Guidelines for preparation and assessment of
Feasibility Study Reports of
Projects at Central Government level in
Rwanda

Volume 1
METHODOLOGY FOR PROJECT APPRAISAL
Colophon

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</thead>
<tbody>
<tr>
<td>AADT</td>
<td>Annual Average Daily Traffic</td>
</tr>
<tr>
<td>AC</td>
<td>Asphalt Concrete</td>
</tr>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>AfDB</td>
<td>African Development Bank</td>
</tr>
<tr>
<td>B/C-ratio</td>
<td>Benefit over Cost ratio</td>
</tr>
<tr>
<td>BAU</td>
<td>Business As Usual</td>
</tr>
<tr>
<td>BoQ</td>
<td>Bill of Quantities</td>
</tr>
<tr>
<td>CA</td>
<td>Contracting Authority</td>
</tr>
<tr>
<td>CAPEX</td>
<td>Capital Expenditure</td>
</tr>
<tr>
<td>CBA</td>
<td>Cost-Benefit Analysis</td>
</tr>
<tr>
<td>CE</td>
<td>Cost per unit of Effectiveness</td>
</tr>
<tr>
<td>CEA</td>
<td>Cost-Effectiveness Analysis</td>
</tr>
<tr>
<td>CF</td>
<td>Conversion Factor</td>
</tr>
<tr>
<td>CIF</td>
<td>Cost Insurance Freight</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer Price Index</td>
</tr>
<tr>
<td>CSCF</td>
<td>Commodity Specific Conversion Factor</td>
</tr>
<tr>
<td>D&amp;B</td>
<td>Design and Build</td>
</tr>
<tr>
<td>DALY</td>
<td>Disability Adjusted Life Years</td>
</tr>
<tr>
<td>DBST</td>
<td>Double Bitumination Surface Treatment</td>
</tr>
<tr>
<td>DCF</td>
<td>Discounted Cash Flow</td>
</tr>
<tr>
<td>DNP</td>
<td>Defects Notification Period</td>
</tr>
<tr>
<td>EC</td>
<td>Effectiveness per unit of Cost</td>
</tr>
<tr>
<td>EDPRS</td>
<td>Economic Development and Poverty Reduction Strategy</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EIB</td>
<td>European Investment Bank</td>
</tr>
<tr>
<td>EIR</td>
<td>Environmental Impact Report</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>ENPV</td>
<td>Economic Net Present Value</td>
</tr>
<tr>
<td>EOCK</td>
<td>Economic Opportunity Cost of Capital</td>
</tr>
<tr>
<td>ERR (EIRR)</td>
<td>Economic (Internal) Rate of Return</td>
</tr>
<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
</tr>
<tr>
<td>ETS</td>
<td>Emission Trading System</td>
</tr>
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<td>EU</td>
<td>European Union</td>
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<td>EUR</td>
<td>Euro</td>
</tr>
<tr>
<td>FDR</td>
<td>Financial Discount Rate</td>
</tr>
<tr>
<td>FEP</td>
<td>Foreign Exchange Premium</td>
</tr>
<tr>
<td>FIDIC</td>
<td>International Federation of Consulting Engineers (Fédération Internationale Des Ingénieurs-Conseils)</td>
</tr>
<tr>
<td>FNPV</td>
<td>Financial Net Present Value</td>
</tr>
<tr>
<td>FOB</td>
<td>Free on Board</td>
</tr>
<tr>
<td>FRR (FIRR)</td>
<td>Financial (Internal) Rate of Return</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>--------------</td>
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</tr>
<tr>
<td>FRW</td>
<td>Rwandan Franc</td>
</tr>
<tr>
<td>FS</td>
<td>Feasibility Study</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GHG</td>
<td>Green House Gas</td>
</tr>
<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH</td>
</tr>
<tr>
<td>HDM-4</td>
<td>World Bank Highway Design and Maintenance Standards Model 4</td>
</tr>
<tr>
<td>HSC2000</td>
<td>International code of safety for High-Speed Craft 2000</td>
</tr>
<tr>
<td>IFMIS</td>
<td>Integrated Financial Management Information System</td>
</tr>
<tr>
<td>IFI</td>
<td>International Funding Institute</td>
</tr>
<tr>
<td>JV</td>
<td>Joint Venture</td>
</tr>
<tr>
<td>kWh</td>
<td>kilowatt hour</td>
</tr>
<tr>
<td>LNG</td>
<td>Liquid/Liquefied Natural Gas</td>
</tr>
<tr>
<td>LRMC</td>
<td>Long Run Marginal Cost</td>
</tr>
<tr>
<td>M&amp;E</td>
<td>Monitoring &amp; Evaluation</td>
</tr>
<tr>
<td>MINECOFIN</td>
<td>Ministry of Finance and Economic Planning</td>
</tr>
<tr>
<td>MINEDUC</td>
<td>Ministry of Education</td>
</tr>
<tr>
<td>MININFRA</td>
<td>Ministry of Infrastructure</td>
</tr>
<tr>
<td>MCA</td>
<td>Multi-Criteria Analysis</td>
</tr>
<tr>
<td>MW</td>
<td>Mega Watt</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
</tr>
<tr>
<td>NISR</td>
<td>National Institute of Statistics in Rwanda</td>
</tr>
<tr>
<td>NPC</td>
<td>Net Present Cost</td>
</tr>
<tr>
<td>NPV</td>
<td>Net Present Value</td>
</tr>
<tr>
<td>NST1</td>
<td>National Strategy for Transformation 1</td>
</tr>
<tr>
<td>NTB</td>
<td>National Transport Board</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operations &amp; Maintenance (costs)</td>
</tr>
<tr>
<td>OPEX</td>
<td>Operational Expenditure</td>
</tr>
<tr>
<td>PA</td>
<td>Public Authority</td>
</tr>
<tr>
<td>PBCC</td>
<td>Planning and Budgeting Call Circular</td>
</tr>
<tr>
<td>PIC</td>
<td>Public Investment Committee</td>
</tr>
<tr>
<td>PIU</td>
<td>Project Implementation Unit</td>
</tr>
<tr>
<td>PM</td>
<td>(Atmospheric) Particulate Matter</td>
</tr>
<tr>
<td>PPD</td>
<td>Project Profile Data</td>
</tr>
<tr>
<td>PPP</td>
<td>Public-Private Partnership</td>
</tr>
<tr>
<td>PSDYE</td>
<td>Private Sector Development and Youth Employment</td>
</tr>
<tr>
<td>RAP</td>
<td>Resettlement Action Plan</td>
</tr>
<tr>
<td>REG</td>
<td>Rwanda Energy Group</td>
</tr>
<tr>
<td>REMA</td>
<td>Rwanda Environment Management Authority</td>
</tr>
<tr>
<td>RMF</td>
<td>Rwanda Maintenance Fund</td>
</tr>
<tr>
<td>RoH</td>
<td>Rule of Half</td>
</tr>
<tr>
<td>RTDA</td>
<td>Rwanda Transport Development Agency</td>
</tr>
<tr>
<td>RURA</td>
<td>Rwanda Utilities Regulatory Authority</td>
</tr>
<tr>
<td>SCF</td>
<td>Standard Conversion Factor</td>
</tr>
<tr>
<td>SDR</td>
<td>Social Discount Rate</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
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<tr>
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</tr>
<tr>
<td>SEA</td>
<td>Strategic Environmental Assessment</td>
</tr>
<tr>
<td>SEIA</td>
<td>Social and Environmental Impact Assessment</td>
</tr>
<tr>
<td>SMART</td>
<td>Specific, Measurable, Achievable, Relevant, Time-bound</td>
</tr>
<tr>
<td>SSC</td>
<td>Social Cost of Carbon (emissions)</td>
</tr>
<tr>
<td>SSP</td>
<td>Sector Strategic Plans</td>
</tr>
<tr>
<td>SPIU</td>
<td>Single Project Implementation Unit</td>
</tr>
<tr>
<td>TDR</td>
<td>Technical Documentation Report</td>
</tr>
<tr>
<td>ToR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>TVET</td>
<td>Technical and Vocational Education and Training</td>
</tr>
<tr>
<td>TWS</td>
<td>Total Weighted Score</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>VAT</td>
<td>Value Added Tax</td>
</tr>
<tr>
<td>V/C ratio</td>
<td>Volume to Capacity ratio</td>
</tr>
<tr>
<td>VOC</td>
<td>Vehicle Operation Cost</td>
</tr>
<tr>
<td>VOSL</td>
<td>Value of Statistical Life</td>
</tr>
<tr>
<td>VOT</td>
<td>Value of Time</td>
</tr>
<tr>
<td>VTC</td>
<td>Vocational Training Centre</td>
</tr>
<tr>
<td>WASAC</td>
<td>Water and Sanitation Corporation</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
<tr>
<td>WTA</td>
<td>Willingness-to-Accept</td>
</tr>
<tr>
<td>WTP</td>
<td>Willingness-to-pay</td>
</tr>
</tbody>
</table>
## Glossary of terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficiary</td>
<td>Organisation or party that benefits from a project. The beneficiary can be the same as the project promoter or financier, but it can also be a third party.</td>
</tr>
<tr>
<td>Benefits-Costs Ratio (B/C-Ratio)</td>
<td>The B/C-Ratio represents a ratio of the present value of the economic benefits stream to the present value of the economic costs stream (net benefits divided by net costs). A B/C-ratio of 1.0 means that the project produces net benefits of zero and the present value of benefits and costs are exactly equal. A B/C-ratio of more than 1.0 indicates that a project is expected to produce positive net benefits. A B/C-ratio of less than 1.0 indicates a project where the net benefits are negative (the present value of costs is larger than the present value of benefits).</td>
</tr>
<tr>
<td>Business as usual (BAU)</td>
<td>Refers to a hypothetical situation and development without implementation of the project. Also referred to as the without project situation or counterfactual.</td>
</tr>
<tr>
<td>Constant prices</td>
<td>Constant prices allow for comparison of prices at different points in time by removing the expected or measured change in the general price level. Refers to valuation of transactions, wherein the influence of general price changes from the base year to the current year has been removed. Also referred to as real prices.</td>
</tr>
<tr>
<td>Conversion factor (CF)</td>
<td>The ratio between the economic value and the financial value of a project output or input. This factor can be used to convert the constant price financial values of project benefits and costs to economic values.</td>
</tr>
<tr>
<td>Cost-benefit analysis (CBA)</td>
<td>Cost-benefit analysis is an economic evaluation technique that analyses the generation of economic benefits and costs from a project or policy through the comparison of the discounted flows of benefits and costs over a prescribed time horizon. The following data are needed to complete a cost-benefit analysis: the number of years to include in the analysis (the project life or time horizon); the values of project benefits and costs (all expressed in monetary terms) for each year included in the analysis; and the discount rate.</td>
</tr>
<tr>
<td>Cost-effectiveness analysis (CEA)</td>
<td>Cost-effectiveness analysis evaluates which program or policy creates the desired or anticipated results at the lowest cost; or achieves the highest impact or output at a given level of costs. Cost-effectiveness analysis is a technique used in weighing the effectiveness of a project against its cost. It is similar to a cost-benefit analysis in many important respects, but doesn’t attempt to monetize all anticipated benefits deriving from the project or the alternatives considered. Its applicability is constrained by the need to make comparisons across alternative approaches to delivering roughly similar bundles of outcomes and benefits.</td>
</tr>
<tr>
<td>Counterfactual</td>
<td>See business as usual.</td>
</tr>
<tr>
<td><strong>Current prices</strong></td>
<td>The value based on prices during the reference year. (Projected future price values include the effects of expected inflation). Also referred to as nominal prices.</td>
</tr>
<tr>
<td><strong>Defects notification period</strong></td>
<td>Defects notification period is a period of time for notifying defects in the works during which the contractor owes the duty to repair defects of all type and notwithstanding his own responsibility as to the defective issue. This period may last from 365 days to up to 2 years and is generally calculated from the date of completion of the works as certified by the issue of the taking over certificate.</td>
</tr>
<tr>
<td><strong>Discount rate</strong></td>
<td>A percentage rate representing the rate at which the value of equivalent benefits and costs decrease in the future compared to the present. A discount rate is commonly applied in financial and economic analysis because it provides a means for converting future costs and benefits into present value monetary amounts (i.e., their worth today). The principle behind discounting is the “time value of money:” a Rwandan Franc paid today is worth more than a Rwandan Franc paid a year into the future because the person holding the Rwandan Franc can invest it and earn a return.</td>
</tr>
<tr>
<td><strong>Discounting</strong></td>
<td>A methodology used to calculate the value, in today’s terms, of costs borne or income received in the future. To test whether an investment is financially viable, future income must be discounted so that it can be measured against the costs. If the present value of the benefits exceeds the costs, the investment is expected to have a positive return.</td>
</tr>
<tr>
<td><strong>Do minimum</strong></td>
<td>A do minimum-scenario is often included to test whether (part of) the project effects could also be realised with a minimal effort.</td>
</tr>
<tr>
<td><strong>Economic prices</strong></td>
<td>The competitive undistorted demand or supply price for an incremental unit of a good where distortions include personal income taxes, corporate income taxes, value-added taxes, excise duties, import duties, and production subsidies.</td>
</tr>
<tr>
<td><strong>Economic (internal) rate of return (ERR or EIRR)</strong></td>
<td>An internal rate of return based on economic prices, calculated to express economic attractiveness of the project. It is analogous to the FRR (or FIRR) in a cost-benefit analysis but based on economic values instead of financial prices.</td>
</tr>
<tr>
<td><strong>Externality</strong></td>
<td>Externalities are costs or benefits arising from an economic activity that affect others than the agent engaged in the economic activity (or making the economic decision) and are not reflected fully in market prices. These are essentially a third party detrimental (or beneficial) effect for which no price is exacted. Externalities are not reflected in the financial accounts, but need to be accounted for an economic analysis.</td>
</tr>
<tr>
<td><strong>Financial (internal) rate of return (FRR or FIRR)</strong></td>
<td>An internal rate of return based on financial prices, calculated to express financial attractiveness of the project.</td>
</tr>
<tr>
<td><strong>Financial sustainability</strong></td>
<td>The assessment that a project will have sufficient funds to meet all its resource and financing obligations, whether these funds come from user charges or budget sources.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Impact</td>
<td>The broader, long-term change to which the Project contributes at country, regional or sector level, in the political, social, economic and environmental global context which will stem from interventions of all relevant actors and stakeholders.</td>
</tr>
<tr>
<td>Incremental approach</td>
<td>Characteristic of project appraisal which aims to isolate project effects from effects that would have taken place without the project too.</td>
</tr>
<tr>
<td>Internal rate of return (IRR)</td>
<td>The internal rate of return is the discount rate that would give a proposal a present value of zero. Generally, a project is accepted if the IRR is higher than the discount rate. However, IRR is not suitable for the ranking of competing projects since simple comparisons between IRRs may be misleading if the projects are not the same size. The size of each project and the discount rate can influence which project is best. In addition, applying different appraisal techniques to the same basic data may yield contradictory conclusions.</td>
</tr>
<tr>
<td>Market failure</td>
<td>Market failure occurs when freely functioning markets fail to deliver an efficient allocation of resources. The result is a loss of economic welfare, especially from the point of view of society as a whole. This is usually because the benefits that the free market confers on individuals or businesses carrying out a particular activity diverge from the overall benefits to society. Market failures may often arise in the presence of information asymmetries, externalities, or public goods.</td>
</tr>
<tr>
<td>Monte Carlo analysis</td>
<td>Monte Carlo analysis expresses the uncertainty associated with the critical variables of a model by treating them as random variables drawn from known distributions. A simulation process is then used to register the impact of this uncertainty on the projected results.</td>
</tr>
<tr>
<td>Net Present Value (NPV)</td>
<td>The NPV is a monetary estimate, in today’s term, of the generation of net benefits over the life of a project. The ‘net’ appellation signifies that both the costs and benefits of the investment are included. Typically projects with positive NPV are seen as favourable. On the other hand, projects with negative NPV likely should be rejected because the present value of the stream of benefits is insufficient to recover the cost of the project. Generally referred to as FNPV (Financial Net Present Value) in the financial analysis and ENPV (Economic Net Present Value) in the economic analysis.</td>
</tr>
<tr>
<td>Nominal prices</td>
<td>See current prices.</td>
</tr>
<tr>
<td>Opportunity cost</td>
<td>Often described as the benefit foregone from not using a good or resource in its best alternative use. Opportunity cost is the full cost of an activity, investment, or purchase, including everything foregone in order to achieve the activity (or investment or purchase). This includes not only the money spent in buying (or doing) the “something”, but also the economic benefits (utility) that were lost because “the beneficiary” bought (or did) that particular something and thus can no longer buy (or do) something else. These lost opportunities may represent a significant loss of utility. The notion of opportunity cost plays a crucial part in ensuring that resources are being used efficiently.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>The main medium-term effect of the intervention focusing on behavioural and institutional changes resulting from the Project.</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>The direct/tangible products (infrastructure, goods and services) delivered/generated by the Project.</td>
</tr>
<tr>
<td><strong>Project appraisal</strong></td>
<td>Ex-ante assessment of a project on its merits according to several criteria.</td>
</tr>
<tr>
<td><strong>Project promoter</strong></td>
<td>Organisation responsible for implementation of the project. Can be the same as the party that will operate the project or that will be the beneficiary, but this is not necessarily the case. May refer to the Chief Budget Manager, too.</td>
</tr>
<tr>
<td><strong>Real prices</strong></td>
<td>see constant prices.</td>
</tr>
<tr>
<td><strong>Retention money</strong></td>
<td>Retention money defines the accumulated sums retained by a contracting authority as a percentage of due payments of works, in order to guarantee that any defects in the construction shall be remedied during the defect’s notification period. Alternatively, in order to cover the liability of the works contractor during the defect’s notification period, the contracting authority can require a performance guarantee that is a conditional on default guarantee.</td>
</tr>
<tr>
<td><strong>Risk analysis</strong></td>
<td>The analysis of project risks associated with the valuation of key project variables, and the risk associated with the overall project result. Quantitative risk analysis considers the range of possible values for key variables and the probability with which they may occur.</td>
</tr>
<tr>
<td><strong>Sensitivity analysis</strong></td>
<td>The analysis of the possible effects of changes in anticipated project outcomes and/or uncertainty in the valuation of project inputs or outputs. Values of key variables are changed one at a time, or in combinations, to assess the extent to which the overall project result, such as measured by the economic NPV, would be affected.</td>
</tr>
<tr>
<td><strong>Shadow price</strong></td>
<td>The true economic value or opportunity cost of an activity (as opposed to the market price, which might be distorted). Shadow pricing is often used in cost-benefit analysis, where the purpose of the analysis is to capture the benefits and costs to society and not market returns. Synonymous with accounting price and social price.</td>
</tr>
</tbody>
</table>
1 Executive Summary

1.1 The FS Guide

These Guidelines for Feasibility Studies of projects at Central Government level in Rwanda (FS Guide) are an initiative of the Ministry of Finance and Economic Planning (MINECOFIN). The objective of introducing this FS Guide is to improve the quality of feasibility studies for projects submitted for the annual planning cycle at MINECOFIN, and to harmonise the methodology and structure of feasibility studies.

The basis for the FS Guide is the EU Guide to Cost-Benefit Analysis of Investment Projects\(^1\), as this was found to be the most comprehensive available guideline for Cost-Benefit Analysis (CBA). Elements of project appraisal guides from the World Bank (WB)\(^2\), the African Development Bank (AfDB)\(^3\), the Asian Development Bank (ADB)\(^4\) and the European Investment Bank (EIB)\(^5\) have been used in this FS Guide too.

This FS Guide was specifically developed for the Rwandan context and includes 4 case studies from Rwanda in different sectors (transport, water supply, education, and health). The FS Guide also includes a detailed methodology for preparation and assessment of Feasibility Study Reports, with methodology elements that are specific for Rwanda and an explanation of the linkage between the Project Profile Data (PPD) information that is required under the national planning cycle and the FS Guide. The FS Guide consists of two volumes. Volume 1: Methodology for Project Appraisal is supplemented by Volume 2: Case Studies, containing sectoral examples on how applying the appraisal methodology.

Apart from this executive summary (Chapter 1), Volume 1 includes the following chapters:

- **Chapter 2** on Guiding principles for carrying out feasibility studies. This chapter explains the main theoretical methodologies and principles which form the basis of feasibility studies and introduces two main methodologies to verify economic viability of investment projects: The **Cost-Benefit Analysis (CBA)** and the **Cost-Effectiveness Analysis (CEA)**. Investment projects, such as power, transport, urban development and rural irrigation generate economic benefits, most of which can be valued. Therefore, establishing economic viability requires a full CBA. However, for many social sector projects, some poverty targeting projects and projects that primarily generate social and environmental benefits, adequate benefit valuation could be difficult. When this is the case, economic viability of a project can be assessed based on the **CEA** and, when appropriate, supplemented by a **Multi-Criteria Analysis (MCA)**.

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5. The Economic Appraisal of Investment Projects at the EIB, European Investment Bank, 2013
Chapter 3 gives a step by step approach to a feasibility study. Each of the 8 steps is explained in detail, with specific examples for Rwanda and indicators. A Feasibility Study Report shall provide the factual inputs for defining the appropriate scope of the project and will outline the financial, institutional and organisational needs for the construction / implementation and operation of a project based on a consultative process among the different stakeholders.

Chapter 4 provides the Project Planning Document (PPD) template and further explanation on the link between the PPD and these Guidelines.

Volume 1 includes several annexes: a template Concept Note, indicative contents of Pre-Feasibility Study Report and Feasibility Study Report, an example of Terms of Reference (ToR) for outsourcing Feasibility Study Reports, a template Bill of Quantities (BoQ) and more in-depth methodological sections on discount rates, conversion factors, and Multi Criteria Analysis.

1.2 Role of project appraisal according to the National Investment Policy

One prerequisite for an efficient implementation of investments is a sound preparation process. Project promoters or investors\textsuperscript{6} need to undertake a feasibility study to provide the information necessary to decide whether or not to proceed with a project.

To ensure that projects are adequately prepared to be delivered in time and within budget, specific levels of appraisal are required. Before a project will be considered for implementation, it will go through a thorough screening and appraisal process.

Projects submitted for the annual planning cycle need to have a feasibility study if their investment costs are above 750 million FRW (approximately 1 million USD). Feasibility studies will be used to assess proposed projects in detail on a quantitative basis requiring comprehensive analysis of market conditions, technical, social, environmental, financial and economic issues depending on the nature of the project in order to determine the optimal project design and form of implementation. Requests for feasibility studies have to be submitted according the 1\textsuperscript{st} Planning and Budgeting Call Circular issued by MINECOFIN to be screened by the Public Investment Committee. The necessary scope of work of the studies required with regard to the specific nature of a project at Central Government level is set out in these guidelines.

1.3 The Project Development Cycle, entities involved and documents required

This document aims to drive institutions of the Central Government level in Rwanda through the ‘Project Development Cycle’ of new public sector investment projects intended to improve public infrastructure and provide basic services to the citizens. The project preparation process comprises the entire set of activities carried out to move a project from conceptualization to implementation.

The primary aim of the project preparation process is to develop a project idea into a well justified and fully defined project whose benefits for the society can be thoroughly assessed. This involves producing

\textsuperscript{6}The project promoter or investor is generally a public authority, but could theoretically be a private entity too. These guidelines are written with a public authority acting as project promoter in mind.
a suite of project documents which demonstrate the potential viability and long-term sustainability of a public investment project. Project preparation is necessarily conducted in steps associated to decisions about going to the next step or to eventually give up the investment.

Considering the cost of the studies necessary to fully prepare an investment project prior to technical approval by the Public Investment Committee (PIC) and the subsequent budget approval, it is crucial to minimize these costs through staged assessment and analysis, before embarking in the preparation of a full Feasibility Report. Projects are not all the same – different projects demand different information to be prepared. For example, some public infrastructure investment projects can be suitable for partnership with the private sector while others are not. Another possible demarcation is based on the size of project’s estimated costs: on this basis the Ministry of Finance and Economic Planning distinguishes between small, medium and major projects as follows:

**Small Project:** < 750 000 000 FRW

**Medium Project:** < 15 000 000 000 but > or equal to 750 000 000 FRW

**Major Project:** > 15 000 000 000 FRW

The preparation process of public investment projects generally starts from the recognition of a public need that requires an investment to be made. This is the Project Identification stage. Before a decision on the investment is taken, it will be necessary to go through a number of compulsory steps aiming to confirm and quantify the needs of the project, identify an optimal solution, investigate the eventual interest of private investors, and further verify the feasibility and desirability of the investment. This is done at the project preparation stage.

The outcome of the Project Identification work including results from Project Preparation shall be presented through a Concept Note. A Concept Note is required for all projects. It defines the project’s needs and specifies the project’s scope. It also describes the project’s design to ensure that the project is costed as accurately as possible and can be tendered and implemented in time and according to budget estimates. The outcome of the Project Preparation work shall be included under various documents, mainly prefeasibility study and feasibility study and annexes such as Environmental Impact Assessment (EIA) Report, technical designs etc. The entities potentially involved include:

- The project’s promoter, on turn a central or local level institution;
- One or more private entities in case the project in subject is suitable for development through a Public-Private-Partnership (PPP).

The following cases should be considered:

- **Case A: The project is initiated by a Rwandan Central Level Entity**

  This case is the subject of this document. Promoters from Rwandan Central Level Entities shall first screen their projects for suitability under the Public Private Partnership procurement framework. In case PPP suitability is established, the ‘Public Private Partnership Guidelines’ as published in the Official Gazette of Rwanda no. 29 bis of 16/07/2018 will apply. In case a project is not suitable for PPP, these ‘MINECOFIN Guidelines for preparation and assessment of Feasibility Study Reports of projects at central government in Rwanda (2018)’ will be utilised. Further, the type and contents of documents to be prepared prior to the final decision on funding will vary
Feasibility Study Guidelines Rwanda

1.3.1 Stages in the Project Development Cycle

The following table presents the stages in the Project Development Cycle, the role of central level entities involved and the documents to be prepared for each project category.

Table 1-1: Stages in the Project Development Cycle in Rwanda, entities and documents

<table>
<thead>
<tr>
<th>Stages in the Project Development Cycle</th>
<th>Contracting Authority</th>
<th>Role of central level entities involved</th>
<th>MINECOFIN / PIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project identification</td>
<td>Project definition</td>
<td>Enabling environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self-assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concept Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent Review and Selection</td>
<td>Small Projects: Concept Note and PPD with request to MINECOFIN/PIC for investment technical approval</td>
<td>1 Step Screening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium Projects: -Concept Note and PPD with request to MINECOFIN/PIC to approve the preparation of Feasibility Study -Feasibility Study and PPD with request to MINECOFIN/ PIC for investment technical approval</td>
<td>2 Steps Screening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Major Projects: -Pre-Feasibility Study, Concept Note and PPD with request to MINECOFIN/ PIC to approve the preparation of Feasibility Study -Feasibility Study and PPD with request to MINECOFIN/ PIC for investment technical approval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budget approval</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Structuring</td>
<td>Developing technical / engineering designs, preparing and launching tender procedures.</td>
<td>Project Finance</td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td>Award of relevant contracts Management of works, supplies and service contracts up to investment finalization</td>
<td>Monitoring and Budget Adjustments</td>
<td></td>
</tr>
<tr>
<td>Post-Implementation</td>
<td>Operation of the investment</td>
<td>Monitoring and Ex-post Evaluation</td>
<td></td>
</tr>
</tbody>
</table>

The planning and budgeting processes are regulated by law 12/2013/OL of 12/09/2013. In order to facilitate proper planning and prioritization across all Ministries and Central Agencies, the Public Investment Committee (PIC) is the single-entry point for your project regardless of the type of project and source of financing. The Technical Secretariat, which prepares the PIC meetings, is based in MINECOFIN within the National Development Planning and Research Department. Documents are submitted to MINECOFIN in accordance with the First Planning and Budgeting Call Circular (PBCC), by using the Integrated Financial Management Information System (IFMIS).

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1.3.2 Required documents

The National Investment Policy\(^8\) demands that all new proposals for project implementation are submitted for the annual planning cycle with a Project Profile Data Forms (PPD)\(^9\) and a Concept Note which include basic project information. Therefore, PPD and Concept Note are the minimum level of information required for submission of project proposals for the annual planning cycle.

- For **Small Size Projects**, PPD and Concept Note shall be submitted jointly with a Basic Conceptual Study.
- For **Medium Size Projects**, the PPD must be supplemented by a Feasibility Study Report and its attachments.
- For **Major Projects**, the PPD shall be based on a Pre-Feasibility Study Report, Feasibility Study Report and its attachments.

**Project Profile Data (PPD)**

The PPD form is regularly updated by MINECOFIN, usually at the beginning of the planning cycle with the 1st Planning and Budgeting Call Circular. Currently, the PPD comprises five sections:

- Contracting Authority and Summary Description
- Project Costs
- Project Financing
- Key Performance Indicators: Outputs and output indicators
- Upload of concept note and annexes (studies/designs, pre-feasibility study, feasibility study...)

**Concept Note (CN)**

The minimum contents of a Concept Note are:

**Written sections:**
- Situation assessment and identification of possible alternative solutions
- Logical framework outlining the Project’s result chain through presentation of overall objective (impact), specific objectives (outcome(s)), outputs, and activity matrix with details on means (resource inputs) and costs.
- Justification of the selected technical option
- Conceptual solution for the selected option
- Detailed budget estimates for the project
- Basic implementation plan, milestones
- Identification of Funding and Cost Recovery Options
- Project’s Socio-Economic Impact
- Justification in relation to the National Planning Framework

**Annexes:**
- Conceptual Study

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\(^9\) Starting from planning of FY 2019/20 onwards, IFMIS will be used for entering with Project Profile Data Forms
In the case of **Major Projects**, the Concept Note shall have the form of a **Separate Executive Summary** of the respective Feasibility Study Report covering the above listed items.

**Pre-Feasibility Study (PreFS)**

A **Pre-Feasibility Study** is a preliminary study undertaken to determine, analyse, and select the best alternative among several relevant project ideas that meet identified needs or problems. Pre-feasibility assesses a project’s readiness, desirability, viability and most appropriate form of implementation. The intention is to identify and exclude unsuitable projects from further preparation and assessment, thus, only if the selected project idea is considered feasible, it will undergo a fully-fledged feasibility study. **A Pre-feasibility study can be carried out internally or outsourced to external experts without prior screening by the Public Investment Committee.**

The minimum contents of a Pre-Feasibility Study are:

**Written sections:**
- Situation assessment and need for the investment
- Presentation of scenarios and technical-economical options for the investment
- Location(s) characteristics, technical and functional data of the investment
- Social, environmental, institutional and implementation aspects
- Investment costs compared with similar investment
- Operational and maintenance costs compared with similar investment
- Feasible solutions to realise the investment
- Proposals of a limited number of options that shall be analysed during the feasibility assessment stage
- Preliminary financial and economic analysis
- Identification of potential sources of funding and financing
- Conclusions and recommendations

**Annexes:**
- Conceptual Study

**Feasibility Study (FS)**

A **Feasibility Study** is a comprehensive investigation which aims at clearly establishing the viability of an idea through a **disciplined and documented process of thinking leading to rigorous assessment of whether a project will work and achieve its expected results**. Such a study usually evaluates in detail a project’s technical design based on test work and engineering analysis, its costs and benefits, social and environmental aspects, institutional issues, financial aspects, feasibility of investments, etc. and determines the optimal project option/design and form of implementation. The study must present enough information to determine whether or not the project should be advanced to final engineering and construction stage. This is a “go/no-go” decision point, thereby implying that sometimes the answer is no.
Request for a feasibility study has to be submitted to MINECOFIN according the 1st Planning and Budget Call Circular, to be screened by the Public Investment Committee. The necessary scope of work of the study required will be adapted to the specific nature of the project. MINECOFIN has the key function as quality assurer.

The minimum contents of a Feasibility Study are:

**Written sections:**
- Description of the context
- Definition of objectives and logic of the intervention
- Identification of the project
- Demand and option analysis
- Environmental considerations, including EIA and climate change
- Technical design and cost estimates
- Plan for implementation and operation of the project
- Financial, economic and sensitivity analysis
- Qualitative and probabilistic risk analysis
- Conclusions and recommendations

**Annexes:**
- **Design and Drawings:** Preliminary Design
- **Other annexes** such as EIA Report, Compensation Report, various studies

### 1.3.3 Distinction between pre-feasibility and feasibility studies

Pre-feasibility studies generally cover the same subjects as feasibility studies, but do so in much less detail. Another key difference is on cost estimation. In PreFS, cost estimation is based on assumptions while cost estimation in FS is normally based on vendors’ offers/proposals, at least for expensive price equipment/materials.

**Feasibility Study Reports for Medium and Major Projects also differ in respect of Options Analysis.**

For **Medium Projects**, option analysis will include the option without project, a do-minimum option and the recommended solution. Cost-benefit analysis (CBA) shall be performed only for the preferred or recommended option.

For **Major Projects**, option analysis will include the option without project, a do-minimum option and at least one other option i.e. the recommended solution. CBA shall be performed for at least two options.

For all types of projects for which a decision to go ahead with feasibility and/or implementation is made, Tender Documents are to be developed to select service providers (Project Identification Phase) as well as service, supply and works providers (Implementation Phase).

The Procurement Plan for the Project Identification Phase shall include the tenders for commissioning a Feasibility Study Report and any associated technical studies, including when this is compulsory, an Environmental Impact Assessment Report. In case of insufficient in-house capacity by the Contracting Authority, the pre-feasibility study can also be tendered prior to tendering of the feasibility study.
The Procurement Plan for the Implementation Phase shall generally include the tender for commissioning detailed technical designs, separately or jointly with the tenders for construction and supervision services.

In line with the FIDIC Contracts Guide terminology, the overall design may comprise three stages: the conceptual design, the preliminary design, and the final design (also termed detailed design under the same Contracts Guide). While conceptual designs are often prepared in-house by the concerned public entities, preliminary design and final/detailed designs are generally outsourced.

1.4 Project Development Cycle for public investment projects: decision points and key outputs

1.4.1. Project’s suitable for Development under the PPP Procurement Framework

When a Project is initiated by a Rwandan Central Level Entity, the first decision to be made is whether or not the project is suitable for Public Private Partnership (PPP). In case the Project Promoter i.e. the Chief Budget Manager within the Contracting Authority (CA) appreciates that a Project is, in principle, suitable for PPP procurement, the process will start with the preparation of the Project’s Pre-Feasibility Study. Thus, the preparation of the Feasibility Study will follow, and in case this is approved, the process will continue in accordance with the PPP Guidelines (Official Gazette of Rwanda no. 29 bis of 16 July 2018).

However, it is assumed that, due to both the relatively limited budget size and the complexity of the process, Small Projects are generally not suitable for PPP procurement. Nevertheless, in case the Contracting Authority that initiates a Project, appreciates that the project could be suitable for PPP procurement, also for this category of projects establishing PPP Project suitability requires the preparation of a Pre-Feasibility Study.
1.4.2. Projects suitable for traditional way of procurement

In case the Project Promoter – Rwandan Central Level Entity, appreciates that a Project is not, in principle, suitable for PPP procurement, the Project’s Identification and Appraisal process will be as follows:

**Small Projects**

The Chief Budget Manager will coordinate preparation of **Concept Note** and Project Profile Document. After the internal validation process, the above documents are submitted to **MINECOFIN during the planning process**. After MINECOFIN screening and technical approval of the project by the PIC, budget approval is further necessary for the Project to proceed to implementation. Pre-Feasibility and Feasibility Study are not required for this Projects’ category.

