than one programme at once, or sharing basic input costs data (e.g. price of construction materials) across a portfolio of projects and selecting those input costs for which data already exist to use for benchmarking.

2. *Types of cost indicators*

We have defined five different types of cost indicators that are useful and relevant for understanding the VFM of an infrastructure investment. These are presented in Table 1.

Table 1: Types of cost indicators for VFM in infrastructure

#	Name of cost indicator	Description	How it shows the VFM of an infrastructure investment
1	**Input unit costs (of materials and resources)**	The cost of a base unit of input. This includes unit costs of materials such as bags of cement, lengths of pipe, solar panels, and of other resources including staff time and equipment costs.	Input costs affect the *economy* of an investment. Even a small price difference for the same item can result in substantial cost differences when procured in large numbers.
2	**Cost per unit of infrastructure**[4] **a. Construction / upfront cost per unit of infrastructure**[5] **b. Operation and maintenance (O&M) cost per unit of infrastructure**[6]	a. Where infrastructure has a single dominant parameter of measurement, such as the length of a road or depth of a borehole, the cost per unit of infrastructure constructed or produced. (E.g. construction cost / solar mini grid). b. Assessment of post construction operation and maintenance costs, per unit of infrastructure. This can be calculated as total O&M costs over the lifetime of the asset or on an average annual basis. (E.g. Annual O&M cost for each solar mini grid installed).	This indicator is a measure of the *efficiency* of an investment – how well inputs are converted into outputs. Influencing factors include: - Procurement method and process: effective competition, market conditions - Management: supervision and control of costs, quality and productivity during implementation - Transparency and accountability of project owner and implementation process In an efficient process the variations to the price arising at successive stages of the infrastructure investment lifecycle should be low. If they are not, they can result in substantial changes to the completion cost and thus to the original expectations of VFM.
3	**Cost per unit of output produced**	This can be used where there are specific continuous outputs that can be measured, such as with water supply or electricity, the cost per unit provided. (E.g. total cost per kWH of electricity produced, operating cost per kWH of electricity supplied).	This indicator can help to measure the *efficiency* and the *effectiveness* of an investment. Influencing factors similar to above. Enables comparisons to be made between effectiveness of similar interventions.
4	**Cost per beneficiary**	The cost of the infrastructure investment per person or per household that will benefit from the intervention. (E.g. cost per incremental household with access to electricity).	This indicator can help to measure the *efficiency* and the *effectiveness* of an investment. Enables comparisons to be made between effectiveness of similar and different interventions.
5	**Cost per unit of outcome**	The cost of the infrastructure for a specified unit of outcome relating to the infrastructure service and its various impacts. This requires a monetised numerator to describe costs, but a non-monetised common denominator for the outcome (e.g. the cost of the investment per job created, the cost / tonne of carbon averted).	This indicator is a measure of the *cost effectiveness* of an investment. Enables comparisons to be made between effectiveness of different interventions in achieving the same outcome

[4] Note: cost indicators 2a and 2b can be summed (appropriately on a whole of life present value basis) to calculate the **total cost per unit of infrastructure**. It is good practice to estimate total costs on a whole of life basis (including all upfront and O&M costs over the life of the asset) as this results in a better understanding of the VFM that an infrastructure investment provides over its lifetime. It is important to take into account the lifetime of an infrastructure asset when comparing VFM between investments as well, as an asset with a useful life of five years will have a different total cost to a similar asset with a useful life of 25 years. We separate total cost into construction (or upfront) costs and O&M costs here, to draw attention to these two cost components, understanding that estimates for these two cost types will be available at different levels of accuracy at different times in the infrastructure investment lifecycle.

[5] Note that upfront costs of constructing an infrastructure asset are wider than ‘construction costs’ only, and include programme overhead, viability studies, community consultation, etc. It is important to understand what cost components are included when calculating and using any indicator, so that comparison to benchmarks is meaningful in assessment of VFM. When computing cost per unit of infrastructure, cost per unit of output, or cost per beneficiary, or cost per unit of outcome it is most appropriate to include all costs that are necessary to achieve the unit of output / reach the beneficiary if making comparison with other interventions designed to achieve similar outputs and outcomes.