**Medium Projects**

The Chief Budget Manager will coordinate preparation of **Concept Note** and Project Profile Document. After the internal validation process, the above documents are submitted to **MINECOFIN during the planning process backing the request to MINECOFIN** to approve a full Feasibility Study. In case of approval of request for FS preparation, and after finalization and internal validation of the Feasibility Study, and the eventually revised Concept Note and PPD, the following Project’s documents shall be submitted to MINECOFIN for screening: **Project Profile Document, Concept Note, and full Feasibility Study Report (with its attachments)**. A Pre-Feasibility Study is not required for this Projects’ category.
Major Projects

Both a Pre-Feasibility Study and a Feasibility Study are required for this Projects’ category. The Chief Budget Manager or institutions will coordinate preparation of Pre-Feasibility Study, PPD and Concept Note and, after internal validation, will submit these documents during the planning process to MINECOFIN, requesting the approval to prepare a full Feasibility Study.

In case of approval of request for FS preparation, and after finalization and internal validation of the Feasibility Study, and the eventually revised Concept Note and PPD, the following Project’s documents shall be submitted to MINECOFIN for screening by MINECOFIN and PIC: Project Profile Document, Concept Note, and full Feasibility Study Report (with its attachments).

During the Project Identification Phase, the Contracting Authority shall tender for services in order to commission the pre-feasibility study (unless this is prepared in-house), and the feasibility study, with the relevant attachments (preliminary design, detailed design and any other required technical studies). The detailed designs could be tendered jointly with the construction works (i.e. by using the D&B procurement option). However, given the possibility that budget approval of the project is achieved at a later stage than the year of project submission to MINECOFIN, technical final design should always be commissioned only after budget approval.
1.5 The dimensions of Project’s Feasibility

The study of Project’s feasibility requires the analysis of four closely interrelated dimensions:

- Institutional and Legal
- Technical
- Environmental and Social
- Financial and Economic
The above four dimensions need to be assessed in parallel in an integrated approach, with continuous feedback and crosschecks between the various dimensions of the assessment. By careful analysis all the relevant aspects at an early stage of a Project’s development, a (pre)feasibility study helps to avoid investment decisions that may not make sense and prepare the ground for a qualified decision whether the selected investment option will be able to meet the established objectives. The study shall also point out which further studies or analyses may be needed for subsequent Project’s implementation.

1.6 Steps of a feasibility study

As a general principle a feasibility study shall conclude about the technical-technological, organisational, social, environmental and economic feasibility of a Project as compared to the relevant benchmarks for such activities and to inform decision-makers whether the planned project represents the best solution to achieve set objectives. Figure 1.5 below presents the eight steps of the envisaged appraisal. The main indicators calculated under the appraisal are:

For both CBA and CEA: The Financial Net Present Value (FNPV) resulting from the financial analysis; for CBA only: The Economic Net Present Value (ENPV) and the Benefit Cost Ratio (BCR) resulting from the economic analysis. Section 3.8 of these Guidelines directs on how interpreting the resulting values – the same chapter includes a checklist for feasibility studies’ assessment.
Important Note: Step 6 is not carried out under the CEA methodology!
1.7 Project’s Financial versus Economic Feasibility

Financial feasibility and socio-economic feasibility analysis are two different types of analysis. Financial analysis focuses on project financial attractiveness and includes only direct cash flows; economic analysis takes a wider perspective and considers the socio-economic welfare effects of a project. The similarity between financial and economic analysis is the methodology applied, however they use different inputs. Both financial and economic analysis need to be considered in a feasibility study to establish the desirability of a project, rendering four basic combinations of results and respective general recommendations:

1. Project is both financially and economically feasible: the project can be left to the private sector, as its financial attractiveness should guarantee the interest of private investors. This does not mean that the project should not be regulated by the Government. Private investors will be focused on the financial results of the project rather than the project’s socio-economic benefits. Some form of Government intervention may be needed to warrant the realisation of the socio-economic effects of the project.

2. The project is financially feasible but not economically feasible, for instance due to negative environmental impacts. These categories of projects can still be left to the private sector, with the public sector requiring compensation for the negative effects. The project promoter could for instance be required to create a hectare of nature elsewhere for every hectare of nature destroyed at the project site, or could be taxed for the emission of greenhouse gases.

3. The project is financially not feasible, but economically feasible. Many public investment projects are in this group: the initial investment is too large to be recovered from project revenues, or there are no revenues, and thus the project is not interesting for private investors. From an economic point of view these projects create benefits that are larger than the costs, which makes them economically desirable. **Public investment projects do not have to be financially feasible, but must always be economically feasible.**

4. The project is not financially nor economically feasible. These projects should not be carried out, at least not in their current definition or configuration. It may be possible to redefine or resize the project, or to time it differently so that it becomes feasible.
2 Guiding principles for commissioning, carrying out and assessing feasibility studies

A feasibility study shall provide the factual inputs for defining the appropriate scope of a project and will outline the financial, institutional and organisational needs for the construction / implementation and operation of a project based on a consultative process among the different stakeholders. In this regard, some general principles apply to the preparation of feasibility studies, which are outlined in this chapter.

2.1 Tendering, commissioning and assessing feasibility studies

Feasibility Studies are prepared under the Procurement Plan for the Identification Phase. It is generally recommended that feasibility studies be commissioned to external service providers. When commissioning feasibility studies, the Terms of Reference will have to be prepared and tailored according to the specificities of the proposed project. The ToR should further define which specific deliverables will have to be produced by when and in which formats. In case an Environmental Assessment Report is also required for the specific Project, this can be commissioned to the FS service provider or to a different service provider. Synchronization of all deliverables – technical studies and drawings, environmental studies, and financial and economic studies, must be required under the ToR.

The technical feasibility assessment under a Feasibility Study will usually include preliminary design sketches for the recommended technical layout. These will also provide a sound basis for subsequent detailed planning and application for land use. The next planning steps will usually involve the detailed technical design, the application for a building permit, and the preparation of tender dossiers for all works, works supervision services and possibly needed supplies. For these technical planning steps, the relevant legislation, regulatory framework, applicable standards and norms, as well as sector policies, will have to be observed. Table 2.1 below presents the types of documents required for each project category, and the associated Design Stages.

Table 2-1: Documents required and associated to Design Studies

<table>
<thead>
<tr>
<th>Documents Project's size</th>
<th>Concept Note</th>
<th>Pre-Feasibility Report</th>
<th>Feasibility Report</th>
<th>Project Profile Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL</td>
<td>Required</td>
<td>Not required</td>
<td>Not required</td>
<td>Required (+)</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>Required</td>
<td>Not required</td>
<td>Required</td>
<td>Required (+)</td>
</tr>
<tr>
<td>MAJOR</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required (+)</td>
</tr>
<tr>
<td>DESIGN STAGES</td>
<td>Conceptual Solution Study</td>
<td>Conceptual Solution Study</td>
<td>Preliminary Design</td>
<td>Main/Detailed (Final) Design</td>
</tr>
</tbody>
</table>

Once the contract with the selected tenderer for the feasibility study is signed, contract management shall include staged acceptance and validation of the relevant deliverables. In case of any open question and missing information, the concerned deliverable shall be reverted to the service provider for the required revisions and completions.
Review of the deliverables forming the Feasibility Study shall be carried out by the Contracting Authority through formal Validation Meetings preceded and/or followed by written comments addressed to the service provider. Frequently the ToR for Feasibility Studies envisage that approval of a specific deliverable is a condition for submission of subsequently scheduled deliverables.

**Reporting format for concept note, pre-feasibility and feasibility studies**

Indicative reporting formats for preparation of concept note, pre-feasibility and feasibility studies are provided under Annex A to these guidelines. Although the formats need to be adapted to the sector and project in reference, as regards feasibility studies the reporting format provides the basis for preparing Terms of Reference and outsource the preparation of these documents.

The feasibility study must be prepared with all necessary background documents, annexes and documentation. The feasibility study result depends on the demand analysis i.e. assessment of past and future demand (forecast), which is a pre-requisite for the CBA and the main determinant of its quality. The economic analysis must build on the financial analysis and both adopt an incremental approach.

**Terms of Reference example for feasibility studies**

Annex B to these guidelines presents general (not sector specific) Terms of Reference for contracting services related to preparation of feasibility study reports. The Terms of Reference and the contract for Feasibility Studies will generally stipulate a staged approval of the service provider outputs, for example demand analysis and options analysis should be approved before the cost-benefit analysis is initiated. Contracts with service providers will require the provision of MS excel copy of the financial model, with traceable formula format, which clearly sets out all assumptions made, sensitivity analyses carried out, and key outputs in support of the various analyses and conclusions.

### 2.2 Choice between different appraisal methodologies

**CONTENTS AND purpose of this section**

- Selection of appraisal methodology: Cost-Benefit Analysis (CBA) or Cost-Effectiveness Analysis (CEA)
- Basis for selection is the extent to which socio-economic benefits can be adequately quantified
- Overview of sectors in which a CBA and in which a CEA should be applied
- Role of Multi-Criteria Analysis (MCA) is indicated
- An overview of other grounds for public intervention

Investment projects, such as power, transport, urban development and rural irrigation generate economic benefits, most of which can be valued. Therefore, establishing economic viability requires a full cost-benefit analysis. However, for many social sector projects, some poverty targeting projects and projects that primarily generate social and environmental benefits, the conventional measure of economic benefits such as willingness to pay may not adequately capture their value to society. For these projects, when adequate benefit valuation is difficult, economic viability of a project can be assessed
based on the cost-effectiveness analysis and, when appropriate, supplemented by a Multi-Criteria Analysis (MCA). Indicative investment decision rules under different situations are presented in Figure 2-1 and discussed below.

Figure 2-1: Indicative investment decision rules

Source: Guidelines for the economic analysis of projects, Asian Development Bank, 2017

**Benefits can be adequately valued**

If the socio-economic benefits can be adequately valued, then CBA is the methodology to apply. CBA measures the difference between the flow of costs and benefits with the project and those without (the "with project" and "without project" scenario). Policy choices are rarely between a project and no project – rather, there are usually several plausible policy alternatives (e.g. the construction of a new greenfield national road for 100km, or greenfield for the first 50km only, with upgrading of existing road for remainder, or upgrading existing road for the entire length). Economic analysis will typically compare several policy scenarios against a common “without project” baseline. Moreover, as infrastructure and other capital assets typically have long life, these different scenarios must measure flows over many years.

**Benefits cannot be adequately valued**

In some sectors, it may not be possible to adequately value the socio-economic benefits. In such cases, the CBA may be replaced by a Cost-Effectiveness Analysis (CEA), focusing on the cost of attaining a given target. In a CEA, rather than judging a project on its Economic Net Present Value (ENPV) as would be done in a CBA, the project is evaluated on cost per unit of output (expressed in FNPV). For example, in a Technical and Vocational Education and Training (TVET) project, the CEA result would be expressed in the
FNPV of the costs of per graduate from the training. In broad lines, a CEA follows the same steps as a CBA, however economic analysis is only qualitative, which also affects risk and sensitivity testing.

**CBA versus CEA**

Much depends on the extent to which output variables, and benefits in particular, can be measured and monetised. There are cases where benefits are hard to quantify, thus, traditional CBA cannot be applied, and cost-effectiveness analysis becomes more appropriate. CEA starts from the premise that the good or service concerned must be supplied. In such cases the decision to carry out a certain type of investment or programme is determined as part of the political process and a cost-effectiveness analysis is used to determine the best project to achieve the desired results, generally the one that achieves the greatest output per unit of input. For projects to be submitted to MINECOFIN to the annual planning cycle, an indicative demarcation of sectors where CBA should be applied and sectors where CEA should be applied is provided in Table 2-2.

**COST EFFECTIVENESS ANALYSIS**

In Cost-Effectiveness Analysis, the appraisal shall focus on verifying that the project is the most efficient solution for the society to supply a given, necessary service at the pre-defined conditions set out. In addition, qualitative description of main economic benefits should be provided. CEA is carried out by calculating the cost per unit of ‘non-monetised’ benefit and is required to quantify benefits but not to attach a monetary price or economic value to the benefits.

The conditions for applying CEA are as follows:

- the project produces only one project output which is homogenous and easily measurable;
- the output is a crucial supply, entailing that action to secure it is essential;
- the aim of the major project is to achieve the output at minimum cost or to maximise outputs with given cost;
- there are no significant externalities;
- there is a wide evidence of appropriate benchmarks to verify that the chosen technology meets the minimum required cost performance criteria.

---

Table 2-2: Sectors indicative applicability for CBA and CEA

<table>
<thead>
<tr>
<th>CBA</th>
<th>CEAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy generation</td>
<td>Education*</td>
</tr>
<tr>
<td>ICT</td>
<td>Health*</td>
</tr>
<tr>
<td>Transport</td>
<td>Sports and culture</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Rural settlement</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Energy transmission &amp; distribution</td>
</tr>
<tr>
<td>PSDYE (infrastructure related)</td>
<td>Environmental protection</td>
</tr>
<tr>
<td>Water supply</td>
<td>Governance and decentralization,</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Justice, reconciliation, law &amp; order</td>
</tr>
</tbody>
</table>
| Urban settlement/affordable housing | P

* In large education or health projects (above 15 billion FRW), a CBA should always be considered. If indeed the benefits cannot be adequately quantified, then a CEA is acceptable.
Advice for applying CEA:

- Make sure you are using the right output or outcome to build the ratio. Try varying the output used to see whether that dramatically alters the comparative rankings of the options and programmes being compared.
- In carrying out a CEA, it is critical to begin with an exhaustive list of all the different costs and benefits that could arise - even if some are later excluded. Otherwise, important aspects of the analysis could be overlooked.
- Information on costs, benefits and risks is rarely known with certainty, especially when one looks to the future. This makes it essential that sensitivity analysis is carried out, testing the robustness of the CEA result to changes in some of the key numbers.

Multi-Criteria Analysis

Multi-Criteria Analysis (MCA) is an appraisal technique used to establish preferences amongst different options for delivering a given set of objectives. It does this with reference to an explicit set of criteria, which helps appraisers to assess the extent to which the investment objectives are met by the different solutions available to them. The problems addressed by MCA consist of a finite number of alternatives that are known explicitly at the beginning of the process. The purpose may be to identify the best alternative, rank options in preference order, or shortlist a number of options for more detailed appraisal. A standard tool of MCA is the “performance matrix”, which compares the performance of each option against multiple appraisal criteria.

MCA is most commonly applied as a supporting technique in CBA or CEA, generally in the options analysis. A comprehensive explanation on the methodology for MCA is included in Annex D.

Other grounds for public intervention

Public intervention as discussed above generally may focus on public infrastructure as well as on other development projects involving, or not, the development of physical assets. There is an a priori rationale for public sector involvement whenever the market cannot or will not produce the socially desirable quantity of the good or service. However, in other cases, public development projects provide incentives aiming to encourage a socio-economic change, for example a change for better use of natural resources.

The nature of government involvement, however, merits careful consideration. In some cases, it may be appropriate for the government to produce goods; in others, financing production of the service might be just more advisable (primary education, for example); in yet others, a subsidy might be the most suitable intervention (subsidizing a forest that sequesters carbon dioxide, or the access of poor people to safe water, for example). In all cases, three fundamental questions should be answered:

1. What market failure leads the private sector to produce more or less than the socially optimal quantity of this good or service?
2. What sort of government intervention is appropriate to ensure that the optimal quantity is produced?
3. Is the recommended government intervention likely to have the desired impact as presented under the result chain framework linking inputs-activities-outputs-outcome(s)-impact?
If there is a strong case for government intervention, the costs and benefits of government involvement must be assessed to show whether or not the benefits are likely to outweigh the costs.

These guidelines mostly focus on public intervention aiming to improve public infrastructure in various sectors. Thus, certain steps of the analysis such as technical designs and related costs would not apply to development projects providing subsidies rather than investment in capital assets. Yet the same appraisal methodologies applicable to capital investment projects, i.e. CBA, CEA and MCA, could prove suitable for assessment of other types of public intervention. The choice of the appraisal methodology shall have to be done on a case by case basis, depending on measurability of benefits and overall information available.

### 2.3 Analytical Framework

#### CONTENTS AND PURPOSE OF THIS SECTION

- Theoretical background of CBA:
  1. Concept of opportunity costs
  2. Long term perspective of analysis
  3. Expression of economic performance in monetary values
  4. Concept of discounting future costs and benefits
  5. Micro-economic and incremental approach isolating project effects from non-project related economic effects
  6. Do nothing scenario versus do something and project scenario
  7. How to treat employment effects

- Theoretical background of CEA and the extent to which the above 7 bullets apply

Feasibility studies include technical, environmental and social, financial analysis and economic studies. The number and scope of these studies depend on the sector of investment. However, all the above-mentioned studies are complementary and need to be conducted in parallel so that all information is coherently processed into the final Feasibility Study Report focusing on Cost-Benefit Analysis.

Cost-Benefit Analysis (CBA) is an analytical tool for judging the economic advantages or disadvantages of an investment decision by assessing its costs and benefits in order to assess the welfare change attributable to it. The analytical framework of CBA refers to a list of underlying concepts which is as follows:

- **Opportunity costs.** The concept of opportunity costs of a good or service consider the costs of alternative choices\(^\text{10}\) and compares these with the costs of the chosen alternative. The rationale of this concept is in the observation that project investment decisions do not just have financial effects but will also have wider external effects (socio-economic effects such as employment, emissions, other environmental effects). These can be socially undesirable outcomes, but also

\(^{10}\) In economic theory, the opportunity costs refer to the best alternative forgone, i.e. the best alternative choice.
desirable outcomes. In a CBA, these external effects are monetised as much as possible by comparing the situation without the project with the situation with the project.

- **Long-term perspective.** A long-term outlook is adopted, ranging from a minimum of 10 to a maximum of 30 years or more, depending on the sector of intervention. Hence the need to:
  o set a proper time horizon;
  o forecast future costs and benefits (looking forward);
  o adopt appropriate discount rates to calculate the present value of future costs and benefits;
  o take into account uncertainty by assessing the project’s risks.

- **Calculation of economic performance indicators expressed in monetary terms.** CBA is based on a set of predetermined project objectives, giving a monetary value to all the positive (benefits) and negative (costs) welfare effects of the intervention. These values are discounted (see box on concept of discounting) and then totalled in order to calculate a net total benefit. The project overall performance is measured by indicators, namely the Economic Net Present Value (ENPV), expressed in monetary values, and the Economic Rate of Return (ERR), allowing comparability and ranking for competing projects or alternatives.

- **Microeconomic approach.** CBA is typically a microeconomic approach enabling the assessment of the project’s impact on society as a whole via the calculation of economic performance indicators, thereby providing an assessment of expected welfare changes. While direct employment or external environmental effects realised by the project are reflected in the ENPV, indirect (i.e. on secondary markets) and wider effects (i.e. on public funds, employment, regional growth, etc.) should be excluded. This is for two main reasons: i) most indirect and/or wider effects are usually transformed, redistributed and capitalised forms of direct effects; thus, the need to limit the potential for benefits double-counting; ii) there remains little practice on how to translate them into robust techniques for project appraisal, thus the need to avoid the analysis relies on assumptions whose reliability is difficult to check.

### CONCEPT OF DISCOUNTING

In the financial and economic analysis, a time value is attached to financial and economic costs and revenues or socio-economic benefit. The future costs and revenues or socio-economic benefits are discounted, expressed in today’s value, in order to make them comparable. Today’s value is referred to as the Net Present Value (NPV), in financial analysis generally as FNPV and in economic analysis as ENPV.
Discounting is done by means of a discount rate; the financial discount rate (FDR) reflecting the public cost of financing in financial analysis and social discount rate (SDR) reflecting the economic opportunity costs of capital (EOCK) in economic analysis. As the financial and economic analysis are usually done in constant (real) prices, the discount rates should be expressed in constant (real) terms too. This means inflation is excluded.

Some examples with a discount rate of 13%:
- 1,000 FRW to be obtained next year are assumed to be worth 885 FRW today \((1,000 / 1.13)\).
- Today’s value of 1,000 FRW to be received in two years will be 783 FRW \((1,000 / (1.13 \times 1.13))\).

The formula for discounting is:

\[
NPV = \frac{\text{value}}{(1 + DR)^t}
\]

where value is the value to be discounted, DR is the discount rate and t is the number of years for which the value needs to be discounted. See also Annex C.

- **Incremental approach.** CBA compares a scenario with-the-project with a counterfactual baseline scenario without-the-project (current situation). The incremental approach requires that:
  
  o a counterfactual scenario is defined as what would happen in the absence of the project. For this scenario, projections are made of all cash flows related to the operations in the project area for each year during the project lifetime. In cases where a project consists of a completely new asset, e.g. there is no pre-existing service or infrastructure, the without-the-project scenario is one with no operations. In cases of investments aimed at improving an already existing facility, it should include the costs and the revenues/benefits to operate and maintain the service at a level that it is still operable (Business As Usual (BAU)) or even small adaptation investments that were programmed to take place anyway (do-minimum). In particular, it is recommended to carry out an analysis of the promoter’s historical cash-flows (at least previous three years) as a basis for projections, where relevant. The choice between BAU or do-minimum as counterfactual should be made case by case, on the basis of the evidence about the most feasible, and likely, situation. If uncertainty exists, the BAU scenario shall be adopted as a rule of thumb. If do-minimum is used as counterfactual, this scenario should be both feasible and credible, and not cause undue and unrealistic additional benefits or costs. As illustrated at the end of this section (see ‘choice of the counterfactual scenario’) the choice made may have important implications on the results of the analysis;

  o secondly, projections of cash-flows are made for the situation with the proposed project. This takes into account all the investment, financial and economic costs and benefits resulting from the project. In cases of pre-existing infrastructure, it is recommended to carry out an analysis of historical costs and revenues of the beneficiary (at least three previous years) as a basis for the financial projections of the with-project scenario and as a reference for the without-project scenario, otherwise the incremental analysis is very vulnerable to manipulation;
finally, the CBA only considers the difference between the cash flows in the with-the-project and the counterfactual scenarios. The financial and economic performance indicators are calculated on the incremental cash flows only.

- **Use of a ‘do-nothing’ instead of a ‘do-minimum’ counterfactual.** The “do minimum” scenario should be used by default to carry out a CBA, except for capacity rehabilitation projects. For capacity expansion or upgrade projects, the analysis asks the question: “Do we expand capacity or keep it at current levels?” The analysis then compares the “do something” with a “do minimum”. If the analyst instead compared the “do something” with a “do nothing”, the project would not be one of capacity upgrade versus no capacity upgrade, but rather one of capacity upgrade versus letting capacity deteriorate potentially into inoperability. The consequence of using a “do nothing” instead of a “do minimum” counterfactual would normally be to overestimate the returns of the capacity expansion project, since the “do minimum” scenario includes fewer benefits or higher costs to users. This is illustrated in Table 2.3 below.

In rehabilitation projects, the nature of the project itself calls for comparing a “do something” with a “do nothing”. Generally, a pure rehabilitation project involves keeping existing capacity constant, rather than expanding it. That is, the “with project” scenario involves no growth in capacity. In that sense, and although it is just a matter of semantics, a rehabilitation project could be viewed as comparing a “do minimum” with a “do nothing.”

- **Employment creation.** It is generally assumed that investments can generate new employment, particularly within areas or countries displaying a high rate of unemployment, since in this case the probability that jobs are displaced by other areas is rather low. Recent research in the context of a mature infrastructure network found that roads-related accessibility improvements increase local employment. Cost-benefit analysis considers direct job creation in the context of economic analysis, by calculating shadow wages on the cost side, while benefits from job creation are not included on the benefit side. However, in some cases, particularly in the context of economic analysis of education and research projects, benefits from the creation of new jobs are monetized through the ‘human capital formation’ method. This method is based on consideration that the staff employed under the investment project shall gain knowledge and experience allowing them to increase their salaries in the long-term. Thus, the benefit to the project is monetized as the present value of the total annual incremental gross salary gained by persons trained under the investment project, over their entire work career. In sectors other than the above, a separate analysis of labour market impact of the investment could be included under the feasibility study report, but related benefits would not be quantified in monetary terms.

11 http://eprints.lse.ac.uk/83637/. However, the study in reference states that overall, “these economic benefits are relatively small. These kinds of returns are not suddenly to transform poorly performing economies into powerhouses. We also need to be careful in interpreting these changes as gains to the national economy. To some extent, jobs may be displaced from other areas”. “Our work is one of the first attempts to carefully quantify the local economic impacts of existing schemes using real world data on actual investments, and the employment effects that they generated. Our report considered previous infrastructure evaluations from across the Organisation for Economic Cooperation and Development, and found only six that carefully analysed the effect of road improvements on local employment. Of these six, ours was one of only two that detected positive effects.”
Applicability to CEA

- CEA does not compare a scenario with-the-project with a counterfactual baseline scenario without-the-project (current situation). Instead, it generally considers historical or ‘acceptable’ (from the perspective of the investor) costs and/or outputs. Thus, before the analysis is performed, the investor should establish the standard costs that should not be exceeded in relation to the physical units to be achieved under the investment. This may require a systematic collection of cost data to be used as benchmarks.
- CEA is based on financial analysis only. Financial analysis is carried out as for the CBA (exception made for the incremental approach) to calculate the FNPV and FIRR. The FNPV is used to derive the FNPV per each physical unit of output. In case the FNPV is not available, total investment costs could be used to calculate the value per each physical unit of output.

2.4 The choice of the counterfactual scenario

If a river with a ferry crossing is assumed, where the daily capacity of the number of vehicles and passengers needs to be expanded to cater to growing demand, then the various scenarios could for instance be formulated as follows:

- Do nothing scenario: leave the situation as it is. The existing ferry will continue to operate, resulting in increasing waiting times to cross the river;
- Do something scenario: small interventions to the existing situation with minimal investments, for instance increasing the frequency of ferry crossings, so that capacity increases somewhat. This results in additional operational costs, but also increases capacity. The question remains if the capacity increase is sufficient to cater to the foreseen demand;
- Project scenario: construction of a bridge. This is a major investment, which will greatly increase demand.

The following example, adapted from EIB (2013)\(^{12}\), illustrates the issue of the project performance in relation to what scenario is selected as counterfactual. The proposed project, which consists of rehabilitating and expanding existing infrastructure capacity, involves investing FRW 450 billion and will result in benefits growing by 5% per year. The ‘do-minimum’ scenario, which consists of only rehabilitating existing capacity, involves investing FRW 30 million, followed by constant benefits. The BAU involves no investment at all, which, in turn, will affect the amount of output the facility can produce, causing a fall in net benefits of 5% per year.

\(^{12}\) European Investment Bank, (2013) The Economic Appraisal of Investment Projects at the EIB.
As shown in Table 2.2 below, the results of the CBA change significantly if different scenarios are adopted as counterfactual. By comparing the proposed project with the ‘do-minimum’ scenario, the ERR equals 3%. If the BAU is taken as a reference, the ERR increases to 6%. Thus, any choice should be duly justified by the project promoter on the basis of clear evidence about the most feasible and most likely situation that would occur in the absence of the project.

The conclusion of the project displayed in Error! Reference source not found. is that the Do Minimum scenario is preferred over the project scenario, as it creates the highest NPV over the BAU scenario compared to the project. In other words, higher investment in the project (compared to the Do Minimum scenario) is not justified by higher benefits.

### Table 2-3: Example effect of scenario choice on ERR (all amounts in billion FRW except ERRs)

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>FRW billion</th>
<th>NPV</th>
<th>1</th>
<th>2</th>
<th>10</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Proposed project</td>
<td>Net benefit</td>
<td>1,058</td>
<td>45</td>
<td>47</td>
<td>70</td>
<td>119</td>
</tr>
<tr>
<td>2 Do-minimum</td>
<td>Net benefit</td>
<td>661</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>3 Business as usual</td>
<td>Net benefit</td>
<td>442</td>
<td>45</td>
<td>43</td>
<td>28</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>FRW billion</th>
<th>NPV</th>
<th>1</th>
<th>2</th>
<th>10</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 Proposed project net of Do-minimum</td>
<td>Net flows</td>
<td>-9</td>
<td>-420</td>
<td>2</td>
<td>25</td>
<td>74</td>
</tr>
<tr>
<td>1-3 Proposed project net of Business as usual</td>
<td>Net flows</td>
<td>182</td>
<td>-450</td>
<td>4</td>
<td>42</td>
<td>103</td>
</tr>
<tr>
<td>2-3 Do-minimum net of Business as usual</td>
<td>Net flows</td>
<td>194</td>
<td>-30</td>
<td>2</td>
<td>17</td>
<td>29</td>
</tr>
</tbody>
</table>

Source: The economic appraisal of investment projects at the European Investment Bank, March 2013

### 2.5 Financial versus Economic analysis

**CONTENTS AND PURPOSE OF THIS SECTION**

- Explanation of the difference between financial and economic feasibility
- Presentation of a quadrant with financially feasible and unfeasible projects versus economically feasible and unfeasible projects
- Public investments do not need to be financially feasible, but should always be economically feasible

Financial feasibility and socio-economic feasibility analysis are two different types of analysis. The financial analysis focuses on project financial attractiveness and includes only direct cash flows (see section 3.5); the economic analysis takes a wider perspective and considers the socio-economic welfare effects of the project (see section 3.6). The similarity between financial and economic analysis is the methodology applied, however they use different inputs.

Both financial and economic analysis need to be considered in a feasibility study to establish the desirability of a project, in four basic combinations (see Figure 2-2).
Figure 2-2: Financial versus economic feasibility

<table>
<thead>
<tr>
<th>Project is financially feasible</th>
<th>Project is financially not feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project is economically feasible</strong></td>
<td>Project can be done by private sector</td>
</tr>
<tr>
<td></td>
<td>Project can be done by public sector, subsidised from public funds</td>
</tr>
<tr>
<td><strong>Project is economically not feasible</strong></td>
<td>Project should not be carried out or it should be taxed to compensate for negative economic effects</td>
</tr>
</tbody>
</table>

1. Project is both financially and economically feasible: the project can be left to the private sector, as its financial attractiveness should guarantee the interest of private investors. This does not mean that the project should not be regulated by the Government. Private investors will be focused on the financial results of the project rather than the project’s socio-economic benefits. Some form of Government intervention may be needed to warrant the realisation of the socio-economic effects of the project.

2. The project is financially feasible but not economically feasible, for instance due to negative environmental impacts. These projects can still be left to the private sector, with the public sector requiring compensation for the negative effects. The project promoter could for instance be required to create a hectare of nature elsewhere for every hectare of nature destroyed at the project site, or could be taxed for the emission of greenhouse gases. However, there might be cases when the economic costs are paramount and no financial and/or in-kind compensation from the private sector may turn the project to be desirable for the society. Thus, the project would not be carried out although financially feasible.

3. The project is financially not feasible, but economically feasible. Many public investment projects are in this group: the initial investment is too large to be recovered from project revenues, or there are no revenues, and thus the project is not interesting for private investors. But from an economic point of view these projects create benefits that are larger than the costs, which makes them economically desirable. An example is an airport, which requires considerable investments in basic infrastructure that can generally not be fully recovered from airport dues and taxes. Yet airports form vital nodes in a country’s transport network as they facilitate (and reduce the costs of) the movement of people and of air cargo imports and exports.

   Many national and international investment programmes are aimed at this category of projects, always with the intention of making up for the lack of financial attractiveness. This can be done by means of grants, subsidies, soft loans, or PPP schemes in which the private sector invests in parts of the project that can be made financially attractive (for example a terminal within a seaport) and the public sector covers the parts of the project that are financially unfavourable.
(the basic infrastructure of a seaport). It is always required that benefits to the economy are sufficiently demonstrated before the decision is taken to invest public money in this type of projects.
Public investment projects do not have to be financially feasible, but should always be economically feasible.

4. The project is not financially nor economically feasible. These projects should not be carried out, at least not in their current definition or configuration. It may be possible to redefine or resize the project, or to time it differently so that it becomes feasible.
3 Feasibility studies

This chapter provides a stepwise approach to Feasibility Studies. Whereas it is written with CBA in mind, many sections also apply to CEA too. The main difference is in the economic analysis, where in a CBA the socio-economic effects are quantified, whereas in a CEA they cannot be quantified. The respective differences are highlighted in the various sections of this chapter.

The structure and contents of the Feasibility Study Report with a CBA shall generally comprise the following chapters:

0. Executive Summary
1. Description of the context
2. Definition of objectives and logic of the intervention
   2.1 Needs assessment
   2.2 Project relevance
3. Identification of the project
   3.1 Project activities
   3.2 Body responsible for project implementation
   3.3 Project stakeholders
4. Technical feasibility & environmental sustainability
   4.1 Demand analysis
   4.2 Option analysis
   4.3 Environmental considerations, including EIA and climate change
   4.4 Technical design and cost estimates
   4.5 Plan for implementation of the project
   4.6 Plan for operation of the project
5. Financial analysis
   5.1 Cash-flows for project costs and revenues, including residual values
   5.2 Tariffs and affordability analysis, whenever relevant
   5.3 Sources of financing
   5.4 Financial profitability & sustainability
6. Economic analysis
   6.1 Fiscal corrections
   6.2 From market to shadow prices
   6.3 Evaluation of non-market impacts
   6.4 Economic viability
7. Risk assessment
   7.1 Sensitivity analysis
   7.2 Qualitative risk analysis
   7.3 Probabilistic risk analysis
8. Conclusions of the feasibility analysis and recommendations
The sections in this chapter follow the same structure as indicated above. Table 3-1 below indicates to what extent these steps apply to CBA and CEA.

Table 3-1: Feasibility study steps applicable to CBA and CEA

<table>
<thead>
<tr>
<th>Step</th>
<th>CBA</th>
<th>CEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Description of the context</td>
<td>applicable</td>
<td>Applicable</td>
</tr>
<tr>
<td>2. Definition of objectives</td>
<td>applicable</td>
<td>Applicable</td>
</tr>
<tr>
<td>3. Identification of the project</td>
<td>applicable</td>
<td>Applicable</td>
</tr>
<tr>
<td>4. Technical and administrative feasibility &amp; environmental sustainability</td>
<td>applicable</td>
<td>Applicable</td>
</tr>
<tr>
<td>5. Financial analysis</td>
<td>applicable</td>
<td>Applicable</td>
</tr>
<tr>
<td>6. Economic analysis</td>
<td>applicable</td>
<td>Only narrative description of foreseen economic effects</td>
</tr>
<tr>
<td>7. Risk and sensitivity assessment</td>
<td>applicable</td>
<td>Qualitative risk assessment. Quantitative risk assessment applies only on project costs/revenues.</td>
</tr>
<tr>
<td>8. Conclusions and recommendations</td>
<td>applicable</td>
<td>Applicable</td>
</tr>
</tbody>
</table>

### 3.1 Description of the project and its context

**CONTENTS AND PURPOSE OF THIS SECTION**

- Importance of proper project description
- Key features of project description:
  1. Socio-economic conditions
  2. Policy and institutional aspects
  3. Statistics and data on the current infrastructure and/or service provision
  4. Information on the project context (such as environmental effects)
  5. Perception of population that will be affected
- CBA and CEA build upon the same features to describe the project and its context

The project appraisal starts with a proper description of the project. This includes a description of the motivation for the project, the objectives of the project, the problem it intends to solve. The first step of the project appraisal aims to describe the social, economic, political and institutional context in which the project will be implemented.

The key features to be described relate to:

- the socio-economic conditions of the country/region that are relevant for the project, including for instance demographic dynamics, expected GDP growth, labour market conditions, unemployment trends, etc.;
- the current infrastructure endowment and service provision, including indicators/data on coverage and quality of services provided, current operating costs and tariffs/fees/charges paid by users, if any;
other information and statistics that are relevant to better qualify the context, for instance, existence of environmental issues, environmental authorities likely to be involved, etc.;
- the perception and expectations of the population with relation to the service to be provided, including, when relevant, the positions adopted by civil society organisations.

The presentation of the context is instrumental to forecast future trends, especially for demand analysis. In fact, the possibility of achieving credible forecasts about users, benefits and costs often relies on the assessment’s accuracy of the macro-economic and social conditions of the region. In this regard, an obvious recommendation is to check that the assumptions made, for instance on GDP or demographic growth, are consistent with data provided in national and sectorial documents. In Rwanda, a good source would be the National Institute of Statistics in Rwanda (NISR).