[6] Total O&M costs are dependent on the functional life of the asset. When a longer period is considered, O&M costs may be much higher than initial construction costs, which could lead to different design decisions to reduce the overall lifetime cost. It is important to consider how use of an annualised total cost versus use of total lifetime cost will affect calculation and analysis of cost indicators. Some infrastructure projects, for instance roads, require specific maintenance activities that are only carried out once per period of several years, described as “periodic maintenance”. If the average annual operation and maintenance cost is used, such periodic costs must be divided by the number of years between such maintenance activities and added to the annual costs.

3. Principles for selecting useful cost indicators

For any infrastructure investment, there are many possible cost indicators that could be selected for analysis and comparison of VFM. In seeking to optimise VFM it is necessary to consider the relative importance and usefulness of different indicators. Principles for selecting the right cost indicators are:

- Indicators should be **closely linked to the design (and monitoring) of the programme**. The choice of output and outcome indicators should flow naturally from a carefully constructed theory of change.
- **Quality is better than quantity.** Limit the number of indicators selected for monitoring and analysis. We recommend that per infrastructure project constructed a maximum of five output/outcome cost indicators should be selected, tightly defined and highly specific (this does not include input unit costs).
- **Input unit costs should be selected using a risk based approach:** Focus should be on:
    1. The sensitive pay items or categories (largest cost components) that affect the total cost
    2. Items where benchmark values are available elsewhere in the industry or local economy
    3. The items where quantities or qualities are difficult to measure or prone to being increased
- **Capture key indicators which are expected to differ due to an FCAS environment.** There should be sufficient available information to explain how and why costs are higher due to FCAS-specific concerns.
- **Don't choose indicators solely on the availability of data:** Given the FCAS context, don't expect all of the information you require to be available. Consider what proxies can be used, who may have useful information, or what assumptions can be made. Reliability of the evidence available should always be assessed and recorded.

Annex B contains common examples of each type of cost indicator we have defined.

4. Cost Indicators across the infrastructure investment lifecycle

At each stage of the infrastructure investment lifecycle, it is possible to use cost indicators to help assess and improve the VFM of an infrastructure investment by comparing results between project options, with other investments, or with industry benchmarks. The cost data used in calculation of an indicator will progressively improve as we move through the infrastructure investment lifecycle – as more data becomes available, and estimated costs turn into actuals. Monitoring variations in cost indicator calculations along the project lifecycle, and evaluating the causes of those variations is also important for a good understanding of the VFM of the investment.

It is important to think about data availability and quality at the start of a project to determine the baseline available, and to build data collection into the project plan. Below we provide summary and detailed guidance for use of input costs and cost indicators across the infrastructure investment lifecycle:

- Figure 1 provides a summary of our guidance for using cost indicators to assess and improve VFM across the infrastructure investment lifecycle.
- Figure 2 displays specific guidance on how to use **input unit costs** (cost indicator 1 from Table 1) across the lifecycle.
- Then each stage of the project lifecycle is expanded upon for the remaining types of cost indicator (cost indicators 2-5 from Table 1), and guidance on using these is outlined in detail.

Figure 1: Summary of guidance for using cost indicators to assess and improve VFM across the infrastructure investment lifecycle