Also, this exercise aims to verify that the project is appropriate to the context in which it takes place. Any project is integrated in pre-existing systems with its own rules and features, and this is an imminent complexity that cannot be disregarded. Investments to provide services to citizens can achieve their goals through the integration of either new or renewed facilities into already existing infrastructures. Partnership with the various stakeholders intervening in the system is thus a necessity. Also, sound economic policy, quality institutions and strong political commitment can help the implementation and management of the projects, and the achievement of larger benefits. In short, investments are easier to carry out where the context is more favourable. For this reason, the specific context characteristics need to be taken into due consideration starting from the project design and appraisal phase. In some cases, improvements in the institutional set up might be needed to ensure an adequate project performance.

**GOOD PRACTICES**
- The context is presented including all sectors that are relevant to the project and avoiding unnecessary discussions on sectors that are unrelated to the project.
- The existing infrastructure endowment and service provision is presented with relevant statistics.
- The sectorial and regional characteristics of the service to be provided are presented in light of the existing development plans.

**COMMON MISTAKES**
- Socio economic context and statistics are presented without explaining their relevance for the project.
- Socio-economic statistics and forecasts are not based on readily available official data and forecasts.
- The political and institutional aspects are considered irrelevant and not adequately analysed and discussed.
3.2 Definition of objectives

CONTENTS AND PURPOSE OF THIS SECTION

- Importance of a clear description of project objectives
- Need to quantify as much as possible with indicators and targets
- Identification of project effects to be further quantified in the CBA
- Embedding the project in long term development plans

The second step of the project appraisal aims to define the objectives of the project. From the analysis of all the contextual elements listed in the previous section, the national, regional and/or sectorial needs that can be addressed by the project must be assessed, in compliance with the national-level sectorial strategy whenever applicable. The project objectives should then be defined in explicit relation to needs. When specifying the needs, the promoter should focus on specific and not generic issues such as economic development. Also, these should be quantified and explained: e.g. volume and growth rate of traffic congestion due to urbanisation dynamics, indices of water quality deterioration as a consequence of industrialisation, risk of energy supply shortage due to increased demand, etc. In other words, the needs assessment builds upon the description of the context and provides the basis for the objective’s definition.

As far as possible, objectives should be quantified through indicators and targets. A target is a quantified aspect of the objectives, for example: reduction of travel time from A to B of X minutes; increasing the catchment area of a service of N thousands of people, improvement of capacity from X to Y MW, reduction of GHG emissions from X to Y tons of CO₂ per year, etc. They may relate, for example, to improvement of the output quality, to better accessibility to the service, to the increase of existing capacity, etc.

A clear definition of the project objectives is necessary to:
- identify the effects of the project to be further evaluated in the CBA and CEA. The identification of effects should be linked to the project’s objectives in order to measure the impact on welfare. The clearer the definition of the objectives, the easier the identification of the project and its effects. Objectives are highly relevant for the CBA and CEA, which should reveal to what extent they are met;
- verify the project’s relevance. Evidence should be provided that the project’s rationale responds to a priority for the territory. This is achieved by checking that the project contributes to reaching the national long-term development plans in the specific sector: the policy and institutional aspects, including existing economic policies and development plans - e.g. linkage to Vision 2020, Vision 2050, EDPRS2\(^\text{13}\), National Strategy for Transformation (NST1), Sector Strategic Plans (SSPs) - organisation and management of services to be provided/developed by the project, as well as

\(^{13}\) Economic Development and Poverty Reduction Strategy 2.
capacity and quality of the institutions involved. Reference to these strategic plans should demonstrate that the problems are recognised and that there is a plan in place to resolve them.

Whenever possible, the relationship or, better, the relative contribution of the project objectives to achieve the specific targets of national policies and strategies should be clearly quantified. Such identification will also enable the linking of the project objectives with the monitoring and evaluation system.

### GOOD PRACTICES

- Project effects are identified in clear relation to the project objectives.
- The general objectives of the project are quantified with a system of indicators and targets.
- Target values are established and compared to the situations with- and without the project.
- Project indicators are linked to those defined in the respective national strategies/plans, esp. NST1 and Sector Strategic Plans (SSPs), or other relevant documents. Where the indicators set at the level of the national strategies/plan are inappropriate to measure the impact of specific projects, additional project specific indicators, are set up.
- If a region or country wide target exists (e.g. 100 % coverage of water supply in a given service area, diversion of minimum 50 % of biodegradable waste from landfill, etc.), the contribution of the project to achieving this wider target (in % of total target) is explained.
- Source and values of indicators are explained.

### COMMON MISTAKES

- The economic effects considered in the CBA / CEA are not well aligned with the specific objectives of the project.
- Project objectives are confused with its outputs. For instance, if the main objective of the project is to improve the accessibility of a peripheral area, the construction of a new road or the modernisation of the existing network are not objectives, but the means through which the objective of improving the area’s accessibility will be accomplished.
- Where the investment is compliance driven (e.g. it must be done further to approval of new legislation), the extent to which the project contributes to achieve such compliance is not shown. If the required standards are not attained by the project, evidence of what other measures are planned and how they will be financed is not provided.
3.3 Identification of the project

**CONTENTS AND PURPOSE OF THIS SECTION**

- Importance of clear project identification
- Project needs to be a self-sustaining unit of analysis
- Description of all physical elements and activities to be implemented
- Description of organisation responsible for project implementation (project promoter) and its capabilities
- Description of the project impact area and all stakeholders and their involvement

A project is clearly identified when:

- the physical elements and the activities that will be implemented to provide a given good or service, and to achieve a well-defined set of objectives, consist of a self-sufficient unit of analysis;
- the body responsible for implementation (often referred to as ‘project promoter’ or ‘beneficiary’) is identified and its technical, financial and institutional capacities analysed; and
- the impact area, the final beneficiaries and all relevant stakeholders are duly identified.

### 3.3.1 Physical elements and activities

A project can be defined as ‘as a series of works, activities or services intended in itself to accomplish an indivisible task of a precise economic or technical nature which has clearly identified goals’. These works, activities or services should be instrumental in the achievement of the previously defined objectives. A description of the type of infrastructure (national road, water supply system, hospital, power plant, broadband, waste water treatment plant, etc.), type of intervention (new construction, rehabilitation, upgrade, etc.), service provided (cargo traffic, urban solid waste management, access to broadband for businesses, cultural activities, etc.) and intended location should be provided in order to define the project activities.

In this regard, the key aspect is that appraisal needs to focus on the whole project as a self-sufficient unit of analysis, which is to say that no essential feature or component is left outside the scope of the appraisal (under-scaling). For example, if there are no connecting roads for waste delivery, a new landfill will not be operational. In that case, both the landfill and the connecting roads are to be considered as a unique project. In general, a project can be defined as technically self-sufficient if it is possible to produce a functionally complete infrastructure and put a service into operation without dependence on other new investments. At the same time, including components in the project that are not essential to provide the service under consideration should be avoided (over-scaling).
The application of this principle requires that:

- partitions of project for financing, administrative or engineering reasons are not appropriate objects of appraisal (‘half a bridge is not a bridge’). A typical case might be that of a request for public funds to support the first phase of an investment, whose success hinges on the completion of the project as a whole. Or, request for state financial support for only a part of a project because the remaining will be financed by other sponsors. In these cases, the whole investment should be considered in CBA / CEA. The appraisal should focus on all the parts that are logically connected to the attainment of the objectives, regardless of what the aim of the donor’s assistance is.

- inter-related but relatively self-standing components, whose costs and benefits are largely independent, should be appraised independently. Sometimes a project consists of several inter-related elements. For example, the construction of an industrial park including a cargo terminal, storage areas and plots for industrial activities. Appraising such a project involves, firstly, the consideration of each component independently and, secondly, the assessment of possible combinations of components. The measurement of the economic benefits of individual project components is particularly relevant in the context of large multifaceted projects. As a whole these projects may present a net positive economic benefit (i.e. a positive ENPV). However, this positive ENPV may include one or more project components that have a negative ENPV. If this component(s) is not integral to the overall project, then excluding it will increase the ENPV for the rest of the project.

- future planned investments should be considered in the CBA / CEA if they are critical for ensuring the operations of the original investment. For example, in the case of wastewater treatment, a capacity upgrade of the original plant shall be factored in at a certain point of the project’s life cycle, if it is needed to comply with an expected population increase, in order to continue to meet the original project’s objectives.

3.3.2 The body responsible for project implementation

The project promoter, i.e. the body responsible for project implementation (and in most cases, also responsible for project operation), usually a ministry or agency, should be identified and described in terms of its technical, financial and institutional capacity. The technical capacity refers to the relevant staff resources and staff expertise available within the organisation of the project promoter and allocated to the project to manage its implementation and subsequent operation. In the case of the need to recruit additional staff, evidence should be provided that no constraints exist to find the necessary skills on the local labour market. The financial capacity refers to the financial standing of the body, which should demonstrate that it is able to guarantee adequate funding both during implementation and operations. This is particularly important when the project is expected to require substantial cash inflow for working capital or other financial imbalances (e.g. medium-long term loan, clearing cycle of VAT, etc.). The institutional capacity refers to all the institutional arrangements needed to implement and operate the project [e.g. the Single Project Implementation Unit (SPIU)] including the legal and contractual issues for project licensing. Where necessary, special external technical assistance may need to be foreseen and included in the project.
When the infrastructure owner and its operator are different, a description of the operating company or agency who will manage the infrastructure (if already known) and its legal status, the criteria used for its selection, and the contractual arrangements foreseen between the partners, including the funding mechanisms (e.g. collection of tariffs/service fees, presence of government subsidies), should be provided.

### 3.3.3 Financial beneficiaries and relevant stakeholders

After having described the project activities and the body responsible for project implementation, the boundaries of the analysis should be defined. The territorial area affected by the project effects is defined as the impact area. This can be of local or national (or even including neighbouring countries as in case regional cross-border river basins are involved) interest, depending on the size and scope of the investment, and the capacity of the effects to unfold.

Although generalisations should be avoided, projects typically belonging to some sectors have a common scope of effects. For example, transport investments such as a new national road, even if implemented within a regional framework, should be analysed from a broader perspective since they usually form part of an integrated network that may extend beyond the geographical scope of the analysis. The same can be said for an energy plant serving a delimited territory but belonging to a wider system. In contrast, water supply and waste management projects are more frequently of local interest. However, all projects must incorporate a wider perspective when dealing with environmental issues related to CO₂ and other greenhouse gas (GHG) emissions with effects on climate change, which are intrinsically non-local.

A good description of the impact area requires the identification of the project’s final beneficiaries, i.e. the population that benefits directly from the project. These may include, for example, road users, households exposed to a natural risk, companies using an industrial park, etc. It is recommended to explain what type of benefits will be enjoyed and to quantify them as much as possible. The identification of the final beneficiaries should be consistent with the assumptions of the demand analysis.

In addition, all bodies, public and private, that are affected by the project need to be described. Large infrastructure investment does not usually only affect the producer and the direct consumers of the service, but can generate larger effects (or ‘reactions’) e.g. on partners, suppliers, competitors, public administrations, local communities, etc. For instance, in the case of a railroad linking Ugandan or Tanzanian border posts with Kigali, local communities along the railroad layout may be affected by negative environmental impacts, while the benefits of the project are mostly accrued by the inhabitants of the towns where the train will stop. The identification of ‘who has standing’ should account for all the stakeholders who are significantly affected by the costs and benefits of the project.
GOOD PRACTICES

- Where a project has several stages or phases, these are properly presented together with their respective costs and benefits.
- Individual investment measures are bundled into one single project when these are: i) integral to the achievement of the intended objectives and complementary from a functional point of view; ii) implemented in the same impact area; iii) share the same project promoter; and iv) have similar implementation periods.

COMMON MISTAKES

- An artificial splitting of the project is adopted to reduce the project investment cost in order to fit to the available budget.
- Project over scaling: investments which are functionally independent of each other are packaged together without a preliminary verification of the economic viability of each investment and of possible combinations and without a clear functional and strategic link among them.
- Project under scaling: a request for funds is presented for financing a portion of a project which cannot be justified in isolation from other functional elements.
- Project over sizing due to over optimistic assessment of the impact area, e.g. on the basis of unrealistic assumptions of demographic growth.
- The institutional set up for project operations is presented unclearly. This will make it difficult to verify that financial cash flows are properly accounted for in the financial analysis.
- Benefits of a second phase of a project are included in the economic analysis of the first phase without also including the additional costs, thus making the first phase look economically and/or financially more attractive.

3.4 Technical and administrative feasibility, social and environmental assessment

CONTENTS AND PURPOSE OF THIS SECTION

- This step contains various types of analyses which require expert involvement
- Demand analysis: provides a forecast of demand for the project
- Demand analysis should be based on background information and socio-economic data, and should be clear and transparent in methodology and main assumptions
- Options analysis should consider various locations, technologies, layouts, designs, etc. of the project as well as potential effectiveness and environmental and social effects
- Options analysis should score and weigh all these criteria to select the best option, usually this is done by means of a Multi-Criteria Analysis (MCA)
- All social and environmental impacts should be considered, described and where possible mitigating measures should be proposed; usually this is done in Environmental Impact Analysis (EIA)
- The social impacts analysis should include expropriation and resettlement issues and all potential social risks of the project
• The technical design should include a description of location of the project, including demonstration of availability and necessary permits
• The technical design should include a description of the main works components, technology applied, design standards etc. It should include cost estimates for each works component, including labour
• A plan for implementation of the project should be provided, including timing of preparatory steps (studies, analysis), construction and implementation phase
• A plan for operation of the project should be provided, including institutional and legal implications, management and governance structures, description of the organisation, procedures, budgets for operations

This stage of the FS development calls for deployment of various technical specialists, including architects, civil/mechanical engineers, geotechnical/materials/measurement engineers, land surveyors/quantity surveyors, environmental experts, social experts, economists etc. In most cases, these services are out-sourced.

Technical feasibility, social and environmental sustainability are among the elements of information to be provided. Although these analyses are not formally part of the CBA / CEA, their results must be concisely reported and used as a main data source within the CBA / CEA (see box). Detailed information should be provided on:

• demand analysis;
• options analysis;
• social and environmental assessment;
• technical design, cost estimates and implementation schedule.

In the following, a review of the key information that needs to be summarised in the CBA / CEA, in order to understand the overall justification of the project solution sought, is provided. Although they are presented consecutively, they should be viewed as parts of an integrated process of project preparation, where each piece of information and analysis feed each other into a mutual-learning exercise (see box on timing of CBA / CEA).

**TIMING OF CBA / CEA: AN ONGOING PROCESS**

The CBA principles should be adopted in the project design process as soon as possible. The CBA / CEA should be understood as an ongoing, multi-disciplinary, exercise performed throughout the project preparation in parallel with other technical and environmental considerations. Prerequisites for the CBA / CEA of the proposed project solution are, however, the finalisation of a detailed demand analysis and the availability of investment and operational and management (O&M) cost estimates, including costs for environmental mitigation and adaptation measures. These are based on the preliminary project design, which are centrepieces of the ‘technical’ feasibility study and the EIA.

This does not necessarily mean that the analysts responsible for preparing the CBA / CEA should start working after the engineers complete the preliminary technical design and deliver the cost estimates, but rather in parallel. In fact, analysts preparing the CBA / CEA should adopt an interdisciplinary approach to project
preparation from an early stage and are usually involved in preliminary, simplified CBAs / CEAs for comparisons of different technical and environmental options. Their involvement in the preparation of the demand analysis and options analysis is useful (and often decisive) in achieving the best results for the project.

Once the optimal project solution is identified, a full-scale CBA / CEA is usually performed at the end of the preliminary design stage. The aim is to provide confirmation to the project planner(s) of the adequacy and economic convenience of the proposed solution to meet the pre-established project objectives. The results of the full-scale CBA / CEA, based on the most recent cost estimates, shall be the foundation for formulating the Project Profile Data form (PPD) to propose a new project in the planning cycle.

3.4.1 Demand Analysis
Demand analysis identifies the need for an investment by assessing:

- current demand (based on statistics provided by service suppliers, regulators, ministries, national and/or regional statistical offices for the various types of users). In the case of a Rwandan road, demand is assessed by carrying out traffic counts on a particular project road. If it is a piped water supply scheme, household surveys would determine how much water is in demand in the projects influence area.
- future demand (based on reliable demand forecasting models that take into consideration macro- and socio-economic forecasts, alternative sources of supply, elasticity of demand to relevant prices and income, etc.) in both the scenarios with- and without-the-project.

Both quantifications are essential to formulate demand projections, including generated/induced demand where relevant, and to design a project with the appropriate productive capacity. For example, it is necessary to investigate which share of the demand for public services, road transport, or disposal of waste material can be expected to be satisfied by the project. Demand hypotheses should be tested by analysing the conditions of both the present and future supply, which may be affected by actions that are independent from the project.

PROJECTS BELONGING TO LARGER, TRANSBOUNDARY NETWORKS

Particular attention should be paid to identifying whether the project under consideration belongs to networks. This is particularly the case for transport and energy infrastructures, which always form part of networks, but also for ICT and telecommunication projects.

When projects belong to networks, their demand (and consequently their financial and economic performance) is highly influenced by issues of mutual dependency (projects might compete with each other or be complementary) and accessibility (ease of reaching the facility).

There are several techniques that can be used for demand forecasting, ranging from simple regression analysis to sophisticated network models. The choice depends on the data that is available, the resources that can be dedicated to the estimates and on the sector for which the estimate is done.
Transparency in the main assumptions, as well in the main parameters, values, trends and coefficients used in the forecasting exercise, are matters of considerable importance for assessing the accuracy of the estimates. Assumptions concerning the policy and regulatory framework evolutions, including norms and standards, should also be clearly expressed. Furthermore, any uncertainty in the prediction of future demand must be clearly stated and appropriately treated in risk analysis. The method used for forecasting (including the type of model), the data source and the working hypotheses must be clearly explained and documented in order to facilitate the understanding of the consistency and realism of the forecasts.

**GOOD PRACTICES**

- Use is made of appropriate modelling tools to forecast future demand.
- Where macro-economic/socio-economic data/forecasts are available from official national sources, consistent use of them is made across all projects/sectors within the country.
- Demand is appraised separately for all distinct groups of users/consumers relevant to the project.
- Effects of current or planned policy measures and economic instruments that could influence the project are taken into account for demand analysis. Also, all parallel investments potentially affecting the demand for services delivered by the project are identified, described and assessed.

**COMMON MISTAKES**

- The methodology and parameters used for estimation of current and future demand are not explicitly presented nor justified, or they deviate from national standards and/or official forecasts for the region/country.
- Users’ growth rates ‘automatically’ assumed throughout the entire reference period of the project are overoptimistic. Where uncertainty exists, it is wise to assume a stabilisation of demand after the first e.g. 3-to-X years of operation.
- Insufficient or incomplete market analysis often leads to an overestimation of revenues. In particular, a full assessment of the competition in the market (projects providing similar products and/or surrogates) and quality requirements for project outputs are often neglected.
- The link between demand analysis and design capacity of the project (supply) is missing or unclear. The design capacity of the project should always refer to the year in which demand is highest.

### 3.4.2 Options analysis

Undertaking a project entails the simultaneous decision of not undertaking any of the other feasible options. Therefore, in order to assess the technical, economic and environmental convenience of a project, an adequate range of options should be considered for comparison.

Thus, it is recommended to undertake, as a first step for large projects, a strategic options analysis, typically carried out at pre-feasibility stage and which may require multi-criteria analysis. The approach for option selection should be as follows:

- establish a list of alternative strategies (e.g. technological choice, location, coverage) to achieve the intended objectives;
• screen the identified list against some qualitative criteria, e.g. multi-criteria analysis based on a set of scores, and identify the most suitable strategy.

For example, a river crossing needs to be provided. There are several options to provide a crossing: by means of starting ferry operations, or by constructing a bridge or a tunnel. There are also options in the choice of capacity: size of the ferry service and frequency, number of traffic lanes in the bridge or tunnel. Each option requires a different investment, has different operational costs and will have a different capacity. There may also be several locations where the crossing can be provided, depending on the width of the river, the flow of the water and the position of the crossing in the road network. There are also several technical solutions; for instance, the material and type of construction of a bridge. These more detailed technological alternatives are generally not part of the strategic options analysis, but are assessed during the technical feasibility phase. Examples are the choice for a type of road pavement or the choice for quay wall construction in a port.

<table>
<thead>
<tr>
<th>STRATEGIC OPTIONS: DIFFERENT EXAMPLES</th>
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<tbody>
<tr>
<td>• Different routes or construction timing in transport projects (roads/rails).</td>
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<tr>
<td>• Centralised vs. decentralised systems for water supply or wastewater treatment projects.</td>
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<tr>
<td>• A new gravity sewer main and a new wastewater treatment plant vs. a pumping station and pressure pipes that pump the wastewater towards an existing treatment plant, but with a capacity which has to be increased;</td>
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<tr>
<td>• Different locations for a centralised landfill in a regional waste management project.</td>
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<tr>
<td>• Retrofitting an old power plant or building a new one.</td>
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<tr>
<td>• Different peak load arrangements for energy supply.</td>
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<td>• Large hospital structures rather than a more widespread offer of health services through local clinics.</td>
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<tr>
<td>• Possible re use of existing infrastructure (e.g. ducts, poles, sewerage networks) or possible co deployment with other sectors (energy, transport) to reduce the cost of broadband deployment projects.</td>
</tr>
</tbody>
</table>

Once the strategic option is identified, a comparison of the specific technological solutions is typically carried out at feasibility stage. In some circumstances, it is useful to consider, as a first technological option, a ‘do-minimum’ solution. As mentioned, this assumes incurring certain investment outlays, for example for partial modernisation of an existing infrastructure, beyond the current operational and maintenance costs. Hence, this option includes a certain amount of costs for necessary improvements, in order to avoid deterioration of infrastructure. Synergies in infrastructure deployment (e.g. transport/energy and high-speed broadband infrastructure) should also be considered, in view of better use of public funds, higher socio-economic impact, and lower environmental impact.

Once all potential technological solutions are identified, also in the context of the Environmental Impact Assessment (EIA), they need to be assessed and the optimal solution selected as the subject of the financial and economic appraisal. The following criteria shall be applied:

• if different alternatives have the same, unique, objective (e.g. in the case of compliance-driven projects with predetermined policy objectives or targets) and similar externalities, the selection
can be based on the least cost solution per unit of output produced, in which case the CEA is completed;

- if outputs and/or externalities, especially environmental impacts, are different in different options (assuming all share the same objective), it is recommended to undertake an MCA for all main options in order to select the best alternative.

The criteria considered in selecting the best solution, with ranking of their importance and the method used in the evaluation, shall always be presented by the project promoter as a justification for the option chosen.

**GOOD PRACTICES**

- The options analysis is based on a common baseline (i.e. a common counterfactual scenario and consistent demand analysis are adopted across the options).
- The options analysis starts from a more strategic point of view (i.e. general type of infrastructure and/or location/alignment for the project) and continues with an assessment of specific technological variants for the type of infrastructure/site selected. New alternative technologies are accompanied by a thorough assessment of their technological, financial, managerial risks, climate risk and environmental impacts.
- For comparisons based on costs, all assumptions on unit costs of investment, O&M and replacement should be disclosed and explained separately for each option to facilitate their appraisal. Unit costs of common consumables (e.g. labour, energy, etc.) are the same for all options.
- Options are compared using the same reference period.

**COMMON MISTAKES**

- The various project options are discussed and analysed in detail, but they are not assessed against a counterfactual scenario which forms the basis of the incremental approach.
- The identification of possible alternatives is done rather ‘artificially’, e.g. alternatives are not genuine solutions but simply constructed to show they are worse than the preferred (pre-decided) alternative.
- There is lack of ‘strategic thinking’: project options are considered only in terms of alternative routes (for transport projects) or alternative technologies of a pre-selected solution, but not in terms of possible alternative means to achieve the intended objectives.
- Too many or irrelevant criteria, or inappropriate scoring, are used in multi-criteria analysis for shortlisting the project options.

### 3.4.3 Social and Environmental considerations, including expropriation and cross-cutting areas

Some requirements on the project’s social and environmental considerations should be fulfilled in parallel with the technical considerations and contribute to the selection of the best project option. In this context, the project promoter shall demonstrate to which extent the project contributes to environmental protection, resource efficiency and climate change targets, respects the “polluter pays principle”, takes account of social risks and impacts, and complies with pertinent regulations. Special attention should be given to the investment social impacts, particularly in case expropriations and resettlements cannot be avoided.
When appropriate, an Environmental Impact Assessment (EIA) procedure must be carried out to identify, describe and assess the direct and indirect effects of the project on human beings and the environment. While the EIA is a formally distinct and self-standing procedure, its outcomes need to be integrated in the FS & CBA / CEA and be in the balance when choosing the final project option. The costs of any environmental integration measures resulting from the EIA procedure (including measures for protection of biodiversity) are treated as input in the assessment of the financial and economic viability of the project. On the other hand, the benefits resulting from such measures are estimated, as far as possible, when valuing the non-market impacts generated by the project.

Costs and benefits resulting from the integration of both mitigation and adaptation measures in the project design are used in the appraisal of the project’s financial and economic performance.

The Project effects and impact on the environment is studied in relation to both the construction phase and the operational phase. Generally, the screening and scoping phase – carried out by the relevant national authorities - determines the studies to be carried out in relation to the characteristics of the project and the impact area. Environmental analysis shall encompass the assessment of the investment impact on habitat and species.

**Environmental Impact Assessment (EIA)**

When appropriate an Environmental Impact Assessment (EIA) needs to be carried out in line with the Organic Law N° 04/2005 of 08/04/2005 determining the modalities of protection, conservation and promotion of environment in Rwanda and respective guidelines to analyse significant environmental impacts (positive or negative) of a proposed project and its alternative design options on the physical, biological, cultural and socio-economic characteristics of a particular geographic area. The objective of the EIA is to prevent and mitigate adverse impacts, enhance positive impacts and assist the rational use of resources, hence maximising the benefit of socio-economic developments and ensuring sustainable development. Respective findings are summarised in the Environmental Impact Report (EIR), including the Environmental Management Plan (EMP), which indicates among others impacts, measures and respective costs to mitigate negative and strengthen positive environmental impacts.

As a tool for sustainable development and poverty reduction in Rwanda, EIA addresses responsible and equitable use of the environment resources and fostering the commitment for environmental protection. EIA contributes to sustainable development by increasing efficiency of development projects in light of environmental regulations and requirements. It streamlines business practices to conform to regulations’ requirements of development, environmental protection and habitat use. It also ensures that projects take necessary prevention, mitigation and monitoring steps to safeguard them from the high costs of environmental remediation if environmental damage occurs.

Projects subject to EIA are listed in the Ministerial Order N° 004/2008 of 15/08/2008 establishing the list of works, activities and projects that have to undertake an environment impact assessment.

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Environmental issues

The Project effects and impact on the environment is studied in relation to both the construction phase and the operational phase. Generally, the screening and scoping phase determines the studies to be carried out in relation to the characteristics of the project and the impact area. Environmental analysis shall encompass the assessment of the investment impact on habitat, species and climate. The impact on any protected areas such as natural parks and wetlands shall be studied in detail. The environmental feature on which the investment can have significant impact may include:

- Flora, fauna, habitats;
- Soil and geology;
- Land Use;
- Surface water;
- Groundwater;
- Agriculture;
- Forestry;
- Hunting;
- Archaeological and Cultural Heritage;
- Landscape and aesthetics;
- Tourism and Recreation;
- Existing public and private infrastructure;
- Population and human health;
- Air Quality.

The analysis shall be cross sectoral. For example, impacts on groundwater do generally determine impacts on habitats and species, agriculture and existing infrastructure; but other impacts may be found on cultural heritage, tourism and recreation. Mitigation measures shall be identified, recommended and costed.

Socio-economic issues

Both positive and negative impacts of the project on the society are to be analysed. The main positive impact is generally the reason why the project is envisaged (e.g. to provide drinkable water to local communities, to improve roads within the project area etc.). The above impact is to be appropriately analysed and quantified. There might be temporary or permanent impacts in terms of jobs and/or economic activities. However, some infrastructure / economic activity might be affected and appropriate mitigation measures are therefore to be envisaged. One particular category of social impact is the need of expropriating land and other properties and the resettlement of the affected households and communities.

Expropriation issues: Resettlement and Compensation

Due to its tremendous social impacts, special attention has to be paid at feasibility stage to the issue of expropriation. Resettlement and Compensation procedures shall be completed before construction or physical implementation of a project commences. The EMP should also outline, how expropriation, resettlement and compensation are supposed to be done; which area or group of affected people will be resettled or compensated, when and at what estimated compensation. Compensation and/or resettlement measures shall be planned and costed according to the Expropriation and Compensation
Law N° 01/2007 of 20/01/2007, the Organic Law on Land (2005), Organic Law on Environment No 04/2005 and any other law relevant to compensation or resettlement issues.

In this context, the following major resettlement issues (risks and opportunities) should be taken into consideration:

- Displacement of people from an area;
- Loss of property, businesses, land or access to other natural resources, e.g. access to (irrigation) water;
- Economic losses for affected individuals and families (e.g. loss of crops and economic fruit trees) with a temporary or permanent loss of income for subsistence (e.g. loss of a roadside location for an informal business, etc.);
- Social disruption and break-up of families due to displacement and relocation;
- Loss of community benefits and social disintegration.
- Risk that people with fewer resources and skills become even more vulnerable due to lack of land, economic losses, social disruption and loss of community benefits (equity issues).
- Possibilities to improve livelihood (i.e. access to resources) of most vulnerable population groups through resettlement and compensation, herewith reducing inequity between different population groups (potential opportunities).

Since the needs, benefits and risks concerning expropriation and resettlement can be different for men versus women, poor versus rich people, rural versus urban population, people with and without disability, respective mitigation measures have to build upon disaggregated information. Thereby ensuring that benefits, risks and opportunities for different groups are integrated into planned resettlement and compensation activities.

At feasibility stage information about estimated figures for the compensation of expropriated landowners as well as cost estimates for further resettlement and mitigation measures, including the underlying assumptions, is required and should form part of the EMP in the EIR.

Where applicable a separate Resettlement Action Plan (RAP) has to be developed. RAP is a document in which a project developer or other responsible entity specifies the procedures that it will follow and the actions that it will take to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by an investment project.

Consideration of social risks and impacts

Development strategies and projects need to be as inclusive as possible: projects shall be designed to ensure equitable opportunities for full participation of all groups in society, economic life and labour market, in this regard also ensuring the accessibility and usability of infrastructure. Ideally, social risks and impacts are fully reflected in the EIA under the headline of socio-economic development. This guideline therefore complements the Rwanda Environment Management Authority (REMA) environmental impact assessment guidelines 2006, as well as sector specific EIA guidelines, and emphasizes the social dimension of the project assessment: The purpose is to identify social and

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15 See: Sector guidelines for EIA for roads development projects in Rwanda, Rwanda Environment Management Authority, August 2009
economic impacts and to define potential measures to avoid, manage, mitigate or offset negative or enhance positive predicted impacts, including the number of jobs created by the project. In this regard impacts can be either positive (i.e. benefits and opportunities to capitalise on) or negative (i.e. adverse impacts to be managed).

Among others, the following social risks and impacts should be considered to identify impacts, develop mitigation measures and derive strategies exploiting positive impacts as opportunities:

- Any prejudice or discrimination towards individuals or groups in providing access to development resources and project benefits: Assessment of who will and who will not benefit in terms of usability and accessibility of the planned infrastructure based on disaggregated information for men, women, people with disability and poor families.
- Opportunities to contribute to the reduction of vulnerability of disadvantaged groups (including people with disability) and improved gender equity through accessibility and usability of the proposed infrastructure project (incl. opportunity to increase access to resources like jobs, markets, public services, social network, etc.)
- Risks that negative project impacts fall disproportionately on individuals or groups who may be disadvantaged or vulnerable: Assessment of who will be negatively and will not be affected by the proposed infrastructure in terms of land and natural resource tenure and use, land access, food security, losing job, social network, access to markets, etc. Again, considering disaggregated information for men, women, people with disability and poor people.
- Impacts on the health, safety and well-being of workers and project affected communities, including increasing the risk of HIV infection during and after the construction phase.
- Consideration of the impact on gender balance and how the project may contribute to promotion of gender equality.
- Potential for child labour.
- Impact on job creation during and after the construction phase.
- Risks to cultural heritage.

At feasibility stage identified social impacts, devised mitigation measures and management strategies as well as associated costs should be part of the EMP in the EIR.

**Linkage of the environmental and social assessment to the further financial and economic analysis**

While the EIA is a formally distinct and self-standing procedure, its outcomes need to be integrated in the CBA / CEA and considered when choosing the final project option. The costs of any environmental integration measures resulting from the EIA procedure are treated as input in the assessment of the financial and economic viability of the project. On the other hand, the benefits resulting from such measures are estimated, as far as possible, when valuing the non-market impacts generated by the project (see chapter economic benefits).

Against this backdrop, the EIR, including the EMP, indicating among others impacts, mitigation measures and respective costs, is needed to prepare a proper financial and economic analysis of the proposed project at feasibility stage.
Also, mitigation measures and management strategies to cope with social impacts (negative and positive) as well as with effects resulting from expropriation and resettlement should be reflected in the EMP to be properly considered in the further steps of analysis. If the information on social aspects and expropriation issues does not form part of the EIR or EMP, separate documents have to be provided at feasibility stage.

GOOD PRACTICES

- Environmental and socio-economic considerations are incorporated into the project design and preparation at an early stage. For example, project design shall study and implement the technical alternatives suitable to decrease the scope of expropriation and resettlements. Any other mitigation measures to reduce environmental and socio-economic negative impacts are proposed under the EIA procedure.
- Cost of measures taken for correcting and monitoring negative impacts are included in the investment cost and the operational costs considered in the CBA / CEA, respectively.
- Early dialogue between the developer and the authorities/nature experts (REMA) is carried out to run procedures smoothly and to enable better and faster decisions, which in turn could reduce costs and avoid delays. Public consultations are also carried out in Rwanda to complement the EIA analysis and include any valuable inputs into the proposals for mitigation and improvement.

COMMON MISTAKES

- There is no consistency between options analysed in the CBA / CEA and options analysed in the EIA. In particular, the options selected for the CBA / CEA are not fully analysed in the EIA.
- Project cost does not incorporate cost of mitigation measures and environmental and socio-economic costs and benefits are not properly considered into the economic analysis.
- No proper consultation of people affected by the project has been conducted.

3.4.4 Technical design, cost estimates and implementation schedule

A summary of the proposed project solution shall be presented with the following headings.

- **Location**: description of the location of the project including a graphical illustration (map). Availability of land is a key aspect: evidence should be provided that the land is owned (or can be accessed) by the beneficiary, who has the full title to use it, or has to be purchased (or rented) through an acquisition process. In the latter case, the conditions of acquisition should be described. The administrative process and the availability of the relevant permits to carry out the works should also be explained. Instances of expropriation should be considered; resettlement and compensation procedures should be described and followed.

- **Technical design**: description of the main works components, technology adopted, design standards and specifications. Key output indicators, defined as the main physical quantities
produced (e.g. kilometres of pipeline, number of overpasses, number of trees planted, etc.), should be provided.

- **Capacity-utilisation plan**: description of the infrastructure capacity and the expected utilisation rate - expected numbers of users. These elements describe the service provision from the supply side. Project scope and size should be justified in the context of the forecasted demand.

- **Costs estimates**: estimation of the financial needs for project realisation and operations are imported in the CBA / CEA as a key input for the financial analysis. Evidence should be provided as to whether cost estimations are project promoter estimates, tender prices or costs as achieved.

- **Implementation timing**: a realistic project timetable together with the implementation schedule should be provided including, for example, a Gantt chart (or equivalent) with the works planned. A reasonable degree of detail is needed in order to enable an assessment of the proposed schedule. In the case of projects that will require land acquisition, the timing of expropriation should be considered. This also takes into consideration the timing of the preparation of a Resettlement Action Plan for the Project Affected Persons.

The Feasibility Study should provide the source for cost estimates as well as specify the stage of the design associated to these cost estimates (e.g. conceptual design, preliminary design or main/detailed design – see also Footnote 14), so that accuracy of the estimates can be properly assessed. Generally, cost estimates are provided under ‘Bill of Quantities’ format. Bill of Quantities (BoQ) is a list of items giving brief identifying descriptions and estimated quantities of the works. Since the BoQ provides a measure of the extent of works, this allows the works to be priced. The works included in each item are defined in detail by the rules in the Method of Measurement. It is necessary therefore for the BoQ to state, usually in the Preamble to the Bill, the method applicable. However, because of the uncertain nature of much of civil engineering work at the billing stage, the quantities are “estimated”. In the majority of contracts, the works will be remeasured on site to reflect the true quantities actually required\(^\text{16}\).

**Annex E** provides a template of Bill of Quantities and other forms that are used during the design stage to prepare estimates of cost of works based on unit prices, in accordance with the International Federation of Consulting Engineers (FIDIC\(^\text{17}\)) guidance. The BoQ may serve a number of functions as:

- It provides for detailed cost estimates that are used to tender the works;
- Once the works are contracted, it provides for a schedule of rates as the contract basis for valuing variations in the works;
- It is a basis for measuring the value of works completed for the purpose of payments.

Authors of a Feasibility Study will need to use information from the Bill of Quantities as an input on estimated costs of each investment component. Moreover, investment costs are to be associated to the

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http://fidic.org/sites/default/files/Bills%20of%20Quantity%20Atkinson.pdf

\(^{17}\) http://fidic.org/about-fidic
estimated duration of works, often as a percentage, e.g. 20% of total investment costs are to be incurred in the first year within the reference period, another 40% in the second year and the remaining 40% in the third year. The Bill of Quantities should provide for prices net of VAT and should specify the exchange rates used to convert prices from other currencies, whenever applicable. Thus, the authors of the feasibility study have to check that this is the case and use the information accordingly.

**GOOD PRACTICES**

- A concise summary of the results of the feasibility study(ies) is included in the CBA / CEA report to explain the justification of the selected solution. Input data from the technical studies are duly used in the CBA / CEA. Should the FS include a section on CBA / CEA, consistency with the main CBA / CEA report is ensured or major differences explained.
- The Bill of Quantities is consulted to check that all investment components (including the costs of environmental mitigation measures) have been included under cost estimates.
- The technical description of investment and operating cost components provides sufficient detail to allow for cost benchmarking.

**Direct employment in the investment and operational phase**

Direct employment during the investment and operational phase is generally estimated by the designers when estimating investment and operational costs. The detailed breakdown of prices (see e.g. Annex E) provided by the designers is in fact based on estimates of costs of materials, equipment and labour. Therefore, engineers are best placed to provide estimates on the number of direct Full-Time-Equivalent (FTE) jobs\(^{18}\) to be created by an investment during both the investment and the operational phase. A good practice is that cost estimates distinguish between skilled and unskilled labour, having in mind that conversion costs for the purpose of the economic analysis could differ for these two categories\(^ {19}\).

According to a recent publication by an International Financial Institution, unskilled labour employed in construction is 40% of the cost and gains 30% of the wage paid\(^ {20}\). In line with the above, it is recommended that Terms of Reference for designers require the designers to estimate the annual number of direct unskilled and skilled FTE jobs during the investment and the operational phase.

The number of direct jobs to be created (expressed in FTE) can for instance be presented as follows, see Table 3-2.

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\(^{18}\) A full-time equivalent, sometimes abbreviated as FTE, is a unit to measure employed persons in a way that makes them comparable although they may work a different number of hours per week. The unit is obtained by comparing an employee’s average number of hours worked to the average number of hours of a full-time worker. A full-time person is therefore counted as one FTE, while a part-time worker gets a score in proportion to hours he or she works. For example, a part-time worker employed for 20 hours a week where full-time works consists of 40 hours, is counted as 0.5 FTE.

\(^{19}\) Skilled labour of category consists of workers who would be able to find alternative employment quickly and where supply is fixed in the short term. This generally includes those with specialist skills and in vocational, technical, or managerial roles. For skilled labour that is scarce, the actual wage rate paid by the project inclusive of benefits can be taken as its economic cost. In the relatively rare case where wage controls and barriers to labour mobility mean the economic cost is greater than the wage actually paid, an upward adjustment to the actual wage paid can be made.

\(^{20}\) Guidelines for the economic analysis of projects, Asian Development Bank, 2017
Table 3-2: Example of presentation of number of jobs created in a project

<table>
<thead>
<tr>
<th>Number of jobs directly created:</th>
<th>No (FTE)</th>
<th>Average duration of these jobs (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>During investment phase</td>
<td>38</td>
<td>12</td>
</tr>
<tr>
<td>During operational phase</td>
<td>59</td>
<td>78</td>
</tr>
</tbody>
</table>

3.4.5 The plan for implementation of the project

The plan for implementation of the project takes into consideration all aspects of implementation of the investment or development project both in terms of resource constraints and institutional capability. In case of hard infrastructure, project implementation starts with the pre-feasibility and feasibility studies and other planning documents, to conclude with the end of construction and installation of supplies, thus allowing the start of operations. In case of development projects, in some cases there are no works or supplies, and therefore the feasibility study is followed by implementation of the activities according to each specific case.

The following implementation aspects are analysed under this section:

- Project implementation team during the investment phase, and,
- Time-Table for implementing the project.

According to the concept adopted by the Government of Rwanda since 2011, a Single Project Implementation Unit (SPIU) established within the Beneficiary organisation shall ensure that the project is delivered on time to suitable costs and quality. The Single Project Implementation Unit is responsible for all phases of implementation (procurement/construction), including the procurement strategy. Therefore, an organisation chart shall be provided in the FS that identifies the various participants, their interfaces and reporting relationships, and their roles and responsibilities and the place of this project management team in the organisational structure of the promoter.

The SPIU shall:

- ease project coordination; introduce economies-of-scale in the shared functions for instance in fiduciary functions like monitoring and evaluation (M&E), finance and accounting as well as procurement among others and
- enhance institutional memory, expertise and the depository of knowledge would be leveraged through reduced staff turnover in Project Implementation Units (PIUs).

A Single Project Implementation Unit typically comprises the following positions that are seen as crucial to the success of project implementation:

- SPIU Coordinator – overall head of unit, who reports directly to the Chief Budget Manager;
- Programme Manager;
- Sector Specialists – sector specific experts relevant to the specific project;
- Fiduciary – Finance, Procurement, M&E – specialists and professionals;
- Administration – Administrative Assistant, IT Technician.

Thus, this section of the FS Report shall describe the background and experiences of these key staff. It is crucial that these staff have the correct experience. A plan for training the assigned staff and/or recruiting new staff shall be prepared; this shall also include the envisaged consultancy agreements. It should be
noted that the Project Management Unit cannot simply offload the entire management task to a contractor, as they are responsible for the overall project and have specialised knowledge that is needed for making key decisions. Finally, the information system supporting Project implementation must be planned.

It is important to define what defines completion or end result of the implementation phase. All steps necessary for the preparation, implementation and launch of the Project, including all relevant tenders, should be identified and scheduled in the Project Time-Chart, which defines inter alia the implementation milestones. The Project Time-Chart comprises:

- The Building Planning and Contract Scheduling;
- The Project Time-Table;
- The Procurement Plan;
- The Plan of public consultations.

The completeness of all required project documentation shall be assessed.

The Building Planning and Contract Schedule includes both procurement and construction. The chart on the following page (Figure 3-1) presents an indicative example of the above schedules. Relevant durations for procurement shall be added in accordance with the applicable procurement law, while the other deadlines shall be based on the appropriate contractual clauses. It is also observed that the construction schedule includes the period of time necessary for completing the investment, plus the period of time contracted as ‘Defects Notification Period’ (from 1 to 2 years, depending on contractual provisions). The supervision of works by the Engineer shall last until the end of the Defects Notification Period.

The Project Time-Table shall be possibly prepared as a Gantt chart presenting project phases, key tasks, responsibilities, and accompanying milestones. Provision of time and date estimates is required.
Figure 3-1: example of Building Planning and Contract Schedule

<table>
<thead>
<tr>
<th>Activity</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple procurement - public procurement specialist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation of tenders - 5 tenders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start the procurement procedure - open procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tender for works (FIDIC Red+GPP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment - lasers/scientific equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment - 2 groups (non scientific equipment)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA time and frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standstill period</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deadline for appeals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deadlines for the Contracting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Works (12 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tests on completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Users permit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation of equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DNP (2 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervision of construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Red: Activity starts
- Blue: Activity ends
- *: Activity spans multiple years
Table 3-3: Template Project Time-Table

<table>
<thead>
<tr>
<th>Phase/key task</th>
<th>Hard infrastructure</th>
<th>Development projects</th>
<th>Start date</th>
<th>Completion date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-feasibility study:</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design studies: conceptual design, preliminary design, main/ detailed design:</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental impact assessment including public consultation:</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial and economic analysis and full Feasibility Study Report:</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation of tender documentation(s):</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use and construction permits (whenever required):</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other approvals and clearances (please specify):</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tender procedure(s):</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land acquisition including public consultation:</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any other public consultations (completed/still outstanding):</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction phase/contract(s) (including supervision during the Defects Notification Period):</td>
<td>X</td>
<td>If applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other activities (please specify):</td>
<td>If applicable</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational phase:</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The potential **financing sources** shall be also presented under this section. Any ongoing negotiations shall be reported and the potential role of the private sector carefully analysed.

**GOOD PRACTICES**

- The key functions to be performed during project implementation have been defined and responsibilities properly assigned to the team members. Any needs for external technical expertise are identified.
- The Project time table also includes all project planning documents under the phases already completed, and indicates the expected dates for the remaining phases, as well as for obtaining location and building permits.
A robust procurement strategy is in place based on market search and knowledge of the potential suppliers and their capacities. A detailed procurement plan is provided which includes all planned tenders, with specification, for each tender, of the envisaged procedure and the estimated tender amount.

**COMMON MISTAKES**

- Timing for acquisition of land including through expropriations, as well as timing for construction of any related infrastructure outside the project scope, are not appropriately factored.
- Outsourcing of all project management tasks.
- Financing sources not identified and potential role of the private sector not analysed.
- Project insurance not included under the procurement plan.
- The Defects Notification Period (DNP) is not included under the construction schedule and/or the duration of works supervision does not consider the DNP’s duration.

### 3.4.6 The plan for operation of the project

The Feasibility Study Report shall provide for analysis of the institutional and legal framework for project operation, followed by the presentation of the management and governance structures needed for decision-making, daily management and monitoring of the operation. The plan for operation of the project shall include allocation of human and financial resources for managing and monitoring the contract.

#### Institutional and legal analysis

This analysis will build on the elements provided in the project identification section (see 3.2.2 above) where the body responsible for project implementation often referred to as ‘project promoter’ or ‘beneficiary’ is identified and its technical, financial and institutional capacities analysed.

This section shall further detail the legal status of the Project once in operation – will it be operated by the Project Promoter or another legal entity. In this case, the agreement in place regarding the operational phase should be referred to including any revenue sharing arrangements and ownership of assets acquired under the Project. This section shall also provide information on any legal issues that are still pending and the envisaged dispute resolution framework.

#### Management and governance structures

The management and governance structures needed for managing, delivering and monitoring the Project shall be defined in this chapter, which shall allow the assessment of the capacities in place and plans to meet any shortage of resources. The separation of responsibilities between management and governance structures shall be ensured, with clear reporting lines and schedules established. The governance function could be undertaken by a Project Steering Committee that shall take decisions and shall also assess each operation's progress and performance. The management and monitoring functions shall be established within the Project Promoter organisational structure.
The procedure for the transition from implementation to operation shall also be clearly described. The role of the Single Project Implementation Unit (SPIU) established by the Project Promoter (a line Ministry of Public Agency) in relation to the Project operational phase, shall be presented. The organisational structure shall be provided jointly with information on the number of staffs required for the successful implementation and operation of the project, by position (project manager, technicians, administrative staff etc.). In case additional staffs need to be recruited, the strategy and timetable for recruitment and training shall be presented.

**Plan for operation of the project**

After the end of the investment or development phase, the Project Operation Plan shall encompass the following elements:

- Contract management team to be assigned based on need and workload analysis,
- Internal procedures regulating implementation and regular update of the Project Operation Plan, and monitoring and reporting during the operational phase,
- Budget allocated for operational and maintenance costs (and any replacements costs whenever necessary)\(^{21}\),
- Monitoring and reporting schedule,
- Financial resources necessary during the current budgetary cycle and beyond, if applicable,
- Evaluation plan.

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**GOOD PRACTICES**

- The procedure for the transition from Project implementation to Project operation is clearly described.
- Financial resources have been secured for managing and monitoring the Project during the current budgetary cycle.
- A monitoring and reporting schedule are developed.
- Plans are developed to respond to difficulties or problems as they eventually arise.

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**COMMON MISTAKES**

- No arrangements are foreseen to ensure that needed financial resources shall be available beyond the current budgetary cycle.

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\(^{21}\) Not applicable to development projects.
3.5 Financial analysis

CONTENTS AND PURPOSE OF THIS SECTION

- Financial feasibility and sustainability are calculated for CBA and CEA alike
- Methodology of financial analysis is based on the discounted cash flow method. Only cash in and out of the project is considered. Taxes, finance costs and amortisations are not included.
- For CBA financial ratios (FNPV and FIRR) are calculated; additionally, for CEA, the FNPV of costs per unit of output or the output per unit of FNPV cost is calculated.
- The financial discount rate to be used in Rwanda is 13%
- Contingencies are not included in the financial analysis (but are included in the budget requests)
- Cash flows out are Capital Expenditures (CAPEX) and operations and maintenance costs (O&M, or OPEX)
- Cash flows out are revenues (if any) and the residual value of the project
- VAT should be included if the project promotor cannot recover VAT (this is valid for most public organisations). VAT should be excluded if the project promotor can recover VAT (this is valid for most providers of utilities such as electricity and water companies)
- Financial feasibility is expressed in a Financial Internal Rate of Return (FIRR) and a Financial Net Present Value (FNPV). The project is financially feasible if the FIRR is above the financial discount rate; the FNPV in that case is above zero.
- Financial sustainability calculations analyse whether the project in each year of analysis has enough cash inflows to cover all cash outflows. In this case, finance costs (loan interest and repayments) are included.

3.5.1 Introduction
This stage is carried out by Economists/Financial Analysts. A financial analysis must be included in the CBA / CEA to compute the project’s financial performance indicators. Financial analysis is carried out in order to:

- assess the consolidated project profitability;
- assess the project profitability for the project promoter and some key stakeholders;
- verify the project financial sustainability, a key feasibility condition for any typology of project;
- outline the cash flows which underpin the calculation of the socio-economic costs and benefits
- The cash inflows and outflows to be considered are described in detail below.

3.5.2 Methodology
The financial analysis methodology used in this guide is the Discounted Cash Flow (DCF) method. The following rules should be adopted:

- The financial analysis should be carried out in Rwandan Francs (FRW). If project inputs or outputs are converted from foreign currencies to FRW, then the applied exchange rate should be clearly mentioned and consistently applied throughout the analysis.

- The financial analysis should consider incremental cash flows (in and out) only.
• Only cash inflows and outflows are considered in the analysis, i.e. depreciation, reserves, price and technical contingencies and other accounting items which do not correspond to actual flows are disregarded.

• Financial analysis should, as a general rule, be carried out from the point of view of the infrastructure owner. If, in the provision of a service in the interest of the general public, owner and operator are not the same entity, a consolidated financial analysis, which excludes the cash flows between the owner and the operator, should be carried out to assess the actual profitability of the investment, independent of the internal payments. This is particularly feasible when there is only one operator, which provides the service on behalf of the owner.

An appropriate Financial Discount Rate (FDR) is adopted in order to calculate the present value of the future cash flows. The financial discount rate reflects the financial opportunity cost of capital.

For financial feasibility analysis of projects to be submitted for funding under the annual planning cycle of MINECOFIN the FDR is set at 13%, in real terms.

See Annex F for more background on the FDR.

• The financial analysis should usually be carried out in constant (real) prices, i.e. with prices fixed at a base-year. The use of current (nominal) prices [i.e. prices adjusted by the Consumer Price Index (CPI)] would involve a forecast of CPI that does not seem always necessary. When a different rate of change of relative prices is envisaged for specific key items, this differential should be considered in the corresponding cash flow forecasts. When the analysis is carried out at constant prices, the FDR will be expressed in real terms. When the analysis is carried out at current prices, a nominal FDR will be used.

• Contingencies: some CAPEX estimates include contingencies, generally of up to 10% of the total CAPEX. These contingencies are included to cover limited variations the cost estimates. There often is considerable time between the moment in which the estimates are done and the time at which the works of the project are implemented, so that price variations in unit prices due to market developments or inflation may occur. The contingency is intended to cover limited cost increases, so that the project does not immediately falls short of cash if the investment costs turn out to be slightly higher than estimated.

The contingency is not included in the financial (nor in the economic) analysis. Instead, a sensitivity test is performed on financial and economic feasibility analysis results, which considers (amongst others) the effect on results of variations in CAPEX. Contingences are generally allowed to be included in grant or funding calculations.

For cost estimates of projects to be submitted for funding under the annual planning cycle of MINECOFIN a maximum contingency sum of 10% of investment costs is allowed. Note that the contingency sum should be calculated on construction works and equipment only (not on initial studies, land purchase, publicity and/or supervision).
- Project cash-flow forecasts should cover a period appropriate to the project’s economically useful life and its likely long-term impacts (design life). The number of years for which forecasts are provided should correspond to the project’s time horizon (or reference period). The choice of time horizon affects the appraisal results. In practice, it is therefore helpful to refer to a standard benchmark, differentiated by sector and based on internationally accepted practice. The proposed reference periods are shown in Table 3-4. These values should be considered as including the implementation period. In the case of unusually long construction periods, longer values can be adopted.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Reference period (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railways</td>
<td>30</td>
</tr>
<tr>
<td>Roads</td>
<td>25-30</td>
</tr>
<tr>
<td>Ports and airports</td>
<td>25</td>
</tr>
<tr>
<td>Urban transport</td>
<td>25-30</td>
</tr>
<tr>
<td>Water supply/sanitation</td>
<td>30</td>
</tr>
<tr>
<td>Waste management</td>
<td>25-30</td>
</tr>
<tr>
<td>Energy</td>
<td>15-25</td>
</tr>
<tr>
<td>Broadband</td>
<td>15-20</td>
</tr>
<tr>
<td>Research and innovation</td>
<td>15-25</td>
</tr>
<tr>
<td>Business infrastructure</td>
<td>10-15</td>
</tr>
<tr>
<td>Other sectors</td>
<td>10-15</td>
</tr>
</tbody>
</table>

Source: EU-guide for Cost-Benefit Analysis 2014

- VAT should be included in the financial analysis if the project promotor cannot recover VAT. This is the case with most public organisations. In these cases, VAT is to be included as investment cost as the project would be short of cash if unrecoverable VAT were to be excluded from the cost estimate.

If VAT can be recovered by the project promotor, it should not be included in the financial analysis. This is the case if the project promotor is a private entity or a corporatised public organisation, such as electricity and water companies in Rwanda.

Since the recoverability of VAT may vary from case to case, it is recommended that a statement from the VAT Authority is obtained and attached to the feasibility study report, which confirms whether the relevant organisation (the future Contracting Authority for the investment in reference) can or cannot recover VAT.

- A practical recommendation is to always round the figures in spreadsheets, in order to keep a good overview of order of magnitude of figures. In a spreadsheet full of figures such as 12,943,278.93 million FRW it is much harder to maintain an overview of order of magnitude than in a spreadsheet that expresses this figure as 12.9 million FRW. Thus, preferably figures are indicated with as little digits as possible, for instance in billions, millions or thousands. It is useful to maintain the full figure in calculations, as for budget reasons some International Financial Institutions (IFIs) or other grantors request calculation outcomes to be indicated up to the final
digit. In those cases, it is recommendable to create an extra outcome sheet with full figures for use in funding applications and to show rounded figures in the calculation sheets.

3.5.3 Investment cost, replacement costs and residual value

The first step in the financial analysis is the analysis of the amount and breakdown over the years of the total investment costs. Investment costs are classified by:

- Initial investment: it includes the capital costs of all the fixed assets (e.g. land, constructions buildings, plant and machinery, equipment, etc.) and non-fixed assets (e.g. start up and technical costs such as design/planning, project management and technical assistance, construction supervision, publicity, etc.). It should be presented in the form of a Bill of Quantities (BoQ), i.e. as an itemized list of quantities and prices, at least per group of assets. Some items might be lumpsums, such as design studies or publicity. Annex E contains more explanation on the BoQ.

In cases where a project consists of a completely new asset, e.g. there is no pre-existing service or infrastructure, the without-the-project scenario is one with no operations. The costs (investment and operations) can simply be taken from the technical assessment. In cases of investments aimed at improving an already existing facility, it should include the costs and the revenues/benefits to operate and maintain the service at a level that it is still operable (Business As Usual (BAU) or even small adaptation investments that were programmed to take place anyway (do-minimum). In particular, it is recommended to carry out an analysis of the promoter’s historical cash-flows (at least previous three years) as a basis for projections, where relevant, so that the incremental costs can be established.

Cost breakdown over the years should be consistent with the physical realisations envisaged and the time-plan for implementation. Where relevant, the initial investment shall also include SEIA costs.

- Replacement costs: includes costs occurring during the reference period to replace short-life machinery and/or equipment, e.g. engineering plants, filters and instruments, vehicles, furniture, office and IT equipment, etc.

It is preferable not to compute cash-flows for large replacements close to the end of the reference period. When a specific project asset needs to be replaced shortly before the end of the reference period, the following alternatives should be considered:
  o shorten the reference period to match the end of the design lifetime of the large asset that needs replacing;
  o postpone the replacement until after the end of the reference period and assume an increase of the annual maintenance and repair cost for the specific asset until the end of the reference period.

AVOIED CAPITAL INVESTMENT COST IN THE COUNTERFACTUAL SCENARIO
According to the incremental approach, investment costs should be considered net of possible avoided capital costs in the counterfactual scenario. The latter costs assume that, without the investment, there is no longer a feasible situation so that it is in any case necessary to implement other interventions, at least in a way to guarantee a minimum level of service provision. This is the assumption of taking the do-minimum as the reference scenario. For example, in the electrical sector, a new substation could be needed to satisfy the load increase in the absence of a new line. This cost must be included in the counterfactual scenario.

- **A residual value** of the fixed investments must be included within the investment costs account for the end-year. The residual value (salvage value) reflects the capacity of the remaining service potential of fixed assets whose economic life is not yet completely exhausted. The latter will be zero or negligible if a time horizon equal to the economic lifetime of the asset has been selected.

For project assets with economic lifetimes in excess of reference period, their residual value shall be determined by computing the net present value of cash flows in the remaining life years of the operation. Other residual value calculation methods may be used in duly justified circumstances. For instance, in the case of non-revenue generating projects, by computing the value of all assets and liabilities based on a standard accounting depreciation formula or considering the residual market value of the fixed asset as if it were to be sold at the end of the time horizon. Also, the depreciation formula should be used in the special case of projects with very long design lifetimes, (usually in the transport sector), whose residual value will be so large as to distort the analysis if calculated with the net present value method.

The residual value can be singled out either within the project inflows or within the investment costs but with negative sign (see Table 3-6 for an example).

3.5.4 Operating costs and revenues

The second step in financial analysis is the calculation of the total operating costs and revenues (if any).

**Operating costs**

Operating costs include all the costs to operate and maintain (O&M) the new or upgraded service. Cost forecasts can be based on historic unit costs, when patterns of expenditures on operations and maintenance ensured adequate quality standards. Although the actual composition is project-specific, typical O&M costs include: labour costs for the employer; materials needed for maintenance and repair of assets; consumption of raw materials, fuel, energy, and other process consumables; services purchased from third parties, rent of buildings or sheds, rental of machinery; general management and administration; insurance cost; quality control; waste disposal costs. and emission charges (including, environmental taxes, if applicable).

Operational costs are usually distinguished between fixed (for a given capacity, they do not vary with the volume of good/service provided) and variable (they depend on the volume). Generally, these costs are estimated by the intended project operator, which should have experience with operating costs of providing the good or service. See Table 3-5 for an example.
Table 3-5 Example of operating cost estimate (all amounts in million FRW)

<table>
<thead>
<tr>
<th>Element</th>
<th>number</th>
<th>Cost/unit/year</th>
<th>Total cost/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>3</td>
<td>19.80</td>
<td>59.40</td>
</tr>
<tr>
<td>Office staff</td>
<td>10</td>
<td>9.90</td>
<td>99.00</td>
</tr>
<tr>
<td>Support staff</td>
<td>4</td>
<td>3.96</td>
<td>15.84</td>
</tr>
<tr>
<td>Total fixed staff</td>
<td>17</td>
<td></td>
<td>174.24</td>
</tr>
<tr>
<td>Variable staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker (produces on average 120 units/year)</td>
<td></td>
<td>6.44</td>
<td>536.67</td>
</tr>
<tr>
<td>Total cost at annual production of 10,000 units*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
<td>61.88</td>
<td></td>
</tr>
<tr>
<td>Office costs</td>
<td></td>
<td>69.70</td>
<td></td>
</tr>
<tr>
<td>Workshop costs</td>
<td></td>
<td>206.00</td>
<td></td>
</tr>
<tr>
<td>Total fixed costs</td>
<td></td>
<td>337.58</td>
<td></td>
</tr>
<tr>
<td>Variable costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy per unit</td>
<td></td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>Raw material per unit</td>
<td></td>
<td>0.070</td>
<td></td>
</tr>
<tr>
<td>Packing material per unit</td>
<td></td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Transport per unit</td>
<td></td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Waste disposal per unit</td>
<td></td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Total cost at annual production of 10,000 units</td>
<td></td>
<td>1,020.000</td>
<td></td>
</tr>
</tbody>
</table>

* in practice the number of workers will not vary per unit but per range of units.

Maintenance costs are generally fixed and estimated along with design and costing the project and expressed as an annual percentage of the initial investment (e.g. average annual maintenance equals 1.5% of the initial investment costs). For different items on the BoQ different percentages apply, depending on their exposure to wear and tear. In some projects, a maintenance regime schedule can be included, specifying maintenance costs per year (for instance a limited amount every year, and major maintenance every 5 or 10 years).

Cost of financing (i.e. interest payments) follow a different course and must not be included within the O&M costs.

**Revenues**

The project revenues are defined as the ‘cash in-flows directly paid by users for the goods or services provided by the operation, such as charges borne directly by users for the use of infrastructure, sale or rent of land or buildings, or payments for services. These revenues will be determined by the quantities forecasts of goods/services provided and by their prices. Incremental revenues may come from increases in quantities sold, in the level of prices, or both.

Transfers or subsidies (e.g. transfers from state or regional budgets or national health insurance), as well as other financial income (e.g. interests from bank deposits) shall not be included within the operating revenues for the calculations of financial profitability because they are not directly attributable to the project operations. On the contrary, they shall be computed for the financial sustainability verification.

When the contribution of the state or other public authority (PA) is, however, in exchange for a good or service directly provided to it by the project (i.e. the state is the user), this shall be generally considered a project revenue and included in the financial profitability analysis. In other words, it is not relevant how
the state or PA pays for the goods or services (i.e. through tariffs, shadow tolls, availability payments, etc.) because the contribution to the project originates from a direct relation to the use of the project infrastructure.

3.5.5 Return on investment

The financial net present value of investment (FNPV) and the financial rate of return of the investment (FRR) compare investment costs to net revenues and measure the extent to which the project net revenues are able to repay the investment, regardless of the sources or methods of financing.

The financial net present value on investment is defined as the sum that results when the expected investment and operating costs of the project (discounted) are deducted from the discounted value of the expected revenues:

\[
\text{FNPV}(C) = \sum_{t=0}^{n} \left( a_t \cdot S_t \right) = \frac{S_0}{(1+i)^0} + \frac{S_1}{(1+i)^1} + \ldots + \frac{S_n}{(1+i)^n}
\]

where: \( S_t \) is the balance of cash flow at time \( t \), \( a_t \) is the financial discount factor chosen for discounting at time \( t \) and \( i \) is the financial discount rate.

The financial rate of return on investment is defined as the discount rate that produces a zero FNPV, i.e. FRR is given by the solution of the following equation:

\[
0 = \sum \frac{S_t}{(1+FRR)^t}
\]

The FNPV is expressed in money terms (FRW) and must be related to the scale of the project. The FRR is a pure number and is scale-invariant. Mainly, the examiner uses the FRR in order to judge the future performance of the investment in comparison to other projects, or to a benchmark required rate of return.

The return on investment is calculated considering:

- (incremental) investment costs and operating costs as outflows;
- (incremental) revenues and residual value as inflows.

In practice, this would result in the following:

- New assets: costs and revenues as in the project scenario, as there are no costs and revenues in the no-project situation;
- Additions to or rehabilitations of existing assets: costs and revenues as in the project scenario minus costs and revenues in the Business As Usual situation.
### 3.5.6 Financial sustainability

The project is financially sustainable when the risk of running out of cash in the future, both during the investment and the operational stages, is expected to be nil. Project promoters should show how the sources of financing available (both internal and external) will consistently match disbursements year-by-year. In the case of non-revenue generating projects, or whenever negative-cash-flows are projected in the future (i.e. in years in which large capital investments are required for asset replacements), a clear long-term commitment to cover these negative cash flows must be provided.

#### Investment phase

The expected investments in the project need to be funded, by grants, loans, or private equity. The project promoter needs to show that project funding is available to cover the initial investments.

#### Operational phase

During the operational phase, the project should generate sufficient cash every year to cover maintenance costs, operational costs and financing costs (interest costs and loan repayments). In project funded by grants, financing costs are not applicable. In non-revenue generating public projects, the annual O&M costs need to be foreseen in the annual budgets. The project promoters should obtain commitment from the budget planners to include the necessary O&M budget for the projects in the annual budgets. In case loans are involved in project funding, for instance a soft loan from IFIs such as World Bank or African Development Bank, the financing costs need to be included in the annual budgets too.

The difference between inflows and outflows will show the deficit or surplus that will be accumulated each year. Sustainability occurs if the cumulated generated cash flow is positive for all the years considered (see examples in Table 3-7 and Table 3-8). The inflows include:

- sources of financing (in the example tables 60% grant and 40% loan is assumed);
- operating revenues from the provision of goods and services; and

<table>
<thead>
<tr>
<th></th>
<th>FNPV</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>startup costs</td>
<td>2,0</td>
<td>2,0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Investment</td>
<td>46,5</td>
<td>20,0</td>
<td>30,0</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>9,6</td>
<td>2,0</td>
<td>2,0</td>
<td>2,0</td>
<td>2,0</td>
<td>2,0</td>
<td>2,0</td>
<td>2,0</td>
<td>2,0</td>
<td>2,0</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>4,8</td>
<td>1,0</td>
<td>1,0</td>
<td>1,0</td>
<td>1,0</td>
<td>1,0</td>
<td>1,0</td>
<td>1,0</td>
<td>1,0</td>
<td>1,0</td>
<td></td>
</tr>
<tr>
<td>Total outflows</td>
<td>61,3</td>
<td>22,0</td>
<td>30,0</td>
<td>3,0</td>
<td>3,0</td>
<td>3,0</td>
<td>3,0</td>
<td>3,0</td>
<td>3,0</td>
<td>3,0</td>
<td></td>
</tr>
<tr>
<td>Revenues</td>
<td>31,6</td>
<td>3,0</td>
<td>5,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td></td>
</tr>
<tr>
<td>Residual value</td>
<td>26,5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30,0</td>
<td></td>
</tr>
<tr>
<td>Total inflows</td>
<td>38,0</td>
<td>0,0</td>
<td>0,0</td>
<td>3,0</td>
<td>5,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td>8,0</td>
<td></td>
</tr>
<tr>
<td>Net cash flow</td>
<td>-23,3</td>
<td>-22,0</td>
<td>-30,0</td>
<td>0,0</td>
<td>2,0</td>
<td>5,0</td>
<td>5,0</td>
<td>5,0</td>
<td>5,0</td>
<td>5,0</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** During the construction phase usually no operating revenues and costs occur. These can include also costs, e.g. for feasibility studies, borne before the start of the evaluation period. The residual value is considered here as a revenue. It can also be considered under outflows, in that case with a negative sign.
• transfer, subsidies and other financial gains not stemming from charges paid by users for the use of the infrastructure.

The residual value should not be considered unless the asset is actually liquidated in the last year of the analysis.

The dynamics of the inflows are measured against the outflows. These relate to the following:
• initial investment
• replacement costs
• operating costs
• reimbursement of loans and interest payments (the loan in the example table has an interest rate of 5% and is to be repaid in 8 years (years 3 to 10).
• taxes on capital/income and other direct taxes (not included in the example table).

It is important to ensure that the project, even if assisted by donor co-financing, does not risk suffering from a shortage of capital. In particular, in the case of significant reinvestments/upgrades, proof of disposal of sufficient resources to cover these future costs should be provided in the sustainability analysis. In this sense it is recommended to carry out a risk analysis that considers the possibility of the key factors in the analysis (usually construction costs and demand) being worse than expected.

Table 3-7: Financially unsustainable project (billion FRW)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startup costs</td>
<td>2.0</td>
<td>20.0</td>
<td>30.0</td>
<td>2.0</td>
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<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Investment</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
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<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Operations</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
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<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Maintenance</td>
<td>3.6</td>
<td>3.5</td>
<td>3.4</td>
<td>3.3</td>
<td>3.1</td>
<td>3.0</td>
<td>2.9</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Loan repayment + interest</td>
<td>3.6</td>
<td>3.5</td>
<td>3.4</td>
<td>3.3</td>
<td>3.1</td>
<td>3.0</td>
<td>2.9</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Total outflows</td>
<td>22.0</td>
<td>30.0</td>
<td>6.6</td>
<td>6.5</td>
<td>6.4</td>
<td>6.3</td>
<td>6.1</td>
<td>6.0</td>
<td>5.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Grant</td>
<td>13.2</td>
<td>18.0</td>
<td>3.0</td>
<td>5.0</td>
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<td>8.0</td>
<td>8.0</td>
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<tr>
<td>Loan</td>
<td>8.8</td>
<td>12.0</td>
<td>3.0</td>
<td>5.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Revenues</td>
<td>22.0</td>
<td>30.0</td>
<td>3.0</td>
<td>5.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Total inflows</td>
<td>22.0</td>
<td>30.0</td>
<td>3.0</td>
<td>5.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Net cash flow</td>
<td>0.0</td>
<td>0.0</td>
<td>-3.6</td>
<td>-1.5</td>
<td>1.6</td>
<td>1.8</td>
<td>1.9</td>
<td>2.0</td>
<td>2.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Cumulative cash flow</td>
<td>0.0</td>
<td>0.0</td>
<td>-3.6</td>
<td>-5.2</td>
<td>-3.5</td>
<td>-1.8</td>
<td>0.1</td>
<td>2.1</td>
<td>4.3</td>
<td>6.5</td>
</tr>
</tbody>
</table>

The project has a negative cash flow in some years and is thus not financially sustainable.

When the investment includes works, cash flow analysis related to investment costs shall also include: 1) the cost of works supervision services during the Defects Notification Period; 2) the amount of ‘retention money’ if the works contract provides for a percentage of the payment to be withheld until the end of the Defects Notification Period. In case the works contractor’s liability during the Defects Notification Period is covered by a performance guarantee, this second item of expenditure (retention money) shall not be included under the analysis. In the above simplified example, only construction and/or equipment costs are envisaged.
If at any one period the project generates negative cash-flows the promoters should decide to obtain short term over drafts or request additional funds. Note that financial sustainability does not consider contingencies, however the contingencies can help to cover small budget deficiencies due to inflation, exchange rate variations or technical uncertainties.

**Financial sustainability versus financial return on investment**

The financial analysis includes both financial sustainability and financial return on investment. How these compare to one another is illustrated in Figure 3-2.