	1. Project identification and options development	2. Project preparation to financial close	3. Procure and build	4. Service delivery and maintenance
Key activities	• Identify beneficiaries and expected project benefits • Identify and assess project options • Prepare high level cost estimates	• Develop scope and detailed design, detailed cost estimate against technical specifications • Undertake detailed economic analysis	• Procure contract for further design and build of infrastructure • Build and commission asset	• Operate the asset • Maintain the asset
Changes in cost estimate	**High level cost estimate**** • Often based on available unit cost benchmark data. • Preferably adjusted for physical, demand, and market conditions	**Detailed cost estimate** Based on input unit costs from the market matched to design quantities and specifications.	**Contract cost** Relationship of contract cost to detailed estimate depends on procurement and market factors, and perceived risk factors (financial, security, climate, corruption).	**Actual completion cost:** Relationship of completion cost to contract cost depends on effectiveness of project management and controls, robustness of design and contract, and incidence of unexpected events.
Guidance for using cost indicators to assess and improve VFM	1. Identify and specify relevant cost indicators to compute and analyse VFM for the intervention across the project lifecycle 2. Compute indicator based on high level budget data 3. Identify benchmarks that are readily available, adjust for intervention specific and local factors, document any missing data 4. Inform implementing partners of data that needs to be collected and analysed throughout the project lifecycle 5. Carry out sensitivity analysis to determine whether different design options could increase VFM	1. Update indicator with data from detailed cost estimate 2. Monitor variances in indicator across phases of the project lifecycle and determine causes of variation. If significant variances cannot be explained, consider alternative options available for proceeding with the project 3. As more detailed designs are prepared, determine whether any design refinements could impact on indicator and VFM 4. If any significant changes to indicator are identified, determine whether further design changes are needed to maintain VFM 5. Document all information collected for future use	1. Update indicator based on contract costs and other information 2. Monitor variances in indicator across phases of the project lifecycle and determine causes of variation. If significant variances cannot be explained, consider alternative options available for proceeding with the project 3. Document all information collected for future use	1. Update indicator based on actual cost and other data – include operations and maintenance costs 2. Monitor variances in indicator across phases of the project lifecycle and determine causes of variation. 3. Determine whether changes in costs or design parameters impacted indicator and hence VFM 4. Document actual data on costs and results and the reasons for any changes from initial calculations, for the benefit of future interventions

**Note: High level cost estimate may be prepared using infrastructure unit construction costs (for example construction cost per km of a particular type of road construction) taken from similar projects already constructed, or from other countries, but applying correction factors to allow for local conditions (for example security costs, or higher materials costs). Where some local unit costs are available for materials and resources, these may give some insight about which local costs are higher by making comparisons with similar unit costs in other regions or countries. Examples of materials and resources unit costs and the local factors that may affect them are provided in Annex A. Where more detailed local unit costs for materials and resources are available, it may be able to estimate the intervention construction cost by combining appropriate local materials and resources unit costs. To arrive at the likely cost of the construction contract, it is also necessary to add appropriate sums for the overheads and profit of the contractor.

Figure 2: Detailed guidance for using input unit costs (1) to assess and improve VFM across the infrastructure investment lifecycle

Key activities

1. Project identification and options development

- Identify relevant unit input costs for analysing the VFM of the intervention according to principles in Section 3 above
- Compare input unit costs to any available and relevant benchmark data such as from other projects in the local area with similar contexts, previous projects undertaken
- Document any important missing cost data to be collected through this project and in subsequent projects (refer to section 7 on recommendations for collecting cost indicator data).
- Inform implementing partners of input unit cost data that needs to be collected, provided and analysed throughout the investment lifecycle.

2. Project preparation to financial close

- Compare unit cost estimate (in detailed estimate) with available benchmarks and initial cost estimate
- Identify any anomalies in unit costs – make a note of costs that seem to be significantly higher or lower than comparators
- Determine cause of any anomalies: input costs are influenced by an array of factors such as commodity prices, border prices for imported materials, local market supply and demand, import content of materials, equipment and labour rates and availability, location (which affects transport haul costs, availability of and premium on natural materials, climate impacts on productivity, environmental mitigation and land access).
- Check the budget narrative for explanations of cost anomalies
- Contact the partner and ask questions where anomalies are not clear.
- Record all information for future use in this and other programmes
- Determine whether any of the causes of anomalies are likely to change before construction is completed, and predict the resulting effects on total cost estimate.
- ***Do not over focus on unit costs at this stage**. Recognise the need for a light touch, flexible initial budget submission but recognise the need to report back in a more detailed manner comparable with the initial budget.*
- Assess the risk of price manipulation – either deflation to influence project approval or inflation to permit rent-seeking.
- Where particular input costs are higher (lower) than expected and cannot be justified, consider what alternative options are available (if sufficient quality is being achieved). Simplified norm-based methods of cost estimation may result in higher cost variance later in the investment lifecycle but market-based methods should reduce the later variance.

3. Procure and build

- Update input unit costs based on contract costs
- Where there are significant cost increases or decreases, determine cause for these and document all costs and supporting information
- Determine impact of unit cost changes on total project budget
- Where anomalies cannot be justified, assess the risk of price manipulation.
- Where significant changes in input materials and resources are detected, consider the impacts on design decisions already made and determine whether any action is needed as a result. In a worst case scenario, this might involve stopping the project.

4. Service delivery and maintenance

- No changes to input unit costs occur during this stage.
- Ongoing collection, maintenance and update of input unit costs should occur regularly across the country office portfolio

Applying input unit cost indicators in FCAS

Input costs can be both higher and more volatile in FCAS, and are often substantially more difficult to gather reliable information for. They can therefore be simultaneously more expensive to track, and of greater importance than usual for evaluating VFM.

The time and resources required to collect data can be reduced by establishing a smaller number of key input costs and prioritising them according to risk (see section 3). Output indicators from Table 1, such as cost per unit of infrastructure (2) and cost per unit of output (3) reflect *combined* input costs (in the numerator), so enable these to be factored into VFM assessments at a broader level.

In FCAS environments some quantities or unit prices may be inflated or misrepresented at early stages of the project. This may indicate corruption or mismanagement where a supplier knows benchmarks and hard data will be difficult to obtain, but may also be an attempt by suppliers to cost-in risk related to market volatility or potential changes in supplier availability between stages 1 and 3 of the infrastructure investment lifecycle. It is important to seek early reliable benchmarks for each input unit cost identified as a key indicator and address how risk can be factored in with suppliers if needed. As explained in Figure 2, input unit cost values are likely to change up to stage 3 – procure and build – so the process and constraints around this can be discussed with the project implementer.

The reasoning behind decisions taken regarding input unit cost tracking should be clearly documented, particularly where these differ from normal practice due to the implementing environment.

The greatest impact of design decisions on VFM occurs during project identification and options development. It is at this stage of the investment life cycle that specific and detailed attention must be applied to improving the *economy*, and hence the VFM, of the intervention. Once key decisions have been made, only more limited refinements are possible during the later stage of preparing design details. At this stage of the lifecycle:

1. Identify and specify the relevant cost indicators to compute and analyse VFM for the intervention across the project lifecycle. These should be derived from a programme's theory of change, results chain, and logframe targets, within the early project design and scoping documents. Practical examples are shown for each type of indicator in table 3.
   - For **(2) cost per unit of infrastructure**, identify the units of infrastructure relevant to the investment that will be constructed (e.g. cost per km of road, cost per ha of irrigation)
   - For **(3) cost per unit of output**, identify the expected output of the project. I.e. where an infrastructure intervention produces a continuous output such as water or electricity (e.g. cost per cubic metre of water produced, or cost per kWH of electricity produced). In calculating this indicator, consider both construction and O&M cost, to determine a long term average cost per unit of outcome. This is also a useful gauge of the level of tariff that might be applied to the infrastructure services. Estimating the total cost per unit of output on a whole-of-life basis is recommended as good practice.
   - For **(4) cost per beneficiary**, identify the relevant level / category of beneficiary (this should match the target beneficiaries in the business case and log frame).
   - For **(5) cost per unit of outcome**, identify the important expected outcomes of the project.

2. Compute indicator based on high level budget data. For O&M cost estimates (e.g. **2b**), if the estimate is not available, ensure estimate is undertaken in sufficient detail at next project lifecycle stage on a whole of

life costing basis.[7] Where possible, it is recommended that this is computed on a whole-of-life costing basis (good practice), but can also be done separately for upfront costs and O&M costs.

3. Identify benchmarks that are readily available, adjust for intervention specific and local factors, document any missing data. Benchmarks may be available from other local projects or from projects in other regions and countries. It is important to consider how the planned design of this particular intervention, and local factors, will affect the infrastructure construction cost (e.g. different types of road construction; different ground conditions; local shortages of materials and resources; security costs and security-related delays) and adjust the benchmark so that it is the closest possible comparison. Document any important missing cost data to be collected through this project and in subsequent project (refer to section 7 on recommendations for collecting cost indicator data).