**Figure 3-2: Financial return on investment and financial sustainability**

Source: based on EU-guide on Cost-Benefit Analysis 2008
If projects fall within an already existing infrastructure, such as capacity extension projects, the overall financial sustainability of the infrastructure operator, including the project (more than that of the single extended segment), should be checked after the project (i.e. in the scenario ‘with the project’), even if the analysis of incremental cash-flows shows that the project will not run out of cash-flow. This is to ensure that not only the project but also the operator will not run out of cash-flow, or possibly experience negative cash flows, after implementation of the project, and is particularly relevant in the case of infrastructure that has previously suffered from severe underfunding.

Payback period
In financial analysis of commercial projects, a payback period is often calculated. The payback period is defined as the time needed to earn back the CAPEX from net revenues (revenues minus OPEX). The shorter the payback period, the more desirable the project. Calculations cannot be explicitly express by a formula, so it is possible to achieve the result only through the gradual loading of the net annual cash flows discounted at the alternative cost of capital until the following cumulative sum will equal the investment costs. If the investment costs are one year higher than the cumulative discounted net cash flow and next year it is already conversely, it means that these two values (FNPV = 0) have been balanced during the year. To find out in which month it happened, the linear interpolation is used.
In many public investment projects, there are no revenues and thus no payback period can be calculated. If the public project does generate revenues, then a payback period can be calculated just as for commercial projects.

3.5.7 Project funding and financing
In general, there are three sources for funding and financing\textsuperscript{22} public investments: i) Internal funding sources, ii) external funding support and iii) borrowing as financing source with the requirement to be paid back at least partly.

**Internal funding sources** comprise state budget sources and non-tax revenues, which are used to fund the investment costs as well as the operational costs. **External funding support** refers to a transfer of resources from a Development Partner (Donor) to the Rwandan budget. The same lines of authority and procedures that govern the normal Rwandan budget are applicable.

**Borrowing** is used for both investment and operational costs. It can be differentiated into domestic borrowing, external concessional (soft loans with interest rate lower than market-rate) and non-concessional loans (with market-rate interest rate) and public guarantees.

There are several ways to fund public investment projects which in some cases are combined. The main funding options are:

- **Grants**: one-off payments to cover (part or all) of the CAPEX of the project, without any need for interest or repayments. Generally, a good substantiation of the level of the grant is requested before it is allocated. The European Union for instance uses the funding gap method. The funding

\textsuperscript{22}Funding: area of intervention for grants; financing: capital contributions that can be reimbursed and remunerated.
gap is the part of the (discounted) investment costs that are not covered by the (discounted) revenues generated by the project. The budget should only pay a grant for that part of the CAPEX that cannot be recovered from net revenues of the project.

- Subsidies: periodical payments to cover (part or all) of the OPEX of a project, without any need for interest or repayments. These are applied to projects with negative net revenues, so that the continuation of the project is guaranteed.
- Soft loans: loans with favourable conditions, such as low interest rates and/or postponed repayments. This instrument is often applied by IFIs and development banks.
- Commercial loans, taken from commercial banks. These are generally not applied for funding of public investment projects, as they will have commercial interest rates and payback periods.
- Public-Private Partnerships (PPPs): joint funding by public and private parties. Usually this means a commercially attractive sub-project is defined, which is developed as a private sector project. The commercially unattractive part is funded from public sources. For example: a container terminal in a port (pavement, equipment, buildings, IT systems) can be constructed and operated by a private operator, but usually the access channel, port basin and quay walls need public funding to be constructed.  

3.5.8 Financial analysis in CEA

The general approach in CEA is based on comparing ‘effectiveness’ of a given option versus an assumed historical or virtual benchmark. Benchmarks can be provided by standard costs or expected outputs per unit of cost. CEA measures costs in a common monetary value (NPV) and the effectiveness of an option in terms of physical units. Because the two are incommensurable, they cannot be added or subtracted to obtain a single criterion measure. One can only compute the ratio of costs to effectiveness in the following ways:

\[
\text{CE ratio} = \frac{C1}{E1} \text{ or } \text{EC ratio} = \frac{E1}{C1}
\]

where: \(C1\) = the cost of option 1 (in monetary units); and \(E1\) = the effectiveness of option 1 (in physical units).

The first equation above represents the cost per unit of effectiveness (CE), e.g. FRW spent per life saved. Projects can be rank ordered by CE ratio from lowest to highest. The most cost-effective project has the lowest CE ratio. The second equation is the effectiveness per unit of cost (EC), e.g. lives saved per USD spent. Projects should be ranked from highest to lowest EC ratios.

For example, as presented in the case study contained in this Guide, investment in TVET facilities can be assessed by considering a standard discounted cost, and compare it with the Project discounted cost, then calculating the CE and EC ratios. In the above-mentioned example, the CE ratio is calculated on the basis of the calculated FNPV (FRW 16974 million) and the estimated number of graduates in the reference period (7169), with the following results:

\[
\text{CE ratio} = \frac{C1}{E1} = \frac{\text{FRW 16974 million}}{7169 \text{ graduates}} = \frac{\text{FRW 2741}}{} = \text{effectiveness of the option in physical units, and,}
\]

\[
\text{EC ratio} = \frac{E1}{C1} = \frac{7169 \text{ graduates}}{\text{FRW 16974 million}} = \frac{\text{FRW 2741}}{} = \text{effectiveness of the option in monetary units, and,}
\]

\[
\text{For further reference see: PPP Guidelines, Official Gazette of Rwanda no. 29 bis of 16 July 2018.}
\]
EC ratio = E1/C1 = Number of graduates (7169)/not discounted investment costs (FRW 13,900 million), = 0.51 versus 0.36 at standard costs, with higher effectiveness of the Project in terms of unit per cost.

The outputs to be ranked by cost-effectiveness analysis will often be social or environmental in nature. For example, work in health economics looking at the cost-effectiveness of different treatments. As with CBA, the level of detail for the analysis will typically depend on the specific issue being addressed but should take a broad view of costs and benefits to reflect all stakeholders.

**EXAMPLE**

In 2005 the UK Government undertook a value for money analysis of Government investment in different types of childcare. The choice was between higher cost "integrated" childcare centres, providing a range of services to both children and parents, or lower cost "non-integrated" centres that provided basic childcare facilities. The analysis used a variant of cost-effectiveness analysis to allow the comparison of the cost-effectiveness of childcare to other policy areas such as employment, education and crime, where the evidence allowed the analysts to quantify intermediate outputs from the policy (e.g. improved educational attainment aged 18) but not the final outcomes of the policy (e.g. better overall life chances, higher skilled workforce and higher economy wide productivity growth).

*Source: United Kingdom Prime Minister’s Strategy Unit, 2004*

**GOOD PRACTICES**

- Price and technical contingencies are excluded from the investment cost for the financial profitability calculation, although they are eligible costs (up to 10 % of the initial investment cost).
- The inflation rate is based on official national projections of the Consumer Price Index (CPI).
- For O&M costs fixed and variable components are calculated separately.
- In the counterfactual case, the chosen regime of regular and periodic maintenance and operations does not lead to disproportionate losses of operational performance. Any predicted change of operational performance is shown to realistically correspond to the chosen maintenance and operations regime and to related incremental benefits calculations (such as time savings and modal shift).
- Fixed maintenance costs are expressed in % of the net cost of the assets for both civil works and plant components. Variable maintenance costs are expressed in unit cost per output of assets (e.g. FRW/ton, FRW/km, FRW/tonkm, etc.).
- When a project adds new assets to complement a pre-existing service or infrastructure, both additional contributions from existing users and contributions from new users of the new service/infrastructure are considered to determine the project revenues.

**COMMON MISTAKES**

- Replacement costs are not considered in the calculation of residual values.
- The total investment cost in the CBA or its individual elements is inconsistent with the values presented in the feasibility study or in other more advanced engineering design documents, if available.
- Costs for protection of archaeological remains in the project site, as well as environmental and/or climate change integration measures are not included in the project cost.
• VAT is included in the financial analysis although it is recoverable.
• Asset depreciation, interest and loan repayments and income tax, and dividends paid to shareholders are included within the O&M costs.
• Subsides received to cover (part of) the operating costs are included in the calculation of the donor contribution as revenues.
• Charges levied by governments in exchange for the goods or services rendered are confused with transfer payments and excluded from the operating revenues. For instance, a charge paid by farmers to the irrigation authority. Although the charge is called ‘tax’, this is not a transfer but a charge directly paid by users in exchange for the use of water. Accordingly, it must be considered as a project’s revenue. Another example is the ‘taxes’ paid by the citizens for waste collection and disposal services.
• In the FRR calculation, cash-flows relative to replacement costs are computed twice: as operating outlays and as equity contribution from the project promoter.
• In the case of loans involved in project financing, loan conditions are not explained.
• Nominal interest rates are used to calculate the interest payments, where the analysis is carried out at constant prices.

3.6 Economic analysis

CONTENTS AND PURPOSE OF THIS SECTION

• Methodology of economic analysis is based on calculating the welfare effects of the project on society, which is a wider approach than the financial analysis
• The social discount rate to be used in Rwanda is 13%
• Cost inputs are based on financial costs, however with a correction for price distortions such as taxes, subsidies, market imperfections. This correction is mostly done on the basis of conversion factors.
• Rwanda has standard conversion factors that can be applied to CAPEX and OPEX items
• Socio-economic effect calculations try to monetise as much as possible the socio-economic effects of the project. These are calculated on the basis of the demand analysis and the description of potential project effects. Quantification should be based on transparent data and methodologies and should only include the incremental effects of the project (based on a comparison of do nothing with project scenario)
  1. Direct effects are the effects on the project promotor (financial costs converted to economic costs), but also direct effects on society, such as generalised transport cost savings, improved agricultural productivity, improved career opportunities due to education, etc
  2. Indirect effects are the effects on other markets, such as employment effects in supplying sectors. Care should be taken not to overestimate these.
  3. External effects are the effects for which no market exists, such as emissions, noise, safety or damage to landscape.
• Economic feasibility is expressed in an Economic Internal Rate of Return (EIRR) and an Economic Net Present Value (ENPV). The project is economically feasible if the EIRR is above the social discount rate; the ENPV in that case is above zero.
• In a CEA, economic analysis is restricted to analysing the cost effectiveness, answering the question of realised units of output versus units of costs (for instance costs in FRW per trained person in a Technical and Vocational Education Training project).
3.6.1 Introduction

The basis of economic analysis is the assumption that a project not only has financial impacts, but wider impacts on the welfare and wellbeing of those affected too. A project creating a health centre in a town will result in better quality of life for people in this town, resulting in a positive effect on welfare. A hydropower plant will provide an environmentally friendly source of electricity, but it will have a negative impact on landscape too.

In an economic analysis, the project’s contribution to welfare is expressed in monetary values as much as possible. The key concept is the use of shadow prices to reflect the social opportunity cost of goods and services, instead of prices observed in the market, which may be distorted. Sources of market distortions are manifold:

- non-efficient markets where the public sector and/or operators exercise their power (e.g. subsidies for energy generation from renewable sources, prices including a mark-up over the marginal cost in the case of monopoly, etc.). Examples in Rwanda are the tariffs for electricity delivered by Rwanda Energy Group (REG), which is subsidised from Government budgets, and similarly the water tariff charged by the Water and Sanitation Corporation (WASAC);
- administered tariffs for utilities may fail to reflect the opportunity cost of inputs due to affordability and equity reasons;
- some prices include fiscal requirements (e.g. duties on import, excises, VAT and other indirect taxes, income taxation on wages, etc.). An example in Rwanda is the fuel price, which is regulated by the Rwanda Utilities Regulatory Authority (RURA) and which includes a mark-up for maintaining strategic oil reserves, for road maintenance and VAT;
- for some effects no market (and no prices) are available (e.g., time savings).

The standard approach suggested in this guide, consistent with international practice, is to move from financial to economic analysis. Starting from the account for the return on investment calculation, the following adjustments should be:

- corrections for fiscal distortions and conversion from market to shadow prices;
- evaluation of non-market impacts and correction for externalities.

After market prices adjustment and non-market impacts estimation, costs and benefits occurring at different times must be discounted. The discount rate in the economic analysis of investment projects, the Social Discount Rate (SDR) or economic discount rate, reflects the social view on how future benefits and costs should be valued against present ones.

In Rwanda, the SDR is published by MINECOFIN as Economic Opportunity Cost of Capital (EOCK) on their website\(^{24}\). The EOCK or SDR to be applied is 13%.

See Annex F for more background on the SDR.

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\(^{24}\) http://rwanda-cscf.cri-world.com/
After the use of the appropriate SDR, it is possible to calculate the project economic performance measured by the following indicators: Economic Net Present Value (ENPV), Economic Rate of Return (ERR) and benefit/cost ratio (B/C ratio). In the following sections the steps to move from financial to economic analysis are described.

3.6.2 Corrections for fiscal distortions and conversion from market to shadow prices

**Corrections for fiscal distortions**

Taxes and subsidies are transfer payments that do not represent real economic costs or benefits for society as they involve merely a transfer of control over certain resources from one group in society to another. Some general rules can be established to correct such distortions:

- prices for input and output in the economic analysis must be considered net of VAT;
- prices for input should be considered net of direct and indirect taxes
d25;
- prices (e.g. tariffs) used as a proxy for the value of outputs should be considered net of any subsidy and other transfer granted by a public entity,
- a Foreign Exchange Premium (FEP) should be considered in the pricing of tradable goods, as the economic value of foreign exchange may exceed the market exchange rate applied.

As concerns the methods of eliminating transfer payments, if it is possible to determine their exact value, they should be directly eliminated from the cash flows. For example, VAT payments on construction costs can be simply dropped off in the economic analysis. If it is not possible to determine their exact value, they should be eliminated from the project cash flows using conversion factors.

For projects in Rwanda, it is important to check if VAT is included in the financial costs or not, as this dictates the starting point for application of the standard conversion factors (SCF) from the MINECOFIN database. VAT is generally included in financial costs for all projects developed by government organisations. Exceptions are WASAC and REG, who can recover VAT.

**From market to shadow prices**

When market prices do not reflect the opportunity cost of inputs and outputs, the usual approach is to convert them into shadow (economic) prices to be applied to the items of the financial analysis. This is done by means of conversion factors. The approach for estimating conversion factors is dependent on the type of input (and output). **Annex G** presents a simplified theoretical approach to the estimation of shadow prices.

The economic implications of the conversion factors are as follows:

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25 Despite the general rule, in some cases indirect taxes (or subsidies) are intended as a correction for externalities. In this and in similar cases, it is justified to include these taxes (subsidies) in project costs (benefits), provided that they adequately reflect the underlying marginal cost (Willingness-To-Pay (WTP)), but the appraisal should avoid double counting (e.g. including both energy taxes and estimates of full external environmental costs).
A conversion factor of less than 1 (one) implies that the economic cost or benefit of the good or service is lower than its financial cost or benefit.

For example, assume 1 litre of gasoline costs 1000 FRW (including VAT) and that Government excises a tax of 50% on gasoline. Then the financial costs of 1 litre of fuel are 1000 FRW, but the economic costs are $1000 \times \frac{1}{1.18} \times \frac{1}{1.50} = 565$ FRW (rounded). The conversion factor is 0.565.

A conversion factor greater than 1 (one) implies that the economic costs or benefit of the good or service is higher than its financial cost or benefit.

For example, assume 1 kWh of electricity costs 100 FRW (including VAT) and that Government subsidises 25% of the cost price. Then the financial costs of 1 kWh of electricity are 100 FRW, but the economic costs are $100 \times \frac{1}{1.18} \times \frac{1}{(1-0.25)} = 113$ FRW (rounded). The conversion factor is 1.13.

In practice, the level of detail of the conversion from market to shadow prices should correspond to the level of detail of the project. In a pre-feasibility study, a single conversion factor of 0.8 to 0.9 can be applied overall, where 0.9 is on the conservative side.

In CBAs at the level of a feasibility study, it is good practice to apply different conversion factors to various items on the BoQ. This can be various materials, various labour categories, and different types of energy sources or utilities (electricity, fuel, water). See Annex G for theoretical background on conversion factors.

It should be noted that applying conversion factors to financial costs and revenues is just one step of the economic analysis. Another important step is monetisation of non-market impacts and externalities, see 3.6.3.

### RWANDA STANDARD CONVERSION FACTORS

In Rwanda, MINECOFIN has set standard conversion factors that can be applied in CBA studies. They are available on the Ministry website. There is a database of about 5,000 tradable items in the database, as well as conversion factors for non-tradable items.

Some explanation on the application of the database:

- The database makes a difference between **tradable items** and **non-tradable items**. A good or service is considered internationally tradable if (i) a project’s demand for it as an input is ultimately met through an expansion of imports or a reduction of exports, and (ii) its production by a project leads to a reduction in

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26 The evaluation of the shadow price of a project’s direct benefits, i.e. revenues related to the use of the goods or services rendered by the project, is commonly done through the marginal willingness-to-Pay (WTP) concept. The WTP measures the maximum amount that people would be willing to pay for a given outcome that they view as desirable.


imports or an expansion of exports. Non-tradable items are not traded internationally, for example local transportation, construction, electricity, telecommunication, water supply, all public services, hotel accommodation, real estate and goods with very high transportation costs, such as gravel or sand.

- The database gives standard conversion factors for 4 non-tradable items: transportation, construction, electricity and telecommunications. These are based on a Rwanda-specific average breakdown of the service into various tradables and non-tradables, and thus for transport for instance includes various types of labour (skilled, semi-skilled and unskilled), fuel, equipment, etc.

- The tradable items are divided into 4 categories:
  1. Importable input to the project: items that are imported to be used in the project;
  2. Importable output: items that are produced by the project that would substitute imported items;
  3. Exportable input: items that are used in the project that would otherwise be exported;
  4. Exportable output: items that are produced by the project for export.

One tradable can thus have 4 different conversion factors in the database, following the above categories. These conversion factors consider import duties, import subsidies, excise taxes, export taxes, export subsidies, and a Foreign Exchange Premium (FEP), depending on the category and applicability of the duty, subsidy or tax.

Rwanda SCF always include a correction for VAT. Therefore, when converting from financial to economic costs VAT has to be carefully considered:

1. If VAT is included in the financial costs, then the SCF from the database can be applied.
2. If VAT is not included in the financial costs, then the SCF from the database should be adapted before it can be applied. The Rwanda database of SCFs allows for manual recalculation of the SCF so that the correction for VAT can be deleted. See the print screen shown below of the SCF for imported motor vehicles.

![Print screen of SCF for imported motor vehicles](image-url)
Table 3.9 gives an example of conversion of a BoQ item with several sub-items from the road case study (note that the share of the elements in the total costs are random and not based on actual road construction projects). Financial costs in Table 3.9 include VAT.

<table>
<thead>
<tr>
<th>Element</th>
<th>Share in costs</th>
<th>Financial cost (billion FRW)</th>
<th>Type of conversion</th>
<th>Conversion factor</th>
<th>Economic cost (billion FRW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel (sourced locally)</td>
<td>30%</td>
<td>14.2</td>
<td>standard factor MINECOFIN</td>
<td>0.8924</td>
<td>12.7</td>
</tr>
<tr>
<td>Asphalt (imported)</td>
<td>20%</td>
<td>9.5</td>
<td>standard factor MINECOFIN</td>
<td>0.8112</td>
<td>7.7</td>
</tr>
<tr>
<td>Transport</td>
<td>15%</td>
<td>7.1</td>
<td>standard factor MINECOFIN</td>
<td>0.8724</td>
<td>6.2</td>
</tr>
<tr>
<td>Construction</td>
<td>35%</td>
<td>16.6</td>
<td>standard factor MINECOFIN</td>
<td>0.8840</td>
<td>14.7</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>47.4</td>
<td></td>
<td>0.8777*</td>
<td>41.2</td>
</tr>
</tbody>
</table>

Source: taken from the road case study (see Volume 2 Case Studies)

* is the resulting weighted conversion factor for the item ‘road’ on the CAPEX list

3.6.3 Evaluation of non-market impacts and correction for externalities

In the previous sections, the conversion of project costs (inputs) and direct project outputs into economic prices has been discussed. However, an important aspect of the economic analysis is the inclusion of wider socio-economic impacts, which as indicated can be classified in three categories:

1. Direct effects (this includes effects on the project promoter/developer, such as CAPEX, OPEX and revenues, but also effects on society as a whole, such as time saving for transport users).
2. Indirect effects (this includes effects on other markets, such as employment effects at supplying sectors).
3. External effects (this includes effects for which no market exists, such as emissions, noise, safety, or the creation of barriers or damage to landscape).

Direct effects

Apart from the direct effects on the project promoter/developer, which are taken from the financial analysis and on which conversion factors have been applied to convert them to economic effects, there are wider direct effects which affect society as a whole. Examples are:

- Transport cost savings: a new road offers a faster or shorter route from A to B so that the cost of transport passengers and freight from A to B is reduced. The transport cost saving should be based on the time saved or costs saved in the project case compared to the counterfactual (without project case). If for instance travelling between A and B used to take 2 hours before project implementation, but now takes only 1.5 hours due to road improvements, then the travel cost savings should be based on saving half an hour per vehicle (and a value of time of the passengers of those vehicles).
- Agricultural productivity improvements: an irrigation project increases the yield of farming land. Again, counterfactual and project case need to be compared. If the yield was 3000 kg/ha/year before the project and will be 4000 kg/ha/year after the project, then the economic benefit of the project should be based on an additional yield of 1000 kg/ha/year.
- Avoided waste in landfills and increased recycling due to a waste management project. Here, the economic benefit should be based on an assessment of avoided damage to environment due to dumping and the additional value created through recycling.
**Indirect effects**

This category includes effects on other markets, such as employment effects in sectors supplying to the project. Generally, these are calculated by means of multipliers, indicating for instance that each job in sector X generates 1.4 additional jobs in other sectors. Care should be taken not to overestimate the indirect employment effects; these effects are often misused by project developers to promote their projects. The question always remains what activities the employees had before their engagement in the newly created jobs. Only the incremental effects should be included: if they came from other jobs, the employment effect may be limited.

Another example of indirect effects is the creation of additional economic activity or output due to the provision of electricity. The availability of electricity may allow people to increase their productivity or to engage in new economic activities. Again, only the incremental effects should be included.

**External effects**

For these effects no market exists. Examples are emissions, noise, safety or the creation of damage to landscape. The net effect can be positive or negative. A few examples:

- the construction of a hydro-power plant to replace a coal fired power plant will greatly reduce the emission of greenhouse gases such as CO₂, NOₓ, SO₂, and PM.
- the construction of a dam with reservoir (for instance to feed a hydro-power plant) will have a large effect on the landscape due to the water reservoir and the effects on the river flow downstream of the project.
- the construction of a new road with separate traffic lanes for each direction will increase road safety but may also generate additional traffic, which will result in additional emissions, noise and safety. The net effect should be calculated, it depends on the amount additional traffic and on the safety improvement.

Generally, emission, noise and safety effects are based on predefined values and costs, such as per ton-kilometre or passenger-kilometre in transport (often specified per type of transport), or per kilowatt-hour (kWh) or megawatt hour (MWh) in case of a power plant. Many countries use predefined values per transport category, which are updated every 5 to 10 years to include technological progress (increased fuel efficiency, alternative fuels, etc). For example: average emissions of CO₂ per ton-kilometre in a >20-ton truck with 50% load factor, or average number of fatalities per billion passenger car kilometres on a dual lane road. Values of CO₂ emissions are based on the EU climate change scenario, see box on Social Cost of Carbon (SCC). Values of fatalities are often based on the average economic output of this person that is forgone, the Value of Statistical Life (VOSL), in order to avoid the ethics of putting a price on human life.

**Quantification of the unit value of avoided CO₂ emissions**

In order to assess the social benefits of avoided CO₂ emissions, a social cost of CO₂ emissions should be used (Social Cost of Carbon - SCC). However, there is no consensus on the actual SCC. For example, the European Commission CBA guide, referring to the European Investment Bank as a source, in its central scenario recommends using 25 Euro/ton CO₂ in 2010 and applying an annual increase of 1 Euro/ton until 2030. A “high” scenario recommends using 40 Euro/ton CO₂ in 2010 with a 2 Euro/ton CO₂ of annual increase until 2030.
In a more recent document from 2016, titled EC Climate change and major projects\textsuperscript{29}, another SSC quantification is proposed (see orange line in figure 3.3 below). On the other hand, the “EU reference scenarios to 2050”\textsuperscript{30} provides its own projections of Emission Trading System credits prices (note that the market prices of ETS-credits do not necessarily reflect the actual SCC). These projections, along with ETS prices are plotted on Figure 3-3.

![Various ETS and SCC projections in Euro/ton of CO$_2$](image)

Figure 3-3: Various ETS and SCC projections in Euro/ton of CO$_2$

Lacking specific values for the Republic of Rwanda, the above projections were compared with the most recent World Bank projections contained in the ‘Report of the High-Level Commission on Carbon Prices’ (May 2017)\textsuperscript{31} and projection by the United Kingdom Government (January 2018)\textsuperscript{32}.

According to the World Bank projections, SCC would vary from 30-50 USD/ton of CO$_2$ in 2020 to 130-160 USD/ton of CO$_2$ in 2050. UK estimated carbon values are provided until 2035 and provide higher values than the EU and World Bank values.

In the light of the above, the EU SCC under the climate change scenario are recommended for use in economic studies in Rwanda as values that, although lower than World Bank projections in the medium-term (2030-2040), tend to converge towards World Bank values in 2050.

\textsuperscript{29} https://ec.europa.eu/clima/sites/clima/files/docs-major_projects_en.pdf
Table 3-10 Various alternatives for SCC (per ton of CO₂ emitted)

<table>
<thead>
<tr>
<th>Source</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union (SCC climate change scenario)</td>
<td>46 EUR/ton</td>
<td>52 EUR/ton</td>
<td>75 EUR/ton</td>
<td>121 EUR/ton</td>
</tr>
<tr>
<td>World Bank</td>
<td>30-50 USD/ton</td>
<td>80-100 USD/ton</td>
<td>110-130 USD/ton</td>
<td>130-160 USD/ton</td>
</tr>
<tr>
<td>Rwanda recommended values</td>
<td>46,000 FRW/ton</td>
<td>52,000 FRW/ton</td>
<td>75,000 FRW/ton</td>
<td>121,000 FRW/ton</td>
</tr>
</tbody>
</table>

**EXAMPLE: CALCULATION OF VALUE OF CO₂ EMISSIONS**

**Based on number of vehicles**

If only the number of vehicles is known, and not the number of passengers and tons of freight, then the emissions of CO₂ can be based on the amount of fuel consumed per vehicle to travel a certain distance. For instance, a car that travels 80 km consuming 7 litres per 100 km uses 5.6 litres of petrol. CO₂ emissions per litre of petrol are 2.78 kg. The total CO₂ emission of the passenger car travelling 80 km is thus 5.6 * 2.78 = 15.57 kg of CO₂.

The total emission needs to be multiplied by the cost of emitting CO₂, generally expressed in a price per ton. The emission price per ton of CO₂ is 39,000 FRW in 2018 (see box on Social Cost of Carbon). In our example, this means that the CO₂ cost of the car travelling 80 km is 607 FRW.

**Based on the number of passengers or tons of freight**

In case only the number of passengers or tons of freight is known, an average value of CO₂ emission per passenger-kilometre or ton-kilometre should be applied. These are available for various vehicles and load factors and are for instance expressed as: CO₂ emission in a passenger car (average occupancy 1.5 persons): 150 g per passenger-kilometre. With this value (and the average distance and number of passengers) and a CO₂ value per ton, the cost of CO₂ emissions can be calculated too.

Significant progress has been made in recent years in refining the estimates of unit values of non-market impacts and improving methods to integrate such values into economic analysis. Developments in this field, both empirical and theoretical are, however, still needed, in order to broaden the range of externalities considered, such as the conservation of ecosystem services. Considering that ecosystem services change is one of the vital aspects of welfare, this should be always considered as potential for any project.

Whenever money quantification is not possible, environmental impacts should at least be identified in physical terms for a qualitative appraisal in order to give to decision-makers more elements to make a considered decision. See section 3.4.3.

**3.6.4 Economic performance**

Once all project cost and benefits have been quantified and valued in money terms, it is possible to measure the economic performance of the project by calculating the following indicators (Table 3-11):

- Economic Net Present Value (ENPV): the difference between the discounted total social benefits and costs;
- Economic Rate of Return (ERR): the rate that produces a zero value for the ENPV;
• **B/C ratio**, i.e. the ratio between discounted economic benefits and costs.

### ECONOMIC PERFORMANCE INDICATORS

The difference between ENPV and FNPV is that the former uses accounting prices or the opportunity cost of goods and services instead of imperfect market prices, and it includes as far as possible any social and environmental externalities. This is because the analysis is done from the point of view of society, not just the project promoter. Because externalities and shadow prices are considered, some projects with low or negative FNPV(C) may show positive ENPV (see also section 2.5).

The ENPV is the most important and reliable social CBA indicator and should be used as the main reference economic performance signal for project appraisal. Although ERR and B/C are meaningful because they are independent of the project size, they may sometimes be problematic. In particular cases, for example, the ERR may be multiple or not defined, while the B/C ratio may be affected by considering a given flow as either a benefit or a cost reduction.

In principle, every project with an ERR lower than the social discount rate or a negative ENPV should be rejected. A project with a negative economic return uses too many socially valuable resources to achieve too modest benefits for all citizens. Sinking a capital grant in a project with low social returns means diverting precious resources from a more valuable development use.

Table 3-11: Economic rate of return (FRW billions)

<table>
<thead>
<tr>
<th>ENPV</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startup costs</td>
<td>1,7</td>
<td>1,7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment</td>
<td>40</td>
<td>17,0</td>
<td>25,5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>8,5</td>
<td></td>
<td>1,8</td>
<td>1,8</td>
<td>1,8</td>
<td>1,8</td>
<td>1,8</td>
<td>1,8</td>
<td>1,8</td>
<td>1,8</td>
</tr>
<tr>
<td>Maintenance</td>
<td>4,1</td>
<td></td>
<td>0,9</td>
<td>0,9</td>
<td>0,9</td>
<td>0,9</td>
<td>0,9</td>
<td>0,9</td>
<td>0,9</td>
<td>0,9</td>
</tr>
<tr>
<td>Total economic costs</td>
<td>52,4</td>
<td>18,7</td>
<td>25,5</td>
<td>2,6</td>
<td>2,6</td>
<td>2,6</td>
<td>2,6</td>
<td>2,6</td>
<td>2,6</td>
<td>2,6</td>
</tr>
<tr>
<td>Benefit 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefit 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External effects</td>
<td>4,3</td>
<td></td>
<td>0,3</td>
<td>0,6</td>
<td>0,8</td>
<td>1,0</td>
<td>1,2</td>
<td>1,3</td>
<td>1,3</td>
<td>1,4</td>
</tr>
<tr>
<td>Residual value</td>
<td>22,6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25,5</td>
<td></td>
</tr>
<tr>
<td>Total benefits</td>
<td>84,6</td>
<td>0,0</td>
<td>0,0</td>
<td>7,3</td>
<td>10,1</td>
<td>14,8</td>
<td>18,5</td>
<td>22,2</td>
<td>26,3</td>
<td>29,3</td>
</tr>
<tr>
<td>Net benefits</td>
<td>32,2</td>
<td>-18,7</td>
<td>-25,5</td>
<td>4,7</td>
<td>7,5</td>
<td>12,2</td>
<td>15,9</td>
<td>19,6</td>
<td>23,7</td>
<td>26,7</td>
</tr>
</tbody>
</table>

Financial costs have been converted to economic costs by applying conversion factors. This affects the residual value too.

Socio-economic benefits and external effects of the project have been calculated.

### GOOD PRACTICES

- Cost savings in O&M or investment are accounted for and included on the cost side as a negative, i.e. as decreasing costs and with appropriate conversion factors.
- Project positive impacts on employment are captured by applying the Shadow Wage Conversion Factor to (unskilled) labour cost and not including job creations as a direct benefit of the project.
• Project impacts on the overall economy (i.e. GDP growth) are excluded from the analysis of the project benefits.
• If specific indirect taxes are intended to correct for externalities, then these are included in economic analysis to reflect the social marginal value of these externalities, provided that they adequately reflect the underlying WTP (see annex G) or marginal damage cost and there is no double-counting with other economic costs.

COMMON MISTAKES

• In the economic analysis a nil cost is given to the opportunity cost of land owned by a local municipality, although it may have value in other uses (e.g. it may be rented to local farmers).
• Conversion factors are ‘borrowed’ from other countries without justification.
• Revenues from tariffs are included as an economic benefit in addition to consumers’ marginal willingness to pay for the service rendered.
• Failure to isolate the ‘incremental’ economic benefits of the project, i.e. the benefits which are not displaced from other markets. This is especially evident in cases where it is attempted to measure secondary indirect impacts.
• Together with the application of the shadow wage on the cost side, benefits from job creation are included on the benefit side.

3.7 Risk assessment

CONTENTS AND PURPOSE OF THIS SECTION

• The risk assessment consists of three elements:
  1. Sensitivity analysis (or quantitative risk analysis) testing the effect of variations in major input variables (such as costs, demand, major assumptions) on financial and economic feasibility conclusions of the project. This gives an indication of how robust financial and economic feasibility is under various scenarios.
  2. Qualitative risk analysis, listing all potential risks to the project, the chance of occurrence and the potential impact on the project.
  3. Risk prevention and mitigation, where a description is given of how risks identified in step 1 and 2 can be prevented from occurring, and what the mitigating measures are in case they should occur.

A risk assessment must be included in the CBA/CEA. This is required to deal with the uncertainty that always permeates investment projects, including the risk that the adverse impacts of climate change may have on the project. The recommended steps for assessing the project risks are as follows:

• sensitivity analysis;
• qualitative risk analysis;
• risk prevention and mitigation.
The rest of this section presents the aforementioned steps.

### 3.7.1 Sensitivity analysis

Sensitivity analysis enables the identification of the ‘critical’ variables of the project. Such variables are those whose variations, be they positive or negative, have the largest impact on the project’s financial and/or economic performance. The analysis is carried out by varying one variable at a time and determining the effect of that change on the NPV. As a guiding criterion, the recommendation is to consider ‘critical’ those variables for which a variation of ±1% of the value adopted in the base case gives rise to a variation of more than 1% in the value of the NPV. The tested variables should be deterministically independent and as disaggregated as possible. Correlated variables would give rise to distortions in the results and double-counting. Therefore, before proceeding to the sensitivity analysis, the CBA/CEA model should be reviewed with the aim of isolating the independent variables and eliminating the deterministic interdependencies (e.g. splitting a variable in its independent components).

For example, ‘revenue’ is a compound variable, which depends on the two independent items ‘quantity’ and ‘tariff’, both of which should be analysed. Table 3-12 gives an illustrative example. Numbers are shown for a cost-benefit analysis, but the method can be applied to the FNPV or the CE ratio in a cost-effectiveness analysis in the same manner.

#### Table 3-12: Critical variables example

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variation of the FNPV due to a ±1% variation</th>
<th>Criticality judgement</th>
<th>Variation of the ENPV due to a ±1% variation</th>
<th>Criticality judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly population growth</td>
<td>0.5%</td>
<td>Not critical</td>
<td>2.2%</td>
<td>Critical</td>
</tr>
<tr>
<td>Per capita consumption</td>
<td>3.8%</td>
<td>Critical</td>
<td>4.9%</td>
<td>Critical</td>
</tr>
<tr>
<td>Unit tariff</td>
<td>2.6%</td>
<td>Critical</td>
<td>Not Applicable</td>
<td>-</td>
</tr>
<tr>
<td>Total investment cost</td>
<td>8.0%</td>
<td>Critical</td>
<td>8.2%</td>
<td>Critical</td>
</tr>
<tr>
<td>Yearly maintenance costs</td>
<td>0.7%</td>
<td>Not critical</td>
<td>0.6%</td>
<td>Not critical</td>
</tr>
<tr>
<td>Per capita Willingness-to-pay</td>
<td>Not applicable</td>
<td>-</td>
<td>12.3%</td>
<td>Critical</td>
</tr>
<tr>
<td>Annual noise emissions</td>
<td>Not applicable</td>
<td>-</td>
<td>0.8%</td>
<td>Not critical</td>
</tr>
</tbody>
</table>

Source: EU-guide for Cost-Benefit Analysis 2014

A particularly relevant component of the sensitivity analysis is the calculation of the switching values. This is the value that the analysed variable would have to take in order for the NPV of the project to become zero, or more generally, for the outcome of the project to fall below the minimum level of acceptability (see Table 3-13). The use of switching values in sensitivity analysis allows making some judgements on the risk of the project and the opportunity of undertaking risk-preventing actions. For instance, in the example below, one must assess if a 19% investment cost increase which would make the ENPV equal to zero thereby means that the project is too risky. Thus, the need to further investigate the causes of this risk, the probability of occurrence and identify possible corrective measures (see next section).
Table 3-13: Switching values example

<table>
<thead>
<tr>
<th>Variable</th>
<th>Switching values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits/revenues</strong></td>
<td></td>
</tr>
<tr>
<td>Yearly population growth</td>
<td>Minimum increase before the FNPV equals 0</td>
</tr>
<tr>
<td></td>
<td>Maximum decrease before the ENPV equals 0</td>
</tr>
<tr>
<td>Per capita consumption</td>
<td>Minimum increase before the FNPV equals 0</td>
</tr>
<tr>
<td></td>
<td>Maximum decrease before the ENPV equals 0</td>
</tr>
<tr>
<td>Unit tariff</td>
<td>Minimum increase before the FNPV equals 0</td>
</tr>
<tr>
<td></td>
<td>Maximum decrease before the ENPV equals 0</td>
</tr>
<tr>
<td>Per capita Willingness-to-pay</td>
<td>Minimum increase before the FNPV equals 0</td>
</tr>
<tr>
<td></td>
<td>Maximum decrease before the ENPV equals 0</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Total investment cost</td>
<td>Minimum decrease before the FNPV equals 0</td>
</tr>
<tr>
<td></td>
<td>Maximum increase before the ENPV equals 0</td>
</tr>
<tr>
<td>Yearly maintenance costs</td>
<td>Minimum decrease before the FNPV equals 0</td>
</tr>
<tr>
<td></td>
<td>Maximum increase before the ENPV equals 0</td>
</tr>
<tr>
<td>Annual noise emissions</td>
<td>Minimum decrease before the FNPV equals 0</td>
</tr>
<tr>
<td></td>
<td>Maximum increase before the ENPV equals 0</td>
</tr>
</tbody>
</table>

Source: EU-guide for Cost-Benefit Analysis 2014

Finally, the sensitivity analysis must be completed with a scenario analysis, which studies the impact of combinations of values taken by the critical variables. In particular, combinations of ‘optimistic’ and ‘pessimistic’ values of the critical variables could be useful to build different realistic scenarios, which might hold under certain hypotheses. In order to define the optimistic and pessimistic scenarios it is necessary to choose for each variable the extreme (lower and upper) values (within a range defined as realistic). Incremental project performance indicators are then calculated for each combination. Again, some judgments on the project risks can be made on the basis of the results of the analysis. For example, if the ENPV remains positive, even in the pessimistic scenario, the project risk can be assessed as low (see Table 3-14).

Table 3-14: Scenario testing example

<table>
<thead>
<tr>
<th>Variable</th>
<th>Base case</th>
<th>Scenario -</th>
<th>Scenario -</th>
<th>Scenario +</th>
<th>Scenario ++</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly population growth</td>
<td>100%</td>
<td>70%</td>
<td>85%</td>
<td>115%</td>
<td>130%</td>
</tr>
<tr>
<td>Per capita consumption</td>
<td>100%</td>
<td>70%</td>
<td>85%</td>
<td>115%</td>
<td>130%</td>
</tr>
<tr>
<td>Unit tariff</td>
<td>100%</td>
<td>70%</td>
<td>85%</td>
<td>115%</td>
<td>130%</td>
</tr>
<tr>
<td>Total investment cost</td>
<td>100%</td>
<td>130%</td>
<td>115%</td>
<td>85%</td>
<td>70%</td>
</tr>
<tr>
<td>Per capita Willingness-to-pay</td>
<td>100%</td>
<td>70%</td>
<td>85%</td>
<td>115%</td>
<td>130%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Result</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FNPV</td>
<td>-34,284</td>
<td>-68,568</td>
<td>-51,426</td>
<td>-20,570</td>
<td>-6,857</td>
</tr>
<tr>
<td>ENPV</td>
<td>212,128</td>
<td>116,720</td>
<td>159,164</td>
<td>265,273</td>
<td>307,716</td>
</tr>
</tbody>
</table>

Source: authors

3.7.2 Qualitative risk analysis

The qualitative risk analysis aims shall include the following elements:

- a list of adverse events to which the project is exposed;
- a risk matrix for each adverse event indicating:
  - the possible causes of occurrence;
  - the link with the sensitivity analysis, where applicable;
To carry out the qualitative risk analysis, the first step involves the identification of adverse events that the project may face. Building a list of potential adverse events is a good exercise to understand the complexities of the project. Examples of events and situations with negative implications in the implementation of the project and, in particular, generating cost overruns and delays in its commissioning, are very varied and depend on the project specificities: landslides; adverse impacts of extreme weather events; non-obtainment of permits; public opposition; litigation; etc.

Once the potential adverse events have been identified, the corresponding risk matrix may be built. The following paragraphs contain some brief instructions on how to operationally build a risk matrix.

First, it is necessary to look at the possible causes of the risk materialising. These are the primary hazards that could occur during the life of the project. All causes of each adverse event must be identified and analysed, considering that several weaknesses of forecasting, planning and/or management may have similar consequences over the project. The identification of the causes of potential dangers can be based on ad hoc analyses or looking at similar problems that have been documented in the past. In general, the occurrence of a disaster is looked upon as a design weakness, in the broadest possible sense, and therefore it is expected that all the potential causes of failure are properly identified and documented. Examples can be: low contractor capacity; inadequate design cost estimates; inadequate site investigation; low political commitment; inadequate market strategy, etc.

When appropriate, the link with the results of the sensitivity analysis should be made explicit by showing which critical variables are affected by the adverse events. For example, for the adverse event unexpected geological conditions the corresponding critical variable is investment cost, and so on. However, depending on the nature of the event considered this is not always applicable (for example no variable corresponds to qualitative events such as public opposition).

For each adverse event, the general effect(s) generated on the project and the relative consequences on the cash flows should be described. For example, delays in the construction time will postpone the operational phase, which in turn, could threaten the financial sustainability of the project. It is convenient to describe these effects in terms of what the project promoter (or the infrastructure manager and services provider) might experience in terms of functional or business impacts. Each effect should also be characterised by its consequences over the project calendar (short vs. long term implications), relevant for both the prediction of the effect on the cash flows and the determination of appropriate risk mitigation measures.

A Probability (P) or likelihood of occurrence is attributed to each adverse event. Below, a recommended classification is given, although in principle other classifications are possible:
• Very unlikely (0–10 % probability)
• Unlikely (10–33 % probability)
• About as likely as not (33–66 % probability)
• Likely (66–90 % probability)
• Very likely (90–100 % probability)

To each effect a Severity (S) impact from, say, I (no effect) to V (catastrophic), based on cost and/or loss of social welfare generated by the project, is given. These numbers enable a classification of risks, associated with their probability of occurrence. Below a typical classification is given (Table 3-15).

Table 3-15: Risk severity classification

<table>
<thead>
<tr>
<th>Rating</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>No relevant effect on social welfare, even without remedial actions.</td>
</tr>
<tr>
<td>II</td>
<td>Minor loss of the social welfare generated by the project, minimally affecting the project long run effects; however, remedial or corrective actions are needed.</td>
</tr>
<tr>
<td>III</td>
<td>Moderate: social welfare loss generated by the project, mostly financial damage, even in the medium-long run. Remedial actions may correct the problem.</td>
</tr>
<tr>
<td>IV</td>
<td>Critical: High social welfare loss generated by the project; the occurrence of the risk causes a loss of the primary function(s) of the project. Remedial actions, even large in scope, are not enough to avoid serious damage.</td>
</tr>
<tr>
<td>V</td>
<td>Catastrophic: Project failure that may result in serious or even total loss of the project functions. Main project effects in the medium-long term do not materialise.</td>
</tr>
</tbody>
</table>

Source: EU-guide for Cost-Benefit Analysis 2014

The Risk level is the combination of Probability and Severity (P*S). Four risk levels can be defined as follows with the associated colours (see Table 3-16).

Table 3-16: Risk level colouring example

<table>
<thead>
<tr>
<th>Risk level</th>
<th>Colour</th>
<th>Severity/Probability</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Moderate</td>
<td>B</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>High</td>
<td>C</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unacceptable</td>
<td>D</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Very high</td>
<td>Very high</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Moderate</td>
<td>High</td>
<td>Very high</td>
<td>Very high</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: EU-guide for Cost-Benefit Analysis 2014

This exercise must be carried out during the planning phase so that decision makers can decide what is the acceptable level and thus what mitigation measures must be adopted. During the risk analysis included in the CBA/CEA, the remaining risks in the final design of the project are analysed. In principle no unacceptable risks should remain. The classification is useful, however, to identify the potential problems that the project might be confronted with.

3.7.3 Risk prevention and mitigation

Once the level of the remaining risks (P and S) is established, it is important to identify the mitigation and/or prevention measures foreseen. The diagram below (Table 3-17) shows, in a qualitative way, the kinds of measures or combinations of measures to reduce the project risk prevailing in the various areas.
of the above defined risk matrix. The identification of these measures requires a thorough knowledge of the causes of risk and of the nature and the timing of the end effects.

### Table 3-17: Risk measures example

<table>
<thead>
<tr>
<th>Severity/Probability</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Prevention or mitigation</td>
<td></td>
<td></td>
<td>Mitigation</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Prevention</td>
<td></td>
<td></td>
<td>Prevention and mitigation</td>
<td></td>
</tr>
</tbody>
</table>

Source: EU-guide for Cost-Benefit Analysis 2014

The ‘intensity’ of the measure should be commensurate to the level of risk. For risks with high level of impact and probability, a stronger response and a higher level of commitment to managing them shall be implemented. On the other hand, for low level risks, close monitoring could be sufficient. When the risk level becomes unacceptable (a situation that should never materialise, in principle) the entire project design and preparation must be revised. When identifying measures to mitigate existing risks, it is mandatory to define who is responsible for their execution and in what stage of the project cycle this will happen (planning, tendering, implementation, operation).

Finally, the impacts of the risk prevention and/or mitigation measures on the project’s resilience and the remaining exposure to risk need to be assessed. For each adverse event, it is suggested to assess the residual risk after the implementation of the measures. If risk exposure is assessed to be acceptable (i.e. there are no longer high or very high-risk levels), the proposed qualitative risk strategy can be adopted. If a substantial risk remains, it is required to move to a probabilistic quantitative analysis to further investigate the project risks (see next section).

Table 3-18 on the next page provides a simplified example of a risk prevention matrix for illustrative purposes.
### Table 3-18: Risk prevention matrix example

<table>
<thead>
<tr>
<th>Adverse event</th>
<th>Variable</th>
<th>Causes</th>
<th>Effect</th>
<th>Timing</th>
<th>Effect on cash flows</th>
<th>Probability</th>
<th>Severity</th>
<th>Risk level</th>
<th>Prevention and/or mitigation measures</th>
<th>Residual risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction delays</td>
<td>Investm. cost</td>
<td>Low contractor capacity</td>
<td>Delay in service start</td>
<td>Medium</td>
<td>Delay in establishing a positive cash flow including benefits materialisation</td>
<td>C</td>
<td>III</td>
<td>Moderate</td>
<td>Set up of a Project Implementation Unit to be assisted by technical assistance for project management during implementation</td>
<td>Low</td>
</tr>
<tr>
<td>Project cost overrun</td>
<td>Investm. cost</td>
<td>Inadequate design cost estimates</td>
<td>Investment cost higher than expected</td>
<td>Short</td>
<td>Higher (social) costs in the first phase of the project</td>
<td>D</td>
<td>V</td>
<td>Very High</td>
<td>The design of the project must be revised</td>
<td>Moderate</td>
</tr>
<tr>
<td>Landslides</td>
<td>Not applicable</td>
<td>Inadequate site investigation</td>
<td>Interruption of the service</td>
<td>Long</td>
<td>Extra costs to rehabilitate the service</td>
<td>A</td>
<td>III</td>
<td>Low</td>
<td>Close monitoring</td>
<td>Low</td>
</tr>
<tr>
<td>Delayed obtaiment of permits</td>
<td>Not applicable</td>
<td>Low political commitment Mismanagement of the licensing procedures</td>
<td>Delay in start of the works</td>
<td>Short</td>
<td>Delay in establishing a positive cash flow including benefits materialisation</td>
<td>A</td>
<td>II</td>
<td>Low</td>
<td>Close monitoring</td>
<td>Low</td>
</tr>
<tr>
<td>Public opposition</td>
<td>Not applicable</td>
<td>Inadequate market strategy Underestimation of threats</td>
<td>Demand lower than expected</td>
<td>Medium</td>
<td>Lower revenues and social benefits</td>
<td>C</td>
<td>V</td>
<td>High</td>
<td>Early definition of an appropriate social plan, awareness-raising activities and campaigns to raise the level of social acceptance</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Source: EU-guide for Cost-Benefit Analysis 2014
GOOD PRACTICES

- The sensitivity analysis is extended to all the independent variables of the project and, among them, the critical variables are identified.
- A large enough numerical scale (i.e. a scale of 1-5) is used for adequate differentiation of probability of occurrence and impact levels of the adverse effects.
- The cost of prevention/mitigation measures is included within the investment and/or O&M costs. This includes risks linked to natural disasters or other similarly unforeseeable events which need to be either covered in the technical design of the project and/or adequately insured (if possible).
- The switching values for critical variables are also calculated.

COMMON MISTAKES

- Risks that are out of the control of the project promoter or other stakeholders (i.e. change of legislation) are neglected in the analysis, although they may substantially contribute to the success/failure of the project.
- Too aggregated variables (e.g. benefits as a whole) are considered in the sensitivity and risk analysis. As a consequence, it is not possible to identify which parameters the prevention/mitigation measures have been focused on.
- Independently from the type of analysis, risk prevention/mitigation measures are not identified.
- A too generic discussion on risk causes and prevention measures is carried out with no mention of their likelihood of occurrence and/or identification of impacts.
- There is no identification of the risk manager, i.e. the function responsible for the implementation of the identified risk prevention/mitigation measures.

3.8 CBA/CEA checklist and interpretation of results

3.8.1 Checklist

The following checklist is intended as a suggested agenda both from the standpoint of the project promoter, who is involved in preparing the project dossier, and from that of the project examiner, who is involved in reviewing the quality of the appraisal.

Table 3-19: CBA/CEA checklist

<table>
<thead>
<tr>
<th>Step</th>
<th>Question</th>
</tr>
</thead>
</table>
| General | - Has an incremental approach been adopted?  
          - Is the counterfactual scenario credible?  
          - Has an appropriate time horizon been selected?  
          - Have project effects been identified and monetised in the CBA?  
          - Have appropriate financial and social discount rates been adopted?  
          - Does the economic analysis build on the financial analysis?  
          - Are all prescribed documents made available to the required quality level and in the prescribed formats?  
          - Are the findings of the study well-documented, sound and sufficiently clear? |

<table>
<thead>
<tr>
<th>Step</th>
<th>Question</th>
</tr>
</thead>
</table>
| Presentation of the context                   | • Is the social, institutional and economic context clearly described?  
• Have all the most important socio-economic effects of the project been considered in the context of the region, town or sector concerned?  
• Are these effects actually attainable given the context?  
• Are there any major potential constraints to project implementation?  
• Does the project have clearly defined objectives stemming from a clear assessment of the needs?  
• Is the project relevant in light of the needs?  
• Are the project objectives quantitatively identified by means of indicators and target values?  
• Is the project coherent with the national and regional strategies and priorities, as well as with strategic goals defined at sectoral levels (as defined in formally approved documents)?  
• Are the means of measuring the attainment of objectives and their relationship, if any, with the targets of national strategies indicated?  
• Does the project constitute a clearly identified self-sufficient unit of analysis?  
• Have combinations of self-standing components been appraised independently?  
• Has the technical, financial and institutional capacity of the promoter been analysed?  
• Has the impact area been identified?  
• Have the final beneficiaries eventually profiting from the project been identified?  
• If the project is implemented by a PPP, is the PPP arrangement well described, are the public and private parties clearly identified?  
• Whose costs and benefits are going to be considered in the economic welfare calculation?  
• Are all the potentially affected parties considered?  
• Has current demand for services been analysed?  
• Has future demand for services been forecasted?  
• Are the demand forecasting method and assumptions appropriate?  
• Does the application dossier contain sufficient evidence of the project’s feasibility (from a technical point of view)?  
• Has the applicant demonstrated that other alternative feasible options have been adequately considered?  
• On what criteria was the project optimal option selected? Are these criteria appropriate for the type of project?  
• Is cost of measures taken for correcting negative social & environmental impacts included in the cash flows considered in the CBA / CEA?  
• Is the technical / procedural design appropriate to the achievement of the objectives?  
• Is capacity utilisation rate in line with demand expectations?  
• Are the project cost estimates (investment and O&M) adequately explained and sufficiently disaggregated to allow for their assessment?  
• Have the key activities to be performed during project implementation been defined and responsibilities assigned to identified staffs?  
• Is any need for external technical expertise identified?  
• Is a procurement plan provided which includes all planned tenders, estimated deadlines for contracting, envisaged procedure and estimated tender amounts? Is there evidence that estimated tender amounts are based on market search?  
• Is a comprehensive time-table provided for Project implementation and does it include land acquisition if applicable, as well as timing for construction of any related infrastructure outside the project scope, and the milestones established for the purpose of monitoring the Project during implementation?  

(Note that this is not a separate step in the CBA/CEA-methodology, where it is generally part of the technical feasibility study)
### Feasibility Study Guidelines Rwanda

**Step** | **Question**
--- | ---
|  | • Is the procedure for the transition from Project implementation to Project operation clearly described?  
• Is the Plan for Project’s operational phase provided and does it present the management and governance structure envisaged for managing, delivering and monitoring the Project? Are reporting lines established?  
• Are needed financial resources indicated for managing the Project during the operational phase?  
• Is a monitoring and reporting schedule developed?

**Financial analysis** | **CBA and CEA:**  
• Have depreciation, reserves, and other accounting items which do not correspond to actual cash flows been excluded from the analysis?  
• Has the residual value of the investment been properly calculated and included in the analysis?  
• In the case of using current prices, has a nominal financial discount rate been adopted?  
• Has VAT, if recoverable by the beneficiary, been excluded from the analysis?  
• Have transfers and subsides been excluded from the computation of the project revenues?  
• If tariffs are levied from users, how has the polluter-pays-principle been applied, what is their cost recovery level in the short, medium and long-term?  
• If an affordability cap is applied to tariffs, has an affordability analysis been carried out?  
• Is the financial sustainability analysed at project and, where appropriate, operator level?  
• If the project is not financially sustainable by itself (produces negative cash-flows at some point), is it explained how the required funds are planned to be covered?

**Economic analysis** | **CBA:**  
• In the case of market distortions, have shadow prices been used to better reflect the social opportunity cost of the resources consumed?  
• Is the Standard Conversion Factor calculated and applied to all minor non-traded items?  
• In the case of major non-traded items, have sector-specific conversion factors been applied?  
• Has the appropriate shadow wage been chosen for the labour market?  
• If cash-flows present fiscal requirements, have market prices been corrected?  
• Have non-market impacts been considered for the evaluation of the project economic performance?  
• Have externalities been included in the analysis, including climate change effects?  
• Are the unit values for quantification of economic benefits and externalities and their real growth over time adequately presented/explained?  
• Have the main economic performance indicators been calculated (ENPV, ERR and B/C ratio) considering the right categories of cost and benefits? Is there any risk of benefit double counting?  
• Is the economic net present value positive? If not, are there important non-monetised benefits to be considered?  
• Are all benefits that could not be quantified, properly described?
### 3.8.2 Interpretation of results

The performance indicators resulting from CBA analysis are as follows:

- **Financial Rate of Return (FRR)** and corresponding **Financial Net Present Value (FNPV)**;
- **Economic Rate of Return (ERR)** and corresponding **Economic Net Present Value (ENPV)**;
- **Benefit Cost Ratio (BCR or B/C)**.

**Interpretation of results from financial performance indicators**

In case **FNPV > 0**, the project is financially feasible: a positive financial net present value indicates that the present value of projected earnings generated by a project or investment exceeds the present value of the anticipated costs. Generally, an investment with a positive FNPV will be profitable; an investment with a negative FNPV will result in a net loss.

The calculation of the financial return on investment measures the capacity of the net revenues to remunerate the investment cost. **When the FRR is lower than the applied discount rate, or the FNPV is negative, then the revenues generated will not cover the costs and the project needs budget assistance.**

Financial information should be studied also in respect of: financial sustainability and, for revenue-generating projects, also the payback period.

**Financial sustainability**: a project is financially sustainable when it does not incur the risk of running out of cash in the future. The crucial issue here is the timing of cash proceeds and payments. Project promoters should show how over the project time horizon, sources of financing (including revenues and any kind of cash transfers) will consistently match disbursements year-by-year. **Sustainability occurs if the net flow of cumulated generated cash flow is positive for all the years considered.**
**Payback period:** an effective project shall have, as minimum, a discounted payback period shorter than the expected lifetime of the investment. In case of a project with long payback period, by providing a grant from the budget, a capital mix can be reached that reduce the payback periods to more acceptable levels.

**Interpretation of results from economic performance indicators**

The **ENPV is the most important and reliable social CBA indicator** and should be used as the main reference economic performance signal for project appraisal. Although ERR and B/C are meaningful because they are independent of the project size, they may sometimes involve problems. In particular cases, for example, the ERR may be multiple or not defined, while the B/C ratio may be affected by considering a given flow as either a benefit or a cost reduction.

**For a project to be approved, the ENPV should be positive i.e. ENPV >0 and ERR should be higher than the social discount rate.** In principle, **every project with an ERR lower than the social discount rate or a negative ENPV should be rejected.** A project with a negative economic return, uses too much of socially valuable resources to achieve too modest benefits for all citizens. In some exceptional cases, however, a project with a negative ENPV could be accepted for budget assistance if there are important non-monetized benefits (e.g. for biodiversity preservation projects, cultural heritage sites, landscape). This should be seen as a rare occurrence, and the appraisal report should still specify in a convincing way, through a structured argument, sustained by adequate data, that, in some sense, social benefits exceed social costs, even if the applicant is unable to fully quantify the former.

The **Benefit-Cost Ratio** is the present value of project benefits divided by the present value of project costs. **If B/C >1 the project is suitable because the benefits,** measured by the Present Value of the total inflows, are greater than the costs, measured by the Present Value of the total outflows. Like the IRR, this ratio is independent of the size of the investment, but in contrast to IRR it does not generate ambiguous cases and for this reason it can complement the NPV in ranking projects where budget constraints apply. In these cases, the B/C ratio can be used to assess a project’s efficiency.

The **performance indicators resulting from CEA analysis** are as follows:

**CE ratio = C1/E1** and **EC ratio = E1/C1** where: C1 = the cost of option 1 (in monetary units); and E1 = the effectiveness of option 1 (in physical units). The first equation above represents the cost per unit of effectiveness (CE). This cost should be below the benchmark cost for the investment, if this is established, or should be the lowest cost among alternative options. The second equation represents the effectiveness per unit of cost, therefore, the higher the ratio the better.
4 Compiling the Project Profile Data

The submission of Project Profile Data (PPD) through IFMIS is compulsory under the 1st Planning and Budgeting Call Circular. The templates for the PPD are regularly updated by MINECOFIN, usually at the beginning of the planning cycle with the 1st Planning and Budgeting Call Circular.

The following table provides an overview of the contents of the Project Profile Data (PPD) required for projects to be submitted to MINECOFIN for funding, cross-referenced with the source of information in the standard chapters of a Feasibility Study Report and the main steps of the feasibility appraisal as presented in the FS Guide chapter 3.

Table 4.1: Source of information under Feasibility Study Reports for compiling the PPD

<table>
<thead>
<tr>
<th>No</th>
<th>Project Profile Data – required information</th>
<th>FS Report chapters</th>
<th>Main steps of the feasibility appraisal as presented in the Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Section 1. Project Promoter and project’s objectives</td>
<td>3. Identification of the Project</td>
<td>Step 3. Project identification</td>
</tr>
<tr>
<td>1.1</td>
<td>Project Promoter</td>
<td>0. Executive Summary</td>
<td>Not applicable</td>
</tr>
<tr>
<td>1.3</td>
<td>Contact person</td>
<td>2. Definition of objectives and logic of the intervention</td>
<td>Step 2. Definition of objectives</td>
</tr>
<tr>
<td>1.4</td>
<td>Project’s objectives (summary of objectives – 250 words max. plus separate paper)</td>
<td>0. Executive Summary</td>
<td>Step 4. Technical feasibility &amp; environmental sustainability</td>
</tr>
<tr>
<td>1.5</td>
<td>Type of project</td>
<td>3. Identification of the project</td>
<td>Step 3. Project identification</td>
</tr>
<tr>
<td>1.6</td>
<td>Start and end date, duration of project implementation in years (in case of construction projects without operation)</td>
<td>4. Technical feasibility &amp; environmental sustainability - Plan for implementation of the investment</td>
<td>Step 4. Technical feasibility &amp; environmental sustainability</td>
</tr>
<tr>
<td>1.7</td>
<td>Location / district(s)</td>
<td>0. Executive Summary</td>
<td>Step 4. Technical feasibility &amp; environmental sustainability</td>
</tr>
<tr>
<td>1.8</td>
<td>Availability of basic infrastructure (e.g. Access to water, access to electricity, roads, land, etc.)</td>
<td>4. Technical feasibility &amp; environmental sustainability</td>
<td>Step 4. Technical feasibility &amp; environmental sustainability</td>
</tr>
<tr>
<td>1.9</td>
<td>Procurement modality (role of the private sector)</td>
<td>4. Technical feasibility &amp; environmental sustainability - Plan for implementation of the investment</td>
<td>Step 4. Technical feasibility &amp; environmental sustainability</td>
</tr>
</tbody>
</table>

| 2  | Section 2. Project costs and financing | 5. Financial analysis | Step 5. Financial analysis |
| 2.1 | Estimated total investment costs (without operation and maintenance costs) | | |
| 2.2 | Potential financing sources | | |

33 Table 4-1 refers to information required for the 2017-2018 planning cycle – updates are to be checked through the MINECOFIN web pages.

34 The PPD requires to prepare a short project description (up to 100 words) that shall provide for a ‘project justification statement’ and mention the main project activities, for example as follows: “Aim of the project is to rehabilitate the existing road Muhanga - Karongi with a length of 78 km. The road has currently a single lane and some of its sections are subject to landslides and flooding, with frequent traffic interruptions. It is envisaged that the road will be reconstructed to a width of 7.5 meters. Main activities shall be preparation (studies, documentation and compensation costs); building and construction (earthworks, road, bridges, retaining walls, public utilities, road information system, vegetation and landscape, noise and safety barriers, other environmental mitigation measures); and supervision of works (4% of building and construction costs).”
<table>
<thead>
<tr>
<th>No</th>
<th>Project Profile Data – required information</th>
<th>FS Report chapters</th>
<th>Main steps of the feasibility appraisal as presented in the Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3</td>
<td>Medium Term Budget Estimate (planned disbursements)</td>
<td>5. Financial analysis</td>
<td>Step 5. Financial analysis</td>
</tr>
</tbody>
</table>

3 Section 3. Key performance indicators

| 3.2 | Output / benefit indicator #1 | 6. Economic analysis | Step 6. Economic analysis |
| 3.4 | Output / benefit indicator #3 | 6. Economic analysis | Step 6. Economic analysis |

Estimate of annual outputs:


4 Project Planning Documents – Feasibility Study / Assessment (uploads)

| 4.1 | Concept note | 0. Executive Summary | Not applicable |
| 4.5 | Other project documents (financing agreement, expropriation report, land valuation, etc.) | FS annexes | |
List of references


- Commodity-Specific Conversion Factors Database for the Republic of Rwanda, Ministry of Finance and Economic Planning (MINECOFIN), see http://rwanda-cscf.cri-world.com/

- Cost-benefit analysis for investment decisions – Chapter 8: the economic opportunity cost of capital, Jenkins, G., Kuo, C., and Harberger, A., 2011.

- Developing Harmonised European Approaches for Transport Costing and Project Assessment (HEATCO), see http://heatco.ier.uni-stuttgart.de/


- General Guidelines and Procedure for Environmental Impact Assessment, Rwanda Environment Management Authority, June 2011


- Guidelines for the economic analysis of projects, Asian Development Bank, 2017


- Interest rate structure up to October 2017, National Bank of Rwanda, 3 November 2017

- Investment project financing – Economic analysis guidance note, World Bank, 9 April 2013


- Public Investment Criteria: Economic Internal Rate of Return and Equalizing Discount Rate, Asian...
Development Bank Report nr 37, Ifzal Ali, November 1986

- Sector guidelines for EIA for roads development projects in Rwanda, Rwanda Environment Management Authority, August 2009
- Social Discounting of Large Dams with Climate Change Uncertainty, Marc Jeuland, 2010, Water Alternatives 3(2): 185-206
- The Economic Appraisal of Investment Projects at the EIB, European Investment Bank, 2013
- The Social Discount Rate in Developing Countries, Missaka Warusawitharana, 9 October 2014 on FEDS Notes (See: https://www.federalreserve.gov/econresdata/notes/feds-notes/2014/the-social-discount-rate-in-developing-countries-20141009.html)
- TREMOVE economic transport and emissions model, see http://www.tmleuven.be/methode/tremove/home.htm
- Vocational Training: Creating Opportunities. KfW Development Bank’s Commitment, October 2017
- Key Aspects of the Economics of Technical and Vocational Education and Training (TVET) Lessons Learned and Gaps to be Filled. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. Author/Responsible/Editor: Artjom Wolf, Andrea Erdle © GTZ 2009, Eschborn
Annexes

Annex A – Indicative reporting format for Concept Note, Pre-Feasibility and Feasibility Studies

Indicative reporting format for Concept Note

WRITTEN SECTIONS

1. General information on the proposed investment project
   1.1 Project’s Name
   1.2 Contracting Authority
   1.3 Name of Chief Budget Manager
   1.4 Name of Investor (if applicable)
   1.5 Total estimated costs (national currency)
   1.6 Estimated duration of implementation phase (months)

2. Situation assessment and identification of possible alternative solutions
   2.1 Investment objectives
   2.2 Need of the investment – current and future demand, expected positive effect that are predicted by achieving the investment and negative effects by non-doing the investment.
   2.3 Alternative solutions that could respond to the identified needs.

3. Justification of the selected technical option
   3.1 Criteria for selecting the project optimal option.
   3.2 Description of the selected technical option and its merits versus alternative options.

4. Conceptual solution of the selected option
   4.1 Information on the legal, economic and technical characteristics of land or construction.
   4.2 Features of the site / sites proposed to achieve the investment.
   4.3 Short technical and functional description of the investment: purpose and functions; characteristics, parameters and technical data; specific deliverables; estimated minimum operating duration corresponding to the destination / proposed functions.
   4.4 Justification of need to develop, as appropriate, further studies.

5. Detailed budget estimates for the project
   5.1 Estimated costs for the implementation of the investment considering, where appropriate:
      - costs of similar investments made;
      - cost standards for similar investments.
5.2. Estimated costs for design, phasing, technical and economic documentation related to the investment and development of other specialised studies depending on the specific investment, including the expenses necessary for obtaining permits, authorisations and approvals required by law.

5.3. Estimated operational costs.

6. Basic implementation plan, milestones
   6.1. Procurement strategy in brief.
   6.2. Duration of each implementation phase and deadlines.

7. Identification of funding and Cost Recovery Options
   Source identified for financing the investment and operational costs.

8. Project’s Socio-Economic Impact
   Description of socio-economic impact quantified as far as possible.

9. Justification in relation to the National Planning Framework
   Present the way the Project shall contribute implementing NST1, Vision 2050 and any related national strategy or law obligations.

DESIGNED SECTIONS

Indicative annotated reporting format for Pre-Feasibility Studies (PreFS)

Maximum length of the pre-feasibility study report excluding appendices: 30-40 pages.

The report should be structured using the headings (chapters, sections and subsections) given below. Under each heading, explanatory notes are added to indicate the topics to be handled in that part of the report.

1. Executive Summary

Two-page summary referring to background of the pre-feasibility study, period in which it was conducted and by whom, context of the envisaged investment/intervention/project, brief description of the investment, its location, investment promoter, the conclusions of demand and option analysis, investment costs, brief presentation of main benefits.

2. Situation assessment and need for the investment

2.1. Relevant policies, strategies, legislation and any other reference framework
National policies/strategies affecting the sector, programmes (including sectoral objectives, strategies, priorities and implementation mechanisms), international agreements relating to the sector which the country has signed, policy links (including land-use policies), and legal aspects linked to the sector.

2.2. Features of the sector in the country
Institutional and administrative setting, role of resources and linkages with other sectors in the national and local economies, all relevant revenues and financing, role of sector in environmental conservation and protection, and key intersectoral links, condition of infrastructure in the relevant areas.

2.3. Beneficiaries and stakeholders involved
Principal stakeholders and their roles, including: resources users, non-governmental organisations (including community-based organisations and service NGOs), private sector organisations, and relevant Government institutions. Also, analysis of institutional arrangements and any co-ordination mechanisms.

2.4. Situation analysis and identified weaknesses
Analysis/review of problems/opportunities described in the Terms of Reference for the pre-feasibility study or, if not described in the ToR, identification and analysis of problems/opportunities to be addressed by the intervention. These problems and opportunities may refer to both the sector and the targeted area(s). Relevant interventions by the Government and donors in the sector or other relevant sectors served by the proposed project.

2.5. Documentation available
Key documents for the study such as previous studies and evaluation reports.

3. Identification of the intervention

3.1. Project description
Concise description of the project (presenting its aim, existing situation, issues it will address, facilities to be constructed, technical and functional data of the investment, characteristics of the physical outputs such as length, capacity by using relevant metrics etc.), a map identifying the project area and the project within the area, components with their individual total cost estimates (without activity cost breakdown). The map of the project area, supplemented by photo / video evidence whenever appropriate, shall be included as technical attachment to the pre-feasibility study report as technical attachment 1.

3.2. Project purpose and demand analysis
Detailed description of why do the target groups and beneficiaries need the project, supported by relevant evidence. The demand for the project should be demonstrated and quantified as far as possible.

3.3. Objectives to be achieved through the investment
Project objectives (list with short explanation) and consistency of objectives with the relevant national / local strategies. Investment expected contribution to achieving the established objectives as well as to support socio-economic development of the project impact area.

3.4. Project results
Description of what services will the project deliver to the target groups and beneficiaries, and which are broadly the expected results, thus also identifying the investment’s potential benefits.

3.5. Assumptions and risks analysis
Assumptions that are to be confirmed before going for the investment are presented, along with any action by agencies other than the investment promoter, required to support the achievement of the project activities, results and purpose.
Capacity of the project to respond to the non-realisation of crucial assumptions that could jeopardise the project’s success, and the extent to which these risks have been considered, are also presented.
Risk analysis shall include as appropriate: i) political and regulatory risks; institutional and administrative capacity issues and risks; technical issues and risks; social issues and risks; environmental issues and risks; economic and financial issues and risk. A risk prevention matrix should be developed and cost of any feasible mitigation measures broadly estimated.

The five above sections shall be summarized through a logframe matrix of proposed project/programme design, including intervention logic, indicators, assumptions and preconditions., attached under the technical appendices as technical appendix 2.