4. Inform implementing partners of data that needs to be collected, provided and analysed throughout the project lifecycle.

5. Carry out sensitivity analysis to determine whether different design options could increase VFM. This could include for example, changing the width of a road, or other intervention modifications such as addressing local materials or skills shortages. These modifications could increase VFM by reducing the construction cost per unit of infrastructure / unit of output / beneficiary / unit of outcome. They could also for example, increase the number of beneficiaries, if the location of an intervention was to be changed so that it reached more people.[8]

6. Where available, document differences in expected costs resulting from risks and difficulties associated with conflict or fragility. Establishing expectations on these issues will help to inform judgements later on in the project cycle. As well as feeding into a theory of change and business case which may need to make the case for the investment in the programme in spite of potentially higher costs, a clear idea of where the risks lie in advance will enable a better informed conversation with implementers if special circumstances are claimed later in the cycle.

1. Project identification and options development | **2. Project preparation to financial close** | 3. Procure and build | 4. Service delivery and maintenance

At the start of project preparation, the design decisions that are likely to have the most significant impacts on VFM will normally already have been made. There may, though, be opportunities for further refinement, and it is important to verify that the estimated costs and other information that were used to select design options were correct. At this stage of the lifecycle:

1. Update indicator with data from detailed cost estimate.
2. Monitor variances in indicator across phases of the project lifecycle and determine causes of variation. The indicator should be monitored over time for individual projects, and across individual projects at any one point in time. A pattern of high variances between lifecycle phases can indicate areas of weak controls or capacity. If significant variances cannot be explained, consider alternative options available for proceeding with the project.

[7] O&M costs are likely to have a high variable cost component based on the amount of use of the asset. It is important to make explicit assumptions about the amount of use and document these transparently for any estimate of O&M costs. As infrastructure assets have long functional lives, a key VFM consideration of effectiveness is the trade-off between the initial development cost and the future cost stream required to operate, maintain, and rehabilitate the asset over its functional lifetime. With detailed upfront and O&M costs prepared on a whole of life costing basis, it is possible to express total whole-of-life cost of an infrastructure investment as an annualised figure. This is the ultimate measure of cost-effectiveness of the asset: an estimate of the annual spending required to build, operate, and maintain the asset at the desired level of service. Estimating total cost per unit of infrastructure this way is recommended as good practice.

[8] The relative importance of different beneficiaries might be taken into account here, recognising that this may be a subjective assessment based on programme objectives and the purpose of this particular intervention.

3. As more detailed designs are prepared, determine whether any design refinements could impact on the indicator and hence VFM. Compare these results to the sensitivity analysis undertaken in the project identification and options development phase.

4. If any significant changes to the indicator are identified, determine whether further design changes are needed to maintain or avoid a reduction in VFM.

5. If any significant changes are ascribed to conflict or fragility-related cost drivers, compare these with the expected risk areas identified during the previous stage. The original analysis may have been based on flawed assumptions, and require updating; or the risk profile may have changed. This process may also identify further risks with a material impact on the business case for the programme.

6. Document all information collected for future use.

1. Project identification and options development | **2. Project preparation to financial close** | **3. Procure and build** | **4. Service delivery and maintenance**

By the time we reach procure and build, most design and cost decisions are locked in. However, it is still important to monitor cost indicators at this stage of the lifecycle, and specifically variations between this and earlier stages. A pattern of high variances between detailed design and contract price may indicate weak completion, weak procurement processes or collusion. At this stage of the lifecycle:

1. Update indicator based on contract costs and other information. The contract costs should be more detailed than those in earlier stages of the lifecycle. There may be more detailed information available at this point on project beneficiaries as well, which should be updated.

2. Monitor variances in indicator across phases of the project lifecycle and determine causes of variation. The indicator should be monitored over time for individual projects, and across individual projects at any one point in time. A pattern of high variances between detailed design and contract price may indicate weak competition, weak procurement processes, or collusion. If significant variances cannot be explained, consider alternative options available for proceeding with the project.