3.6 Options analysis and feasible solutions to realise the investment
Presentation of the scenarios and technical-economical options for the investment analysed in order to select the option considered for the conceptual technical solution and preliminary costing. At least the following information should be included:
(i) Options for scale (against technical, operational, economic, environmental and social criteria) and options for location of the proposed infrastructure, with characteristics of alternative sites;
(ii) Technological options — per component and per system;
(iii) Risks involved for each alternative, including risks related to climate change impacts and weather extremes;
(iv) Option analysis for option without project, do minimum and the recommended solution;
(v) Indicative costs for each option (including consideration of operational costs) and CBA for the recommended option;
(vi) Summary table containing all pros and cons for all options considered.
The criteria considered in recommending the best solution shall be presented with ranking of their importance and method of their evaluation.
The consultations conducted on option analysis shall be also briefly presented.
A full report on option analysis shall be included under the technical appendices.

3.7 Conceptual technical solution
Description and features of the selected site.
The conceptual technical solution for the selected option is developed/designed and briefly described. Drawings and any other technical attachments are included under technical appendices.
The solution shall be possibly developed by considering the characteristics of the site selected in the context of option analysis.
4. Implementation

4.1. Physical and non-physical means
Preliminary indication of physical works, equipment, supervision, technical assistance, policy or technical studies, monitoring and evaluation.

4.2. Organisation and implementation procedures
Choice of implementation agency, initial assignment of responsibilities, and definition of procedures (including procurement procedures).

4.3. Time schedule
Expected project duration and phasing.

4.4 Cost estimate and financing plan
Preliminary costs by component and input, in foreign exchange and local currency, with specification of exchange rate used, indicating the financing source where possible. Both Investment costs and operational and maintenance costs shall be compared with similar investments, whenever possible.

4.5. Special conditions and accompanying measures
Preliminary action for government and parties involved, including the private sector, whenever applicable possibly even prior to launching the feasibility study. This section contains preliminary information on the project implementation. Further information will be provided in the feasibility study during the Formulation phase.

5. Factors ensuring sustainability

5.1. Policy support measures
The extent to which implementation of existing policy requires modification or additional policy measures at a national and/or regional level.

5.2. Appropriate technology
The extent to which the technology and the standards proposed are compatible with: those already in use in the country, the use of local materials and skills, the physical and financial resources of private sector (whenever applicable).

5.3. Environmental protection
The extent to which the impact of the project on people, land use, water, air, noise, flora and fauna and cultural heritage is consistent with agreed environmental standards and practices. It shall be indicated whether an Environmental Impact Assessment is required for the project.

5.4. Socio-cultural and gender aspects
The degree to which the project is consistent with present socio-cultural norms and practices. Any social issues that shall be brought about by the project such as need of expropriations and resettlements.

5.5. Institutional and management capacity, public and private
The extent of efficiency with which relevant institutions, public and private, may fulfill their responsibilities in the project. The eventual need for specialized consultancy shall be discussed.
6. Preliminary financial and economic analysis

Description of economic entities included in the analysis; definition of the ‘with’ and ‘without project’ scenarios and underlying assumptions; analysis of relevant alternative scenarios; description and calculation of benefits and costs; detailed analysis and justification of any revenues and affordability of fees for services for low-income groups; description and justification of type and analysis performed and of the results of the analysis; assessment of project relevance, effectiveness, efficiency and viability from the financial and economic perspective. This section should provide confirmation that key sustainability issues have been incorporated either in the project or as external assumptions.

7. Identification of potential sources of funding and financing

Potential sources of funding and financing shall be indicatively identified for both investment costs and operational costs: revenues, equity, bank loans, budget allocations for state / local budget, foreign loans guaranteed or contracted, state or external grants, and other legal sources.

8. Conclusions and recommendations

The pre-feasibility report shall conclude by recommending or not the project. In case the project is recommended including recommendation of a specific option, the conclusions shall include proposals of any further studies that need to be conducted to confirm the pre-feasibility findings. Possibly, detailed Terms of Reference for the necessary further studies – such as Technical Studies, Economic Studies, Environmental and Social Studies – shall be developed by the pre-feasibility consultants. The above-mentioned ToR shall be attached to the pre-feasibility report.

9. List of Appendices

Appendices to the pre-feasibility report shall include both technical and administrative annexes.

9.1. Technical appendices to the pre-feasibility report

1. Map of the project area supplemented by photo / video evidence.
2. Logical framework matrix of proposed project/programme design, including intervention logic, indicators, assumptions and preconditions.
3. Full options analysis report: analysis of the options for the project/programme design, incorporating feasibility and sustainability. Analysis of the relevance of the preferred option (the project), which is the basis for the conclusions.
4. Other technical appendices, including at least the Conceptual Study of the preferred option, Location Plan, Situation Plan.
5. Terms of Reference for further studies (Feasibility Studies, Environmental Impact Assessment).

9.2. Administrative appendices to the pre-feasibility report

1. Terms of Reference for the pre-feasibility study (as prepared by the project promoter/investor).
2. Study methodology/work plan prepared by the consultant (2-4 pages).
4. List of persons/organisations consulted and dates of consultations (1-2 pages).
5. Minutes of relevant consultation meetings (length as appropriate).
7. Curricula vitae of the consultants (max 1 page per person).
Indicative annotated reporting format for Feasibility Studies

To be used as an input for contracting services related to preparation of Feasibility Study reports.

Maximum length of the feasibility study report excluding appendices: 120-150 pages.

The report should be structured using the headings (chapters, sections and subsections) given below. Under each heading, explanatory notes are added to indicate the topics to be handled in that part of the report.

0. Separate Executive Summary

Ten to thirty pages summarising each chapter of the Feasibility Study.

1. Executive Summary

Two to five pages summary referring to background of the feasibility study, period in which it was conducted and by whom, context of the envisaged investment/intervention/project, brief description of the investment, its location, investment promoter, the conclusions of demand and option analysis, investment costs, brief presentation of main benefits.

2. Presentation of the context (Step 1)

This assessment requires the definition of the social, economic, political and institutional context. The key features to be described relate to:
(1) the socio-economic conditions of the country/region that are relevant for the project;
(2) the policy and institutional aspects, including existing economic policies and development plans with their policy objectives;
(3) the existing situation i.e. description of existing infrastructure and service provision, use/objective of the infrastructure;
(4) the weaknesses of the existing situation; particular emphasis should be made on the territorial needs addressed by the project;
(5) the perception and expectations of the population with relation to the service to be provided.

3. Definition of objectives and logic of intervention (Step 2)

3.1. Strategic Planning and Project Specific Objectives

This section shall clearly demonstrate the needs and relevance of the project.

Clear objectives shall be defined for the project in order to verify that the investment responds to an existing need and to assess the results and the impact of the project. As far as possible the objectives should be quantified through indicators with baselines and target values.

The definition of the objectives shall be used to identify, where possible and appropriate, the project benefits in order to assess contribution of the project to welfare and to achieving the specific objectives of the national policies, strategies, plans and or/programmes in reference.

3.2. Contribution to socio-economic development

This section shall describe the project’s contribution to socio-economic development. Topics to be addressed may include:
• How does the project contribute to socio-economic development (i.e. sustainable growth, environment, innovation, education, (sustainable) mobility, health, etc.)?
• Have the expected socio economic trends at country/regional level been assessed?
• Is the project specifically addressing them?

3.3. Measures to ensure optimal utilisation of the Project

• This section shall present the measures taken to ensure optimal utilisation of the infrastructure in the operational phase. In particular:
  • What are the organizational measures adopted?
  • What are the operational measures?
  • Are these measures in line with demand projections?
  • Is there any competing infrastructure planned to be built or legislative issues that may threaten the assumed utilisation of project assets?

4. Identification of the project (Step 3)

The identification of the project shall take place considering the following:
(1) The project needs to be clearly identified as a self-sufficient unit of analysis, that is, technical lots or administrative or financial phases that cannot be regarded as being operational in themselves, shall be analysed together with other phases comprising a project. Project activities shall be described.
(2) A concise description of the project shall be given including facilities to be constructed, characteristics of the physical outputs such as length, capacity by using relevant metrics etc.
(3) Project location should be described a map identifying the project area and the project within the area, supplemented by photo / video evidence whenever appropriate, shall be included as technical attachment to the feasibility study report.
(4) The impact area, final direct beneficiaries and relevant stakeholders whose welfare counts in the aggregation of net benefits shall be considered. Stakeholders analysis and their roles shall include: resources users, non-governmental organisations (including community-based organisations and service NGOs), private sector organisations, and relevant Government institutions; analysis of institutional arrangements and any co-ordination mechanisms.
(5) The body responsible for implementation is identified and its technical, financial and institutional capacities analysed.

5. Results of feasibility studies with demand and option analysis, technical feasibility and environmental sustainability (Step 4)

5.1. Demand analysis

Detailed description of why do the target groups and beneficiaries need the project, supported by relevant evidence. The demand for the project should be demonstrated and quantified as far as possible. The demand analysis shall identify and quantify the social need for the investment and consider as a minimum:
- the current demand, by the use of models and actual data;
- the future demand, from macroeconomic and sector forecasts and elasticity estimates of demand to relevant prices, income, and other core determinants;
- supply side aspects including the analysis of existing supply and expected (infrastructure) developments.

Current Demand Analysis / Base Case. The following topics should be addressed, if applicable:
• Historical trends in terms of volumes (and prices if relevant) in the targeted markets
• Sector analysis (if relevant)
• Current situation, historical and market share (including competition)
• Promoter's marketing/sales/distribution organisation and its planned evolution.
• Pricing policies
• Capacity constraints.

**Future Demand Analysis.** The promoter's demand projections shall be discussed in light of:
• Socioeconomic and demographic trends
• Market trends and other relevant elements
• Promoter’s competitive advantages/disadvantages
• Demand projections
• Capacity aspects
• Changes in pricing policies
• Economic life span of the project
• Other assumptions used.

5.2. **Option analysis**

- List of alternative strategies identified to achieve the intended objectives (i.e. type of infrastructure and location for the project); description of the selected strategy and, if applicable, methodology applied for its selection.
- Identified options in line with the strategy to achieve intended objectives; criteria used to screen and identify the most suitable option (e.g. Multi-criteria analysis / criteria used and approach for ranking/comparing; simplified CBA if alternatives present different outputs, externalities and environmental impacts; or least cost solution if alternatives have the same, unique, objective and similar externalities).
- **Option analysis for at least option without project, do minimum and the recommended solution. CBA performed for at least the three options.**
- Comparison of the specific technological solutions for the selected option (including in the context of EIA/SEA procedures).
- Final option(s) chosen and description of the promoters’ justification.

5.3. **Technical description and engineering aspects**

- Site characteristics.
- Infrastructure characteristics of site and requirements (roads and transport, communications, water supply, sewerage system and electricity provisioning, heating, cooling and ventilation system, waste disposal, energy requirements.
- Type of works (i.e. new infrastructure/plant, rehabilitation, upgrade/modernisation) and their suitability of the works to cope with requirements (demand, regulations, safety, etc.).
- Scope of the works and its main components.
- If the project is a stage/phase of a larger investment the broader works scope should be described.
- Particular engineering / technological aspects.
- Engineering / technological risks and, if applicable/relevant, the adopted mitigation measures/factors.

5.4. **Project costs**

**Investment Costs**

- Total investment cost and detailed cost breakdown.
• Individual project elements and unit costs, including cost of measures taken to address negative environmental impacts, if any.
• Level of accuracy of costs estimates i.e. whether the costs are based on basic/detailed design, or pre/post tendering estimates, or contractual estimate (the most recent cost information should be used).
• Deviations from original estimates (feasibility / application) after tendering/contracting, if applicable.
• Specify the exchange rate used.

Operational Costs
• Current operation and maintenance costs; changes in operation costs after the project
• Operating and maintenance unit costs of investment.

5.5. Environmental considerations including EIA and climate change
• Analysis of environmental analysis requirement (environmental screening)
• Climate Change Mitigation and Greenhouse Gas Emissions
• Summary and conclusions on the environmental impact assessment (if required)

5.6. Plan for implementation of the project

Procurement Process
• Type of envisaged procurement.
• Status of procurement process.

Implementation Schedule
• Location and building permits requirement and status.
• Implementation schedule with time-table including planning if applicable.
• Identified phases and the optimal set-up from effectiveness and efficiency point of view.

Physical and Financial Indicators to Monitor Implementation
• Physical and financial indicators for monitoring the progress of the project and their expected values (e.g. indicate the expected annual and cumulative percentage of physical completion of the project, which normally differs from the financial one, and include a link to the project web site, if exists).

5.7. Plan for operation of the project
• Legal status of promoter and other entities participating in the project
• Organisational Structure
• Monitoring structure and arrangements
• Experience with similar projects
• Human Resources
• Human resource requirements
• Recruitment needs (if applicable)
• Personnel Hiring and Training (if applicable)
• Consultancy required support

5.8. Institutional capacity and capability
• Technical capacity and experience of the planning, implementing and operating bodies. Description of management structure during implementation and operation. If applicable, describe the use of external technical assistance during planning, implementation and operation.
• Legal organisation of the implementing and operating bodies (private or public bodies, institutional setup of bodies’ legal services, contractual arrangements for implementation and operation, expropriation rights, open legal procedures, etc.).
• Key financial parameters (Project Measures) and the existing position of the implementing and operating bodies (adequacy of available funds to finance the implementation of the project, financial sustainability during implementation and operation, financial capacity of implementing and operating body/bodies – available info on external risk ratings).
• Administrative and project management arrangements and experience to implement and operate the project. If applicable, describe the use of external technical assistance, PIUs and other arrangements aiming at capacity enhancement.

6. Financial analysis (Step 5)

Methodology and parameters
• Use of the discounted cash flow method (exclusion of contingencies, depreciation and other accounting items from profitability calculations).
• Incremental approach against the counterfactual without-the-project scenario.
• Reference period and price base year.
• Choice of financial discount rate (where rates alternative than MINECOFIN recommended one are used, the promoter’s justification shall be provided).
• Use of constant vs. nominal prices.
• Adoption, where feasible, of a consolidated owner-operator approach.
• Allowance for inclusion (non-recoverability) of VAT in the financial analysis.
• Calculation of residual value.

Tariffs and affordability analysis, whenever relevant
• Strategy for setting users charges/fees/tariffs, proposed tariff structure and consistency with national/regional pricing polices.
• Consistency with polluter pays and full cost recovery principles (include available supporting evidence).
• Social acceptability of tariffs and tariff increases (affordability analysis), when relevant, including eventual measures to manage the cost recovery vs. affordability trade/off.

Financial profitability
• Cash-flows for project costs and revenues, including residual values.
• Financial performance of the project (is the project in need of co-financing?), main financial indicators.
• Check of financial profitability calculations and in case of private partners involved, calculation of return on private capital and comparison with financial profitability benchmarks in the sector.

Financial Sustainability
• Demonstration of financial sustainability at project level (positive cumulated net cash flow over the reference period).
• Inclusion of all inflows (sources of financing, operating revenues, transfers, subsidies and other financial gains) and outflows (debt service costs, short life-time asset renewals and direct taxes in cash flows).
• In case of project not financially sustainable by itself, description of under which mechanisms and arrangements the required funds will be ensured.
• Sources of public subsidies, if any, either for operations or asset renewals at national/regional/local level.
Sources of Funding and Financing
Potential sources of funding and financing shall be indicatively identified for both investment costs and operational costs: revenues, equity, bank loans, budget allocations for state / local budget, foreign loans guaranteed or contracted, state or external grants, and other legal sources.

7. Economic analysis (Step 6)
Methodology and parameters
- Macroeconomic assumptions used and consistency with those used in other parts of analysis.
- Choice of social discount rate in line (where rates alternative to the MINECOFIN recommended one are used, the promoter’s justification shall be provided).
- Discussing (i) price base year used, (ii) reference period used in analysis and (iii) confirm use of constant prices.

Fiscal corrections, from market to shadow prices
- Conversion from financial to economic prices, explaining how fiscal adjustments were made and conversion factors applied.
- Calculation of economic residual value.

Evaluation of non-market impacts (socioeconomic benefits and costs)
- Identification of direct benefits and methods used for monetary evaluation.
- Assumptions (unit values, parameters, growth factors, etc.) underpinning direct benefits identification and evaluation.
- Evaluation of environmental, climate change mitigation and other external benefits/costs.
- If applicable/available, results of the analysis of the distributional effects of the project (i.e. analysis of the project impact on the welfare across users and other stakeholders).
- Qualitative description of non-quantifiable/ non-monetary benefits and costs, where applicable.

Economic viability
- Results of the economic viability calculations: ENPV, ERR and B/C ratio.

8. Risk assessment (Step 7)
Project Risk Management Process
- Process / approach for identification of adverse events to which the project is exposed (including climate change dimension or make reference to the climate change chapter).
- Strategy of the promoter to cope with such eventual adverse events (and in particular how the investment will be completed and functioning within expected applicable and allowable period framework).

Qualitative risk analysis and Prevention/Mitigation Matrix
- Risk matrix provided by the promoter including the assessment of acceptable levels of risk and/or categorisation of risks. Risk analysis shall include as appropriate: political and regulatory risks; institutional and administrative capacity issues and risks; technical issues and risks; social issues and risks; environmental issues and risks; economic and financial issues and risk.
- Details of the possible causes of occurrence and the negative effects generated on the project.
- A description of mitigation and/or prevention measures for the main risks identified by the promoter.

Sensitivity of Economic and Financial Analyses
- Identification of variables to be tested under sensitivity analysis.
• Ranges used for the sensitivity test.
• Identification of the critical variables.
• Calculation of switching values correctly performed.

Probabilistic Risk Analysis
Results about the robustness of project’s financial and/ economic performance, based on the quantitative (probabilistic) risk analysis performed.

9. Conclusions and recommendations (Step 8)

The feasibility report shall summarise the conclusions of the feasibility analysis and recommend, or not recommend, the project.

10. Annexes

Technical appendices
Design and Drawings: Preliminary Design.
Map of the project area supplemented by photo / video evidence.
Logical framework matrix of proposed project/programme design, including intervention logic, indicators, assumptions and preconditions.
Full options analysis report: analysis of the options for the project/programme design, incorporating feasibility and sustainability. Analysis of the relevance of the preferred option (the project), which is the basis for the conclusions.
Other Annexes such as EIA Report, Compensation Report, and various studies (depending on the subject of the Feasibility Study).
List of documentation consulted for the study, such as previous studies and evaluation reports.

Administrative appendices
Terms of Reference for the feasibility study (as prepared by the project promoter/investor and agreed during the Inception Phase).
Study methodology/work plan prepared by the consultant (2-4 pages).
List of persons/organisations consulted and period of consultations (1-2 pages).
Minutes of relevant consultation meetings (length as appropriate).
Literature and documentation consulted (1-2 pages).
Curricula vitae of the consultants (max 1 page per person).
Annex B – Terms of Reference for contracting services for preparation of Feasibility Study Reports

1. Background of the Assignment

1.1. Foreword
(Text to be developed by Contracting Authority (CA, or Client) for consultancy FS & CBA services): Put the project and the investment in context.

In addition to the Feasibility Study with CBA, Technical Documentation for construction shall be prepared. The documentation shall be prepared by experts selected according to the procurement rules of the project promoter (or donor), under a separate contract.

1.2. Project Overview
(Text to be developed by Contracting Authority (CA, or Client) for consultancy FS & CBA services):
The Beneficiary shall be briefly presented together with the basis of the intention of the project and the overall and specific project objectives.
Key stakeholders of the project shall be listed.
Location and concise project description shall be provided.

2. Objective of the Assignment

The overall objective is to carry out a detailed assessment to determine the overall feasibility of implementing the Project.

The specific objective of this assignment is to support the initial development of the Project through the provision of expert's preparation of a Feasibility Study with Cost-benefit Analysis.

Implementation of activities envisaged under this contract shall result in high-quality professional and technical basis for preparation of options and selection of the most favourable solution, that are technically and operationally compliant with all applicable standards and good practice, economically and operationally sustainable and socially affordable in Rwandan circumstances.

The objective is to ensure the most cost-effective project development that would generate the biggest socio-economic (therefore not solely financial) benefits. The Consultant shall therefore select the most cost-effective solution of the options for the economic project lifetime for which it is reasonable to expect that it shall be approved for assistance by national authorities.

Specific objectives are:
- to establish the technical, economic, environmental and social feasibility of the Project,
- to estimate the cost of implementing the project,
- to prepare CBA,
- to prepare Environmental Management Plan (EMP) - check list,
- to prepare Technical Documentation Review,
- to prepare implementation and procurement schedule for the project.

The Consultant shall:
- Keep the Contracting Authority informed of progress and any issues that arise;
- Work closely with the Beneficiary / end recipient of the infrastructure;
• Regularly and frequently consult with and inform all key stakeholders during the implementation of the Project.

The following outputs will be provided by the Consultant:

A. Feasibility Study (FS)
B. Cost-benefit Analysis (CBA)
C. Technical Documentation Report (TDR)

The Feasibility Study must prove the selection of the most favourable solution in terms of technical-technological and financial-economic aspects.

The Cost-benefit Analysis and the Technical Documentation Report must be prepared as an integral part of the Feasibility Study.

3. Scope of Services, Tasks and Expected Deliverables

The following are the specific activities to be carried out by the Consultant:

• Prepare Analysis of the current state - Review of all existing information, reports and studies relevant to the Project
• Prepare the Demand analysis
• Prepare one planned and at least two alternative options of implementing the Project
• Do a comparative ranking for all the projects options based on the economic and financial analysis and recommend the best alternative and its implementation plan.
• Determine an implementation of the time schedule for the Project,
• Prepare a procurement plan,
• Prepare a cost estimate for the main civil works, by using the Bill of Quantities provided by the designers,
• Prepare a detailed list of equipment with the cost estimate,
• Prepare the Cost-benefit Analysis (CBA),
• Prepare Environmental Management Plan (EMP) - check list,
• Identify all risks to the Project and suggested mitigation plans. The Consultant shall also identify risks related to revenues and costs and conduct relevant sensitivity analyses on the financial results with respect to changes in several key variables. The consultant shall prepare an overall risk management matrix for mitigating identified risks and unknowns during planning stage, procurement stage, construction stage, commissioning, defects liability, and operation period.
• Prepare a draft Feasibility Study for review and discussion – the Study shall integrate all available technical and social environmental information and identify any gaps for further consideration,
• Prepare a Final Feasibility Study Report considering the client’s and other stakeholder’s comments,
• Prepare a separate Executive Summary of the Final Feasibility Report outlining the principal of the project, cost of the basic components, economic and technical justifications and the social and environmental assessment of the Project,
• Prepare Technical Documentation Review (TDR) - detailed review of existing project documentation and supporting documents with Technical Documentation Report, with recommendations for improvement,
• Prepare the Guidelines for Sustainable Building Design and Construction (if applicable).
3.1. Results to be achieved by the Consultant

A. Feasibility Study
The Feasibility Study shall provide the factual inputs for defining the appropriate scope of the project and will outline the financial, institutional and organisational needs for the construction and operation of the Project based on a consultative process among the different stakeholders.

As a general principle, the Feasibility Study shall conclude about the technical-technological, organisational and economic feasibility of the Project as compared to the relevant international benchmarks for such activities and to inform decision-makers whether the planned project represents the best use of the funds available.

The Feasibility Study must be prepared with all necessary background documents, annexes and documentation in accordance with applicable legal requirements and methodologies agreed with the Contracting Authority during the Inception Phase.

The Feasibility Study result depends on the Demand analysis i.e. assessment of past and future demand (forecast), which is a pre-requisite for the CBA and the main determinant of its quality.

The structure and contents of the Feasibility Study shall be compliant with the instructions provided by the Contracting Authority during the Inception Phase *(Text to be developed by Contracting Authority for consultancy FS & CBA services, with specifications for the relevant sector of investment)*.

B. Cost-benefit Analysis
The Consultant shall provide full CBA taking into consideration one planned and at least two alternative options of implementing the project. Financial analysis is one of the basic analyses in the Feasibility Study, and shall be given appropriate priority.

The minimum requirement is that the project must be sustainable over its economic lifetime i.e. there must be a flow of future revenue sufficient to cover operating and maintenance costs, including investment maintenance. There is, however, a second aspect of the financial analysis which is of critical importance; this is to estimate the level of subsidy which is required to make the project financially viable. The rationale for public funding is that infrastructure projects cannot cover all of the investment cost and the future operating and maintenance cost from future revenue. The estimated future flow of revenue must, at the least, cover annual operating costs but it can also cover some part of the capital cost of the new investment, in the sense that the flow of revenue can repay a loan to a bank or some other institution. However, there may be some percentage of the capital cost which cannot be met by future revenue and which requires a subsidy to make the project financially viable over its lifetime.

Option analysis shall focus on the following key aspects of selecting the best option:

- properly justification of the solution sought, including evidence that the selected option is the optimal one of the various options considered during the technical feasibility study;
- if different alternatives have the same, unique objective and the same or very similar externalities, the selection shall be based on the least cost solution per unit of output produced considering the long term operating and maintenance costs associated with the option;
• if the output and externalities are different in different options (assuming all share the same objective), a simplified CBA shall be undertaken for all main options to select the best option by determining which option is more favourable from a socio-economic point of view and the selection should be based on economic parameters of a project, including its Economic Net Present Value (ENPV). The simplified CBA shall be carried out based on approximate estimates of key financial and economic data, including demand, investment cost and operating costs, revenues, direct benefits and externalities, where relevant.

Presentation of the options analysed in order to select the option considered for the technical solution and costing shall include at least the following information:

1. Options for scale (against technical, operational, economic, environmental and social criteria) and options for location of the proposed infrastructure;
2. Technological options — per component and per system;
3. Risks involved for each alternative, including risks related to climate change impacts and weather extremes;
4. Cost estimate for each option (including consideration of operational costs);
5. Summary table containing all pros and cons for all options considered.

The criteria considered in recommending the best solution shall be presented with ranking of their importance and method of their evaluation. The consultations conducted on option analysis shall be also briefly presented. A full report on option analysis shall be included under the technical appendices.

The financial model must contain sensitivity and risk analyses. The Consultant shall identify the key variables to which the financial model is sensitive. A series of scenarios shall be developed in order to test the sensitivity of the project to the changes in the key assumptions that are the basis of those variables.

The economic impact of the project shall be described in quantitative terms as much as possible. Economic benefits, together with social benefits generated through the project, shall be described, and project beneficiaries identified. If it is possible to quantify all relevant costs and benefits, then the results of the analysis shall be presented using the recognised criteria such as the economic internal rate of return, net present value, and cost-benefit ratio.

The financial and economic analyses shall be prepared in accordance with the MINECOFIN Guidelines for Feasibility Studies of projects at central Government level in Rwanda.

C. Technical Documentation Review - review of existing project documentation and supporting documents & Technical Documentation Report

The Consultant shall provide a detailed review of technical documentation and supporting documents for the planned option. On the basis of the review, Technical Documentation Report will be drafted. The Technical Documentation Report shall particularly contain:

• Guidelines to designers in order to carry out design process,
• Recommendations for improvements/optimisation of project’s documentation,
• Guidelines for Sustainable Building Design and Construction with recommendations for sustainability measures (to be confirmed during the Inception Phase).

Guidelines for Sustainable Building Design and Construction will be drafted. The main objective of sustainable design is to reduce, or completely avoid, waste of critical resources like energy, water and raw materials; prevent environmental degradation caused by facilities and infrastructure throughout their life.
cycle; and create built environments that are usable, comfortable, safe and productive. Buildings use resources (energy, water, and etc.), generate waste and emit potentially harmful atmospheric emissions. Building owners, designers and builders face a unique challenge to meet demands for new and renovated facilities that are accessible, secure, healthy and productive while minimising their impact on society, the environment, and the economy. The Guidelines for Sustainable Building Design and Construction shall result in net positive benefits to all three areas (society, the environment, and the economy).

The approach is intended to apply an integrated design methodology. All stakeholders shall be involved to contribute their understanding of how the building and its systems will work and benefit to the whole Community. It is imperative that the major decision-maker allows participation of all of the stakeholders, who are affected by the design.

D. (Optional:) Assistance to completing funding applications

As an additional option, assistance to completing funding applications (project descriptions, context, objectives, results of financial and economic CBA and risk and sensitivity assessments, etc) can be requested from the Consultant.

4. Team Composition & Qualification Requirements for the Key Experts

The following criteria will be applied to all Consultants who submit a proposal. In case of applications submitted by a Joint Venture (JV) these selection criteria will be applied to the JV as a whole. In case you are short listed for another assignment at the same time, when proposing full time staff for any of the assignments, those full-time staff shall be different for each assignment. Proposing the same full-time staff for more than one assignment at the same time may result in the rejection of the technical proposal.

4.1. Team Composition - Key Experts

Alternative professional staff shall not be proposed, and only one in curriculum vitae (CV) may be submitted for each position. All experts who have a crucial role in implementing the contract are referred to as key experts.

| The Consultant will make available the following Key experts: | Expert No. 1 – Team Leader |
| | Expert No. 2 – Buildings and Infrastructure project expert |
| | Expert No. 3 – Sectoral Expert |
| | Expert No. 4 – Financial Expert – Expert for financial and economic analyses |
| | Expert No. 5 – Environmental Expert |
| | Expert No. 6 – Land expropriation and resettlement Expert |

4.2. Qualification Requirements

Since the service to be provided by the Consultant is highly specialised, the Consultant’s team shall consist of persons that have experience in the preparation of feasibility studies and CBA in the field of ............ To be inserted for similar types of infrastructure projects. The consultants are requested to indicate (by marking with A, B, C, etc.) which periods/projects listed in the expert’s CV correspond with the requirements A, B, C, etc. One reference may cover 2 or more requirements. The consultant shall support listed projects for key experts with appropriate evidence for at least 3 projects.

Key expert 1: Team Leader – leader in preparation of Feasibility study and coordinator of the contract implementation

Input
The team leader is responsible for the overall contract coordination and quality control of contract implementation. S/he will ensure that the engagement of short-term experts is agreed with the contracting authority and that they are engaged on time to deliver the project outputs.

Qualifications and skills
- Master’s Degree Academic level (University level education in duration of at least 4 years) in Civil Engineering or Architecture
- Good organisational and coordination skills
- Working knowledge of English.
- Advantage: Master of Business administration degree

General professional experience
- Requirement A: At least 10 years of general professional experience in infrastructure projects in the Project sector,
- Requirement B: Minimum 5 years of experience in preparation of feasibility studies in the Project sector intended for International Financial Institutions (IFI) funding.

Specific professional experience
- Requirement C: Experience as a team leader in preparation of feasibility studies or business plans on at least 2 projects funded by IFIs in the last 7 years.
- Requirement D: At least 2 projects completed in the preparation of feasibility studies for buildings and infrastructure projects.
- Requirement E: Knowledge of official languages of Rwanda.

Key expert 2: Buildings and Infrastructure projects expert – design engineer

Input
The expert will be responsible for the coordination and management for preparation of Technical Documentation Report and option analysis activities for the projects.

Qualifications and skills
- Master’s Degree Academic level (University level education in duration of at least 4 years) in Architecture
- Working knowledge of English
- Advantage: certified by the Rwandan Chamber of Architects/Engineers.

General professional experience
- Requirement A: 10 years of professional working experience infrastructure projects,
- Requirement B: Minimum 5 years of experience in preparation of feasibility studies and designs for infrastructure projects intended for International Financial Institutions (IFI) funding

Specific professional experience
- Requirement C: Experience in preparation of feasibility studies on at least 2 projects in the last 7 years,
- Requirement D: At least 2 projects completed in the preparation of feasibility studies and project applications intended for IFI co-financing in the Project sector,
- Requirement E: Experience in the design of at least 1 infrastructure project in the Project sector,
- Requirement E: Knowledge of official languages of Rwanda.

Key expert 3: ……………..
4.3. Other experts, support stuff & backstopping

CVs for experts’ other than the key experts shall not be submitted in the tender. The Consultant shall select and hire other experts as required according to the needs. The selection procedures used by the Consultant to select these other experts shall be transparent, and shall be based on pre-defined criteria, including professional qualifications, language skills and work experience.

All experts should have as a minimum requirement a university degree, at least five (5) years’ work experience, be fluent in English, and proven experience in the field(s) relevant for their specific projects, and work experience in Rwanda will be an asset.

Cost for backstopping and support staff, as needed, are considered to be included in the financial offer of the consultant. The Consultant should provide adequate administrative staff (i.e. secretary, translator, interpreter, accountant) needed to support the expert team in order to assure the quality of all its activities and outputs.

Consultants are reminded that communication with local Final Beneficiaries will mainly be in English. Therefore, if necessary, the Consultant has to hire respectively qualified experts or must provide interpretation and translation services which must be covered by the contract price.

5. Reporting Requirements and Time Schedule for Deliverables

5.1. Reports
The Consultant shall prepare and submit to CA (Client) the following documents and reports:

<table>
<thead>
<tr>
<th></th>
<th>Draft Inception Report</th>
<th>4 hard copies;</th>
<th>4 digital copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Draft Inception Report</td>
<td>4 hard copies;</td>
<td>4 digital copies</td>
</tr>
<tr>
<td>2.</td>
<td>Final Inception Report</td>
<td>4 hard copies;</td>
<td>4 digital copies</td>
</tr>
<tr>
<td>3.</td>
<td>Technical Documentation Report</td>
<td>4 hard copies;</td>
<td>4 digital copies</td>
</tr>
<tr>
<td>4.</td>
<td>Implementation and procurement plans</td>
<td>4 hard copies;</td>
<td>4 digital copies</td>
</tr>
<tr>
<td>5.</td>
<td>Financial and economic analysis</td>
<td>4 hard copies;</td>
<td>4 digital copies</td>
</tr>
<tr>
<td>6.</td>
<td>Draft Feasibility Study Report</td>
<td>4 hard copies;</td>
<td>4 digital copies</td>
</tr>
<tr>
<td>7.</td>
<td>Final Feasibility Study Report</td>
<td>6 hard copies;</td>
<td>6 digital copies</td>
</tr>
<tr>
<td>8.</td>
<td>Executive Summary FS</td>
<td>6 hard copies;</td>
<td>6 digital copies</td>
</tr>
<tr>
<td>9.</td>
<td>Final Funding Application</td>
<td>4 hard copies;</td>
<td>4 digital copies</td>
</tr>
<tr>
<td>10.</td>
<td>Monthly Progress Report</td>
<td>2 hard copies;</td>
<td>2 digital copies</td>
</tr>
</tbody>
</table>


The MS excel copy of the financial model shall be provided with traceable formula format, which clearly sets out all assumptions made, sensitivity analyses carried out, and key outputs in support of the various analyses and conclusions.

Note: a maximum number of words or pages (combined with prescribed font size and line spacing) can be given to prevent the Consultant from providing too long report texts.
5.2. Time Schedule
The assignment is expected to take a maximum of xxxx (xx) months and documents and reports should be reported as follows:

<table>
<thead>
<tr>
<th></th>
<th>Draft Inception Report</th>
<th>1st month (schedule to be adjusted by Contracting Authority)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Final Inception Report</td>
<td>2nd month</td>
</tr>
<tr>
<td>3.</td>
<td>Technical Documentation Report</td>
<td>8th month</td>
</tr>
<tr>
<td>4.</td>
<td>Implementation and procurement plans</td>
<td>9th month</td>
</tr>
<tr>
<td>5.</td>
<td>Financial and economic analysis</td>
<td>13th month</td>
</tr>
<tr>
<td>6.</td>
<td>Draft Feasibility Study Report</td>
<td>14th month</td>
</tr>
<tr>
<td>7.</td>
<td>Final Feasibility Study Report</td>
<td>15th month</td>
</tr>
<tr>
<td>8.</td>
<td>Executive Summary FS</td>
<td>15th month</td>
</tr>
<tr>
<td>9.</td>
<td>Final Application</td>
<td>15th month</td>
</tr>
</tbody>
</table>

All documents shall be prepared in English. The Consultant must include the costs of translation in his Bid price.