3. Document all information collected for future use.

1. Project identification and options development | **2. Project preparation to financial close** | **3. Procure and build** | **4. Service delivery and maintenance**

At this stage of the lifecycle it is important to collect data on actual costs and outcomes to compare to early estimates – particularly including data on actual operations and maintenance costs. These will be useful for estimating such costs for future projects, and improve the cost indicator dataset available. For all infrastructure programming, long-term review of results after programme close is advisable to inform future programming, given the expected lifetime of infrastructure assets. At this stage of the lifecycle:

1. Update indicator based on actual cost and other data – include operations and maintenance costs. During any review of the intervention in the years following the completion of construction, determine the actual operation and maintenance costs per unit of infrastructure / unit of outcome / beneficiary / unit of outcome. Update the indicator computation with this data.

2. Monitor variances in indicator across phases of the project lifecycle and determine causes of variation. The indicator should be monitored over time for individual projects, and across individual projects at any one point in time. A pattern of high variances between contract price and actual costs may indicate weak governance arrangements, weak project management, rent-seeking, weak plans for O&M, or poor design.

3. Determine whether changes in costs or design parameters affected the indicator and hence VFM.

4. Document actual data on costs and results and the reasons for any changes from initial calculations, for the benefit of future interventions.

5. Recommendations for collecting cost indicator data

Effective information management is a key enabler of effective VfM analysis. Much of what is outlined in this document requires the effective storage of information. Learning from one response will inform the next. Unit cost information, past performance capacity of partners, knowledge of what has been considered 'good' in the past, all inform decision making.

It is necessary in the early days of working with a service provider to establish systems and processes against which performance will be assessed. Presenting cost indicators in advance will promote consideration as to how these will best be measured. This is not to catch partners out, but to (i) assist DFID (ex post) assess what went to plan and what needs improvement for future responses and (ii) avoid the tendency / temptation to shift the goalposts ex post to reflect delivery.

Information Exchange Service between Intervention Service Providers

Any knowledge gained about how to improve VFM needs to be exchanged rapidly and efficiently between Service Providers and DFID. This can be achieved by implementing an Information Exchange Service, which maintains a database for information exchange.

This database would include any checklists and intervention implementation notes that could be useful to other projects, as well as input unit costs and other cost benchmarks, and also time series data to compare initial estimates with actual costs measured after implementation.

This data exchange service could actually be a fairly "lean" operation, facilitating data exchange through web-based tools. The Information Exchange Service could be provided by DFID, or it could also be delegated to a service provider.

VfM as a contractual requirement

In cases where a Service Provider is under contract to DFID, it is possible to make cost indicator analysis a contractual requirement, with the results of the analysis to be fed back to the Program Manager to confirm that experience from other projects (checklists and implementation notes) has been taken into account. Details of how cost indicators have contributed to maximising VFM should also be documented and provided to DFID as part of this contractual requirement. Project specific cost indicators could be listed in the contract. It is recognised that this is not always the case, such as when working with multilaterals or through an MOU.

Peer review

The database held by the Information Exchange Service could also be used for independent peer reviews of the VFM analysis results to identify any opportunities for improvements in the methods to be applied.

Annex A: Input materials and resources unit costs

Input materials and resources unit costs are very dependent upon local factors, and require data to be collected from local sources to determine appropriate unit costs. Note that project specific materials unit costs include both a component for material cost at source, and a component for haulage to site. Table 2 includes examples of input unit costs commonly used in infrastructure construction. There are many other examples of input unit costs

Table 2: Examples of input unit costs commonly used in infrastructure projects and the factors affecting them

Unit cost	Subdivisions	Factors affecting cost	Notes
Cost per bag of cement		- Imported or local manufacture - Haulage distance	
Cost per reinforcing bar	- Type of steel - Sizes of steel bars	- Imported or local manufacture - Haulage distance	
Cost per cubic metre of sand gravel	Different types and sizes of sand and gravel	- Quality and grading (range of sizes) of sand/gravel. - Haulage distance	Essential that salt is removed from sand and gravel from coastal sources to prevent deterioration of concrete.
Cost per cubic metre of crushed rock	- Type of rock - Size of pieces of rock	- Quality of rock. - Haulage distance.	Essential not to use certain types of rock that react with cement when used for making concrete.
Cost per cubic metre of bitumen		- Quality of bitumen - Source of supply - Haulage distance	May be measured in barrels
Cost per building block	Type of block	- Local materials to make blocks from - Local capacity for manufacturing blocks - Haulage distance	
Cost per length of pipe	- Material - Size	- Imported or local manufacture - Haulage distance	
Cost per day of unskilled labour		Local labour market and availability of labour	
Cost per day of skilled labour	Many different skills	Local labour market and availability of skilled labour	
Cost per day of equipment hire	Many different types of equipment	- Local availability - Haulage distance	

Annex B: Common examples of cost indicators

Table 3 contains examples of cost indicators that are commonly used in infrastructure projects. Those in red text are currently used in DFID Somalia's programming. The indicators are classified by type as defined earlier in this document.

Common factors affecting cost indicators for infrastructure investments include terrain, ground conditions, contractor capacity, contractor skills, contractor availability, location (and hence transport, security, access, and logistics), and local materials and resource costs. Factors affecting specific cost indicators only are listed in the table.

Table 3: Examples of cost indicators commonly used in infrastructure projects by type

Type of project	Example of cost indicator	Factors affecting unit cost
(2) Cost per unit of infrastructure (construction, O&M, or total cost where appropriate. O&M cost indicators often expressed per year)		
Roads	Cost per km of road construction	Type of road construction (many different types), method of construction (e.g. labour vs equipment-based)
	Cost per km of road rehabilitated	Type of road
	Cost per km of road maintenance (per year)	- Type of road construction (many different types) - The cost of periodic road maintenance activities which only take place at intervals of several years should be converted to an annual cost.
	Cost per supplementary infrastructure (e.g. bridge, footpath)	Type of supplementary infrastructure
Energy	Cost per MW of installed capacity	Method of power generation
Water	Cost per metre of borehole constructed	Size and type of borehole
Irrigation	Cost per ha of irrigation installed	Type of irrigation scheme
Building construction	Cost per square metre of floor area constructed	- Type of building - Method of construction
ICT	Cost per computer room	
	Cost of setting up internet connection	
Street lighting	Cost per operational street light	The periodic cost of replacing batteries at intervals of several years should be converted to an annual cost.
Agriculture	Cost per km of soil bunds constructed	
	Cost per km of fence constructed	
(3) Cost per unit of output produced		
Energy	Unit costs of operation and generation (per kwh)	Method of power generation
	Fuel efficiency kWH per gallon of diesel/oil/unit of gas consumption	Method of power generation
Irrigation	Cost per metre cubed of water supplied	Type of irrigation scheme
	Cost per unit of land productivity increase (kg/ha)	Type of irrigation scheme
	Cost per productivity increase of irrigated land (kg/m3)	Type of irrigation scheme
ICT	Cost per ICT training session delivered	
(4) Cost per beneficiary		

Type of project	Example of cost indicator	Factors affecting unit cost
Multiple sectors	Cost per household accessed	It is important to tightly define beneficiaries. E.g. for road, define households accessed as those within a specified distance of the road
	Cost per business accessed	If businesses differ in size, the size may need to be taken into account
	Cost per beneficiary accessed	
Energy	Cost per incremental household accessing energy (off grid only)	
	Cost per person with access to clean energy	
Water	Cost per incremental household accessing water	
ICT	Cost of establishing mobile access per household	
	Cost per ICT training per person	
(5) Cost per unit of outcome		
Multiple sectors	Cost per short term job created	
	Cost per long term job created	
	Cost per disability adjusted life year (DALY) averted	Health benefits, may be due not only to health projects but to other factors such as air quality improvements
	Cost per death averted	
	Reductions in productivity losses by businesses	
Energy	Cost per tonne of carbon averted	Any figure below the cost of carbon, (around £14) is deemed as cost effective
	Frequency of power outages (% availability of plant)	
ICT	Cost per 1% increase in election participation	
Health	Cost per maternal death averted	
	Cost per couple year protection	

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