The printed and bound documents and their digital versions must be identical and should allow printing of additional copies from the digital versions, if necessary, completely identical to the printed copies. The digital versions shall be made in PDF format. Aside from the PDF format, the Consultant shall also ensure and provide to the CA (Client) the complete documents in the original formats in which they were prepared, which can be altered and supplemented by the CA (Client).

At the end of the assignment Consultant will prepare a Final Report and deliver it to the Client. The Contracting Authority (Client) has to give his comments / approval on each of the Consultant’s deliverable within 15 days, the latest.

During the Inception Phase, the Contracting Authority shall provide detailed instructions regarding the format and editing of the Feasibility Study Report and all its attachments including font/font size of text and footnotes, indentation, format of tables, charts and figures (editing of titles, sources etc.), automatic table of contents, list of sheets for excel sheets, etc.

An indicative Table of Contents of the Feasibility Study Report is provided in attached to these Terms of Reference.

6. Client’s Project Team and Inputs
For project monitoring purposes, the Client has established a Project Team. The Consultant is obliged to closely cooperate with the Project Team, ensure constant contact and be prepared to promptly make potential corrections in the prepared documents.

The Project Team shall assist the Consultant to collect the necessary background documents, organise working meetings and potential presentations, as well as to ensure the necessary reviews. The Project Team shall also ensure other necessary support to the Consultant in contract implementation.

The Client undertakes to submit to the Consultant the necessary input data and background documents (available to the Client) for project implementation, as well as to ensure the necessary points of contact in the utility company and the unit of local self-government when collecting the necessary information for the purposes of performing the activities required for the project.

The Client shall make available to the Consultant information’s, reports, documents, etc., related to the execution of the Services. All documents related to the Services are, and will remain Client’s property until completion of the Services. The Consultant cannot use or dispose of his documentation without previous Client’s written consent.
Available documents relevant for the Project:
<list to be inserted>

7. Other relevant information
The Consultant shall attend working meetings which will be held during contract implementation, upon the Client’s invitation. The Consultant shall also attend and actively partake in the presentation of individual project phases. The Consultant shall, for the needs of the meeting, take part in the preparation of documents and presentations required, take part in these, and present his work.

The key staff defined in ToR shall take part in all the key meetings, as well as in the presentations of activities.

The Consultant shall cooperate with the authors of previously prepared technical documents, relevant for the preparation of the documents covered by these Terms of Reference, and participate in working meetings upon the Project Team’s invitation.

The Client shall, at the request of the Consultant, make available all previously prepared design documents.

8. Improvement of ToR
The Consultant may offer suggestions and improvements in the Terms of Reference, which would from Consultant’s perspective result in better implementation of the Project.

If accepted, such proposals will form part of the Terms of Reference of the proposals submitted by the consultant. The effect on the time and cost estimates given under the above clause shall be clearly identified.

9. Contact person in PIU
The contact person for the Consultant in the Project Implementation Unit (PIU) of the Ministry of... is....
<please add name and contact references>.
Annex C – Establishing the discount rate

C.1 Discount rates in Rwanda

The discount rates to be used in feasibility studies of project to be submitted for funding to MINECOFIN are set at:

- Financial discount rate: 13%
- Social discount rate: 13% (indicated as EOCK under National Parameters on the MINECOFIN website)

Both are expressed in real terms, as the financial and economic analysis are expressed in real terms too.

The FDR is the opportunity cost of capital and is valued as the loss of income from an alternative investment with a similar risk profile. The FDR in Rwanda is based on the lending rate of the National Bank of Rwanda, which ranged between 16.8% and 17.6% in the previous year. As this is a nominal rate, it was corrected for inflation of about 4%, giving an FDR of 13.3% or rounded 13%. Another approximation could be based on the interest rate on T-bonds, which indicates the cost of raising capital by the government. While these are not issued regularly, an approximate level can be obtained for the past 3 years, where T-bonds for 10 years have been issued at 13% in 2015 and for 15 years at 13.5% in 2016.

The social discount rate for Rwanda was established by Cambridge Resources International Inc, in a study commissioned by MINECOFIN. The approach applied is based on the view that the ‘marginal’ source of funds for both the public and private sectors is usually borrowing via the capital market, which corresponds with the social opportunity cost of capital method mentioned in section D.3. The resulting EOCK (or SDR) is 12.93%, or 13% if rounded. Comparable SDR rates as in Rwanda have been found for other African countries, for instance an SDR of 12.77% for Kenya and an SDR of 11.08% for South Africa.

C.2 Theoretical background of establishing the social discount rate

The main methods currently used to calculate the social discount rate are:

1. the social rate of time preference
2. the social opportunity cost of capital.

The first approach is based on the argument that public investment reduces private consumption and thus equates the social discount rate to a rate of time preference, usually estimated with the Ramsey formula, which implies that the social rate of time preference equals the intertemporal discount rate plus the consumption growth rate times the elasticity of the marginal utility of consumption.

35 http://rwanda-cscf.cri-world.com/
36 Interest rate structure up to October 2017, National Bank of Rwanda, 3 November 2017
40 Cost-benefit analysis for investment decisions – Chapter 8: the economic opportunity cost of capital, Jenkins, G., Kuo, C., and Harberger, A., 2011
41 The Social Discount Rate in Developing Countries, Missaka Warusawitharana, 9 October 2014 on FEDS Notes (See: https://www.federalreserve.gov/econresdata/notes/feds-notes/2014/the-social-discount-rate-in-developing-countries-20141009.html)
The second approach is based on the argument that public investment crowds out private investment one-for-one and, as such, the discount rate is estimated based on the pre-tax real rate of return for private investment, typically estimated using returns to private capital. Based partly on this approach, leading development banks, such as the World Bank and the Asian Development Bank, typically apply a real discount rate in the range of 10% to 12% percent when evaluating projects in developing countries. Many government agencies in these countries follow such guidelines and apply a similar discount rate when evaluating public projects.

There is increasing debate on the level of SDRs applied to public investment projects. Economists point out that there is a risk to applying such relatively high discount rates: it implies, for example, that projects requiring a significant upfront cost to realize a flow of benefits over long periods of time may be discouraged. Many international development banks and government planning agencies responsible for project appraisal can be found using rates of 7-12% or more. These agencies justify choosing higher discount rates to account for the opportunity cost of capital, while most economists argue that social discount rates should be below 4%. Meanwhile, a new and robust debate has begun in economics over whether social discount rates of even 3-4% are too high in the context of climate change4243.

42 Social Discounting of Large Dams with Climate Change Uncertainty, Marc Jeuland, 2010, Water Alternatives 3(2): 185-206
Annex D – Multi Criteria Analysis

D.1 Introduction to Multi-Criteria Analysis

Multi-Criteria Analysis (MCA)\(^{44}\) is an appraisal technique used to establish preferences amongst different options for delivering a given set of objectives. It does this with reference to an explicit set of criteria, which helps appraisers to assess the extent to which the investment objectives are met by the different solutions available to them. The problems addressed by MCA consist of a finite number of alternatives that are known explicitly at the beginning of the process. The purpose may be to identify the best alternative, rank options in preference order, or shortlist a number of options for more detailed appraisal. A standard tool of MCA is the “performance matrix”, which compares the performance of each option against multiple appraisal criteria.

MCA can take different forms. These vary according to the nature of the decision and the time, resources and data available to appraise the alternatives, as well as by the skills of the analyst and the requirements of the organisation or culture in which the appraisal takes place. Whether simple or more sophisticated, explicit or implied, all MCA requires judgements to be made by the evaluator. The analytically form of MCA described in this chapter translates the “performance matrix” into a numerical value that provides an overall assessment of the relative contribution of options to delivering the objectives of a project. The assignment of these values is based on the informed judgement of the appraiser.

The advantages of MCA over judgement unsupported by analysis are that:

- The technique is transparent, open and explicit;
- It elucidates the problem or question being addressed and sets out the pros and cons of different solutions;
- The choice of objectives and appraisal criteria are open to analysis, as well as to challenge and change if they are judged to be inappropriate;
- Criteria “weights” and option “scores” are explicit, developed according to established techniques, can be cross-referenced to other sources of information and amended if necessary, provide a clear audit trail;
- It can provide an important means of communication, both within the decision-making body and between that body and external interested parties;
- Simple sensitivity testing can be used to assess the robustness (and/or decision turning-points) of appraisal conclusions.

Where full Cost-Benefit Analysis (CBA), Cost-Effectiveness Analysis (CEA) or other more standard quantitative appraisal techniques are not possible, MCA brings structure, transparency and consistency to the appraisal of investment projects. The method is also useful to inform and supplement CBA and other studies when it is not possible to express all costs and benefits in monetary terms, or where financial and economic indicators are appropriate to complement other evaluation parameters. It can, therefore,

\(^{44}\) This section is adapted from ‘The economic appraisal of investment projects at the European Investment Bank’, March 2013
contribute to appraisals that generate ERRs or other economic indices but leave some relevant factors outside the calculations.

This chapter outlines the application of MCA principles to the appraisal of investment proposals in a way that is both transparent and contestable. In doing so, it focuses on the fuller form of MCA, in which the relative performance of options is expressed numerically (using “weights and scores”) – and, as such, represents an “indicator” of project effectiveness in delivering investment objectives. The quantitative outcome of MCA is then compared with total project costs, represented by the outcome of a standard discounted cost analysis.

D.2 Stages of MCA

In summary, the steps of the MCA approach described in this chapter are six-fold:

1. Establish the decision context and the aims of the MCA.
2. Identify the options to be considered and compared, the project and relevant counterfactual(s).
3. Identify the investment objectives and constraints.
4. Identify the benefit criteria that reflect the value associated with the outcome of each option.
5. Assess the benefits:
   • “weight” the benefit criteria for relative importance;
   • describe the expected performance of each option against the criteria and “score” the ability of each to deliver the benefits; and
   • combine the weights and scores to derive an overall value for each option (total weighted scores) and rank them accordingly.
6. Conduct sensitivity analysis to assess the robustness of MCA results to changes in weights and scores.

The stages of the analysis are outlined below, with supporting material provided in appendices.

D.2.1 Step 1 – Decision Context

The purpose of appraisal of projects is to inform the public funding decisions based on proposals prepared by national authorities and other project promoters. In doing so, it focuses on the evaluation of the appropriateness and robustness of investment projects within the strategic context in which they have been developed – it does not make the investment decision (the promoter does), nor does it prioritise projects across different areas or sectors. In this context, MCA is a suitable appraisal alternative when other techniques cannot be used for reasons of insufficient or inadequate data and limited time and resources available to appraise projects. It enables a comparison of the project with other options, where appropriate, and facilitates the ranking of multiple options from best to worst, as a result of assessing the relative benefits of the project and other options for meeting the investment objectives.

Good practice experience shows that assessment of investment proposals for projects in certain sectors and/or countries are more suited to appraisal using MCA than other methods. In particular, sectors for which project benefits are difficult to measure and value pose a challenge for systematical appraisal using CBA/CEA techniques (and hence the calculation of project ERRs and ENPVs). This includes, for example, investments in education, health and urban development. Whilst the capital investment and operating costs of these projects are more straightforward for the national authorities to appraise, the benefits are
rarely expressed in monetary terms. For this reason, the MCA approach described below focuses on the assessment of a project’s benefits, which are combined with project costs to facilitate an assessment of the overall economic robustness of the project. When combined with the total discounted costs of options, it enables an assessment of the comparative economic value of the project, where the economic decision-criterion is represented by a comparison of (incremental) costs and benefits, where the latter is expressed in total “weighted benefit scores”.

Weighting of criteria and scoring of options are not exact sciences and represent, respectively, opinions about the relative importance of different criteria and the practical benefits that will be received from the implementation of each option. Although the method is itself transparent and systematic, it is important that MCA based appraisals are undertaken by a small appraisal team (not an individual analyst in isolation) and that the results of the appraisal are queried and tested for robustness through sensitivity analysis.

D.2.2 Step 2 – Option Identification

MCA is an incremental approach to comparing alternatives. Differences in the costs and benefits of the situation with the project (i.e. do something specific) and one or more counterfactual scenarios without the project are compared in the option analysis. The “without” scenario could be represented by one or more of the following:

1. “Do nothing” – a baseline option that should be realistically considered, which may or may not be acceptable or possible or could be catastrophic for the service/business in question.
2. “Do minimum” – the minimum investment required if the project is not implemented, incorporating the costs of maintaining the current service/operation over the lifetime of the proposed project.
3. “Do something else” – other projects that could be implemented to meet the objectives of the investment (typically, to differing degrees).

Project promoters variably consider and evaluate alternatives to investment projects. At a minimum, however, evaluation should always involve a comparison of the project with a “do nothing” or preferably, a realistic “do minimum” option (and not simply the static situation before and after the project is implemented).

The alternatives should be described, and wherever possible key descriptors should be quantified; where this is not possible, they should be described qualitatively. Examples include:

- Intended outcomes;
- Expected workloads and performance targets, planned capacity;
- Accessibility;
- Physical characteristics and infrastructure implications;
- Phasing and timing of implementation;
- Flexibility to accommodate future change;
- Staffing consequences;
- Impact on financial parameters;
- Effects on others (other aspects of the business, other parties).
D.2.3 Step 3 – Identify Objectives and Constraints

As a guiding principle, investment objectives and the benefits that flow from their achievement will be determined by the needs of the end users/intended beneficiaries. They focus on the required outputs/outcomes (i.e. “what” needs to be achieved) rather than the means of achieving them (i.e. “how” they will be delivered). Investment objectives may be expressed in terms of criteria, such as relevance, appropriateness, effectiveness, equity, efficiency, acceptability, etc.

The objectives must be consistent with the policies and strategies of the sector and the context in which the project has been designed and will function. They will reflect the business aims of the promoter, as established in existing business plans, and reflect how the investment will contribute to these. As far as possible, objectives should be SMART: specific, measurable, achievable, relevant and with a time dimension. Objectives that are important but difficult to express in SMART terms should be incorporated into appraisals with as much objectivity as possible. However, statements like “upgrade the quality of accommodation” or “improve the quality of information” are typically not useful objectives, as they:

- refer to a means rather than the desired ends (there may be multiple ways of delivering the outcome sought); and
- are not SMART – have no timescale and no standard for measuring improvement.

Constraints are factors that impact on strategic, business and investment objectives and, as such, set the boundaries for the investment. They may relate to policy commitments, the physical environment, availability of appropriate staff, appropriate timescales, minimum standards, and so on. Investment constraints may also be related to financial issues, such as, maximum capital value or a limit on the operating cost implications of an investment.

D.2.4 Step 4 – Identify Benefit Criteria

Benefit criteria are used to identify and evaluate the investment options that are compared during a project’s appraisal (the project and at least one alternative, such as “do minimum”). Derived from the strategic and business objectives and constraints, they fall into the following categories:

- Benefits that can be quantified financially – these should be included in the cost analysis;
- Benefits that can be quantified, but not financially;
- Benefits that cannot be quantified.

There is no “right” answer to the appropriate number of benefit criteria, as this very much depends on the nature of the decision to be made and the availability of supporting information, time and resources. A large number of criteria means additional analytical work. At the same time, there is a danger that important attributes may be ignored if there is a very small number of criteria. It is good practice to check that duplicate, potentially redundant criteria or those that do not help to differentiate the options are removed and the key investment objectives (ends not means) are adequately reflected in the benefits appraisal. The aim is to produce a manageable number of relevant criteria (possibly between 5 and 10) consistent with a well-founded conclusion that effectively compares the project with other options.

Each criterion is described by a list of potential benefits and, where relevant, disbenefits. These are drawn from the hierarchy of objectives, starting from policy aims, the promoter’s strategic and business
objectives, through to those directly related to how the project will contribute to these objectives. Where benefits can be expressed in monetary terms (e.g. cost savings) they are included in the cost analysis and not treated as a benefit criterion – to do otherwise would lead to double-counting. Benefit criteria might, for example, reflect the following kinds of factors:

- Strategic fit and coherence;
- Meeting needs/demands;
- Quality of services/products delivered;
- Effectiveness/efficiency of service/product delivery;
- Accessibility of the project’s services/products;
- Staffing factors (e.g. recruitment and availability of staff);
- Flexibility to respond to changing demands and technological developments;
- Environmental quality;
- Ease and timing of implementation.

D.2.5 Step 5 – Assess Benefits

The evaluation of project benefits focuses on the non-monetary implications of investment options. The benefits delivered by the project are assessed comparatively using the benefit criteria identified at Step 4. Where possible all benefits should be quantified. The construction of weighted benefit scores is preferable to, and more robust than, the simple ranking of alternatives, with no clear measure of the degree to which one option is better (or worse) than another.

**Step 5a: Weight benefit criteria**

The purpose of weighting is to establish the relative importance of each criterion vis-à-vis the others. There are different ways of identifying criteria weights, though the following approach is recommended for its simplicity and transparency:

- Rank the criteria in order of importance;
- Attribute the most important criteria a weight of (say) 100;
- Examine each of the remaining criteria relative to the highest-ranking attribute using pair-wise comparison (e.g. if the most important is 100, what is the relative value of the second (say, 70), the third (say, 50) and so on);
- Repeat the process for each successive pair of benefit criteria until each has been weighted;
- Scale the outcome to 100 (%), thereby attributing each criterion a % that reflects its importance compared with the other criteria;
- Record the weights and the rationale behind them.

**Step 5b: Score options**

The following practical approach is recommended for scoring options for their relative performance against each of the benefit criteria:

- Examine each option against each criterion, using the option descriptions to help make comparative assessments;
- Score each between 0 and 10 on each criterion (again using the descriptions to help make assessments), the better the performs the higher the score;
- Record the scores and the rationale behind them.
Step 5c: Preference ranking of options
To rank options and identify the preferred solution in terms of the non-monetary benefits of the project:

- Calculate total weighted scores;
- Rank options from highest to lowest weighted scores, thereby identifying the best way for achieving the investment objectives from the options selected for appraisal.

D.2.6 Step 6 – Undertake Sensitivity Analysis
Given the subjective (if systematic and transparent) nature of judgements made about benefit criteria weights and option scores, sensitivity testing is particularly important for assessing the robustness of the appraisal’s conclusions. In the sensitivity analysis, facilitated by simple spreadsheet calculations, the weights and scores can be varied to understand how the preference ranking is affected by these factors.

The following steps are undertaken to assess the sensitivity of the appraisal conclusions (i.e. total weighted scores) to the scores assigned to options. For each option:

- Determine the agreed range of scores for each criterion;
- Alter the score of the first criterion within its agreed range;
- Repeat the analysis for scores of each of the other criteria;
- Note the implications for the total weighted benefit score when all scores for the option are at a maximum and when they are at a minimum.

Undertaking sensitivity analysis on criteria weights is complicated by the fact that altering the weight (%) of one criterion affects the weights of other criteria. In this case the process is as follows:

- Determine the agreed range weights for each criterion;
- For the first criterion to be examined, allocate the change in weight across the other weights (proportionately with the originally assigned weights of these);
- Adjust the weights arising from the change in weight of the first criterion and note the implications for the total weighted scores of options;
- Repeat the analysis for the weights of each of the other criteria.

D.3 Incremental costs and benefits
As in other forms of economic appraisal, the analyst’s conclusion on the value of a project is based on the balance of project costs and benefits relative to the alternatives, i.e. the incremental cost-benefits of the options examined in the appraisal. Costs are expressed as the total discounted costs of the investments under appraisal and benefits by the outcome of the MCA. By expressing project benefits in a single indicator (total weighted scores), the outcome of MCA approximates the “effectiveness” indicator used in CEA and the principles of CEA can be applied. In particular, the “cost-effectiveness plane” illustrated below is a useful way of comparing the project with other investment options, including when only one alternative (typically do nothing/minimum) is evaluated in the Bank’s appraisal.

When this approach is applied to a comparison of an investment with the next best alternative (e.g. do minimum) the four-quadrant depiction, shown in , which illustrates that:
• The project is better (more “cost-effective”) if it offers higher benefits at lower costs than the alternative (south-east quadrant of the plane);
• The project is worse (less “cost-effective”) if it delivers fewer benefits at higher costs that the alternative (north-west quadrant of the plane);
• Where the project is costlier but offers greater benefits (north-east quadrant) or is less costly but offers fewer benefits (south-west quadrant), incremental cost-effectiveness is unclear and the appraisal conclusion depends on the magnitude of the incremental cost-benefits.

Figure D-1: Cost-Effectiveness Plane (four quadrant depiction)

Error! Reference source not found. below summarises the outcome of an illustrative investment appraisal involving three options, a minimum option and two major investment options. The more beneficial options are also the costlier, with Option 1 generating the lowest benefits (total weighed scores) for the lowest costs (NPC) and Option 3 the greatest benefits for the highest costs – such that Option 2 is in the north-east quadrant of the cost-effectiveness plane when compared to Option 1, and Option 3 is also in the north-east quadrant when compared to Option 2.
### Table D-0-1: Illustrative incremental cost-benefit comparison of options

<table>
<thead>
<tr>
<th></th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
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<tbody>
<tr>
<td><strong>Costs (FRW billion) and benefits</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Initial investment costs</td>
<td>48</td>
<td>207</td>
<td>211</td>
</tr>
<tr>
<td>Life-cycle investment costs*</td>
<td>13</td>
<td>34</td>
<td>38</td>
</tr>
<tr>
<td>Annual operational costs</td>
<td>44</td>
<td>44</td>
<td>44</td>
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<tr>
<td><strong>Net Present Cost</strong> (3.5% discount rate, 30 years)</td>
<td>752</td>
<td>1,050</td>
<td>1,069</td>
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<tr>
<td>Cost preference rank</td>
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<td>3</td>
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<tr>
<td><strong>Total Weighted Score</strong></td>
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<td>710</td>
<td>800</td>
</tr>
<tr>
<td>Benefits preference rank</td>
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<td>2</td>
<td>1</td>
</tr>
<tr>
<td>NPC (FRW billion)/benefit point</td>
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<td>1.47</td>
<td>1.34</td>
</tr>
<tr>
<td>Rank</td>
<td>3</td>
<td>2</td>
<td>1</td>
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</table>

#### Incremental Cost-Benefit comparison

<table>
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<tr>
<th></th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost differences:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPC option 1</td>
<td>+752</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPC option 1 vs. 2</td>
<td></td>
<td>+298</td>
<td></td>
</tr>
<tr>
<td>NPC option 2 vs. 3</td>
<td></td>
<td></td>
<td>+19</td>
</tr>
<tr>
<td><strong>Benefit differences:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWS option 1</td>
<td>+380</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWS option 1 vs. 2</td>
<td></td>
<td>+330</td>
<td></td>
</tr>
<tr>
<td>TWS option 2 vs. 3</td>
<td></td>
<td></td>
<td>+90</td>
</tr>
<tr>
<td><strong>NPC/TWS differences:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 1</td>
<td>1.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 1 vs. 2</td>
<td></td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>Option 2 vs. 3</td>
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</tr>
<tr>
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<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

*The investment costs incurred through life of the Project (excludes annual maintenance)*

When compared to the minimum option (the “best” cost scenario), the NPC of Option 2 is FRW 298 billion higher and generates 330 more benefit points than Option 1. This balance represents an incremental “cost-benefit” ratio of 0.90, with each additional FRW 1 billion NPC spent generating 1.1 times as many additional benefits compared to Option 1. Likewise, when Options 2 and 3 are compared, the additional NPC is FRW 19 billion for 90 additional benefit points, representing a “cost-benefit” ratio of 0.21, with each additional FRW 1 billion NPC generating 4.7 times as many additional benefits. Overall therefore, and assuming Option 1 is a real option and options are mutually exclusive, Option 2 is more “cost-beneficial” than Option 1 and Option 3 more “cost-beneficial” than Option 2.

### D.4 Other MCA considerations

#### D.4.1 Mutual independence and double-counting

An underlying principle of MCA is that preferences associated with the options are independent from one criterion to another, such that a score can be assigned to one criterion without knowing how the option scores on other criteria. If this proves not to be the case, there are a few ways this can be addressed, such as:

- By combining into one criterion the two non-mutually independent criteria;
• Establishing a minimum requirement for each non-independent criterion and rejecting options that do not satisfy it because their poor performance on one criterion cannot be compensated for by better performance on another\textsuperscript{45};

• More advanced models might be needed if simpler approaches fail to ensure that the independence of criteria scores is ensured.

As in CBA and other appraisal approaches, double-counting should be avoided, otherwise the appraisal will give undue importance (weight) to the elements that are double-counted when calculating the final outcome of the benefits assessment and reaching an appraisal opinion. Care is needed to avoid double-counting by including duplicate factors in both cost and in benefit assessments, and/or by reflecting them in more than one of the benefit criteria. Critical review, checking and rechecking for consistency, mutual dependency, redundancy, etc. of criteria is important throughout the MCA exercise.

\textbf{D.4.2 Timing of benefits}

Major infrastructure investment projects have implications for many years, generating benefits over the total operating period of the project. On the cost side of an appraisal, discounting is used to reflect social time preference expressed in a single indicator of monetary value. In the absence of such approaches when assessing non-monetary benefits, MCA alternatives include, for example:

• Where the completion date is an important consideration (i.e. the point at which project benefits will start to be generated), it can be modelled by a separate criterion within the MCA technique;

• By incorporating time in the definition of other criteria so that temporary impacts are distinguished from permanent or longer–term impact, usually by being explicit about the time horizon over which benefits will be generated;

• Using some other principle for giving less (or more) importance to long-term implications.

Whichever approach is used, it is important that appraisers ensure all assessments of criteria and options are made on a common basis. Hence, if some impacts are immediate or one-off and others are longer term, and/or occurring in variable time patterns, these differences should be recognised explicitly in the scores awarded to option criteria during the appraisal.

\textbf{D.4.3 Superior/inferior or dominant/dominated options}

It is possible that one or more of the investment options examined through MCA might be superior (or inferior) to the other options, as demonstrated by the attribution of highest (or lowest) scores for every benefit criterion and hence for total weighted scores. For example, a new build facility might perform better on every criterion when compared to a “do nothing/minimum” counterfactual (better access/location, better service effectiveness, more flexible, the most modern accommodation, greater acceptability to end users, etc.). If options benefits were the decision-criterion, a clearly superior investment would not need to be appraised further but could be selected as the preferred way forward and, likewise, a clearly inferior option removed from the exercise (unless it has a role as a baseline comparator).

However, even if an investment alternative is shown to be superior in terms of the benefits delivered, as demonstrated through MCA, total project costs must also be factored into the appraisal opinion. The

\textsuperscript{45} This threshold usually ensures preference independence (i.e. independence of scores). All options need to meet the minimum performance, so that the preference on any one criterion is unaffected by those on others.
project may deliver the largest benefits, but it is also likely to be a costly – perhaps the costlier alternative. Hence, a conclusion of dominance (or dominated) should not be made until the MCA results and costs have been brought together, as outlined above.

D.5 Checklist for consecutive stages of MCA

Step 1 – Decision Context

Summary actions/decisions:
- Evaluate the decision context – the nature of the decision required and the resources available to address the decision.

Outputs:
- An appropriate approach to MCA within the decision context;
- An agreed process for undertaking appraisal judgments/decisions.

Step 2 – Option Identification

Summary actions/decisions:
- Develop an understanding and describe the realistic implications of not implementing the project (do nothing, do minimum);
- Consider and explore the range of possible options capable of delivering the investment objectives (albeit to differing degrees);
- Develop an understanding of the project and any other investment options in sufficient detail to undertake the MCA.

Outputs:
- Description of the options to be subjected to MCA (including a baseline, such as do nothing/do minimum).

Step 3 – Identify Objectives and Constraints

Summary actions/decisions:
- Identify the high-level policy aims for the sector and the promoter;
- Identify and review the organisation’s business aims and objectives;
- Identify the objectives for the investment strategy that are SMART (specific, measurable, achievable, relevant and time-linked);
- Check that the chosen objectives concentrate on results rather than the means of achieving them;
- If possible, rank objectives from highest to lowest in order of priority;
- Constraints.

Outputs:
- Statement of ranked/prioritised objectives for the investment;
- Statement of constraints facing the investment.
Step 4 – Identify Benefit Criteria

Summary actions/decisions:
- Identify the benefits that will be realised by meeting the objectives set for capital investment;
- Classify the benefits into groups of benefit criteria.

Outputs:
- List of benefits that the investment seeks to deliver;
- Identification and definition of benefit criteria for the evaluation (comparison of alternatives).

Step 5 – Assess Benefits

Summary actions/decisions:
- Give a weight (0 to 100) to each benefit criterion;
- Give a score (1 to 10) to each option on each of the benefit criteria;
- Multiply weights and scores to provide a total weighted score for each option;
- Rank options in terms of the acceptability of the cost of incremental benefits.

Outputs:
- Weights for benefit criteria;
- Scores for each criterion for each alternative solution;
- Total weighted scores for alternatives;
- Incremental costs and benefits;
- A preferred “benefits” option.

Step 6 – Undertake Sensitivity Analysis

Summary actions/decisions:
- Conduct sensitivity tests on the weighted benefit scores of each option;
- Identify critical factors that affect the ranking/preference of options on “benefits” grounds.

Outputs:
- Sensitivity analysis on benefit criteria weights and options scores;
- Switching values/crossover points that alter the preferred option;
- Conclusions on the robustness of the benefits assessments.
Annex E – Bill of Quantities and other forms to prepare estimates for unit price works contracts

1. Introduction

- The Bill of Quantities is the document containing an itemised breakdown of the works to be carried out in a unit price contract, indicating a quantity for each item and the corresponding unit price. The quantities set out in the Bill of Quantities are estimated quantities. Each price for each item of the Bill of Quantities is detailed in the Price Schedule.

The amounts due will be calculated by measuring the actual quantities of the works executed and by applying the unit rates to the quantities actually executed for each item.

- The Detailed Breakdown of Prices is the list containing the basic costs, net costs and mark-ups from which each price on the Bill of Quantities and the Price Schedule and on the Daywork Schedule results.

The Detailed Breakdown of Prices provides the coefficients for applying the price revision formula (if/as stipulated in the terms of the Contract) and can provide the basis for valuation of additional work ordered.

- Provisional sums for use when works are to be executed on a daily work basis can only be executed by administrative order of the Supervisor in accordance with the terms of the Contract.

2. Specific to Bill of Quantities, Price Schedule, Daily Works Schedule

- The prices inserted in the Bill of Quantities and Price Schedule are to be the full inclusive values of the works described under the items, including all costs and expenses that may be required in and for the construction of the works described, together with any temporary works and installations which may be necessary and all general risks, liabilities and obligations specified or implied in the documents on which the tender is based. It will be assumed that establishment charges, profit and allowances for all obligations are spread evenly over all unit rates.

- Save where the technical specifications or the Bill of Quantities and the Price Schedule specifically and expressly state otherwise, only permanent works are to be measured.

- No allowance will be made for loss of materials or volume thereof during transport or compaction.

- The prices do not include taxes and fiscal duties, as exoneration is explicitly given for the contract. Non-exonerated taxes and fiscal duties are covered in the prices of the Bill of Quantities, Price Schedule and Daily work Schedule, apart from those stated separately in the financial offer templates.

- The Unit prices in Bill of Quantities and Price Schedule are obtained by multiplying the Net cost of Template 5 - Table D, on the one hand, with the coefficient K, on the other hand.

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46 Adapted from PRAG Practical Guide to Contract Procedures for EU External Actions
The coefficient $K$ represents the proportions between the Site costs ($F_c$) of Template 5 - Table E and the Total net costs ($P_s$) and between the General costs ($F_g$) of Template 5 - Table F and the Contract price ($P_v$): $K = (1+A)/(1-B)$ whereby

$A = F_c/P_s$
$B = F_g/P_v$

- The units of measurement used in the annexed technical documentation are those of the International System of Units (SI). No other units may be used for measurements, pricing, detail drawings etc. (Any units not mentioned in the technical documentation must also be expressed in terms of the SI.) Abbreviations used in the bill of quantities are to be interpreted as follows:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>percent</td>
</tr>
<tr>
<td>h</td>
<td>hour</td>
</tr>
<tr>
<td>kg</td>
<td>kilogram</td>
</tr>
<tr>
<td>km</td>
<td>kilometre</td>
</tr>
<tr>
<td>l</td>
<td>litre</td>
</tr>
<tr>
<td>L.s.</td>
<td>lump-sum</td>
</tr>
<tr>
<td>m</td>
<td>metre</td>
</tr>
<tr>
<td>m²</td>
<td>square metre</td>
</tr>
<tr>
<td>m³</td>
<td>cubic metre</td>
</tr>
<tr>
<td>m/d</td>
<td>man/day</td>
</tr>
<tr>
<td>m/m</td>
<td>man/month</td>
</tr>
<tr>
<td>mm</td>
<td>millimetre</td>
</tr>
<tr>
<td>mm²</td>
<td>square millimetre</td>
</tr>
<tr>
<td>N.d.</td>
<td>nominal diameter</td>
</tr>
<tr>
<td>pcs</td>
<td>pieces</td>
</tr>
<tr>
<td>to</td>
<td>tonne</td>
</tr>
</tbody>
</table>

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$^{47}$ SI refers to Système International (d’Unités), the French indication for the International System of Units.
### TEMPLATE BILL OF QUANTITIES

The applicable Method of Measurement is stated as follows: <........>

Prices DO NOT include the Value Added Tax (VAT), this should be added on the final total

<table>
<thead>
<tr>
<th>PRICE No</th>
<th>TITLE</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
<th>ESTIMATED QUANTITIES</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>(b)</td>
<td>(c)</td>
<td>(d)</td>
<td>(e)</td>
<td>(f = d * e)</td>
</tr>
<tr>
<td>000</td>
<td>&lt;for instance: installation of the site&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>001</td>
<td>...</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>Total 000-99</td>
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<td></td>
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</tr>
<tr>
<td>100</td>
<td>...</td>
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<tr>
<td>101</td>
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</tr>
<tr>
<td>...</td>
<td>Total 100-199</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>...</td>
<td></td>
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</tr>
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<td>....</td>
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</tbody>
</table>

Total amount of the works, outside dayworks

<table>
<thead>
<tr>
<th>Dayworks</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Total</th>
</tr>
</thead>
</table>

Note: the numbering of prices under (a) and titles under (b) correspond to the numbering in the Price Schedule
Annex G – Simplified theoretical approach to establishing shadow prices

A simplified theoretical approach for the estimation of the shadow prices is presented in Error! Reference source not found.G.2 below.

Figure G-2: From market to shadow prices

Source: based on EU-guide for Cost-Benefit Analysis 2014 (adapted from Saerbeck 1990)

Project inputs

If they are tradable goods, border prices are used. If a project uses an imported input, e.g. gas and oil, the shadow price is the import cost plus insurance and freight (CIF) in more liberalised (i.e. competitive and undistorted) markets, thus excluding any custom duties or taxes applied once the good enters the national market. Border prices can be expressed as a percentage of the price of the goods, as a fixed amount per unit or as a minimum price applied as soon as the good passes the border. Where the relevant economic border lies is a matter to be ascertained on a case-by-case basis.

If they are non-tradable goods:

- the Standard Conversion Factor, which measures the average difference between world and domestic prices of a given economy (see box for an example) is applied in the case of ‘minor’ items, e.g. administrative costs, intermediate services, etc.;
ad hoc assumptions, depending on the specific hypotheses made on market conditions, should be undertaken in the case of 'major' items, e.g. land, civil works, machinery, equipment, etc. to reflect their long run marginal cost; for manpower, the Shadow Wage is calculated.

The method generally used to operationally put into practice the different techniques presented above is to apply a set of predefined conversion factors to the project financial costs.

**EXAMPLE: APPLICATION OF THE SCF**

An illustrative computation of the Standard Conversion Factor (SCF) for a hypothetical country is hereby presented. The simplified formula for the estimation of the SCF is:

\[ SCF = \frac{M+X}{M+X+TM} \]

where: M is the total value of import at shadow prices, i.e. CIF prices; X is the total value of export at shadow prices, i.e. FOB prices; TM is the total value of duties on import.

It is assumed that the total value of export at FOB prices and of import at CIF prices, in a given year, including both intra-Rwandan and extra-Rwandan trade of all products and services, are respectively FRW 25,000 million and FRW 20,000 million. In the same year, the national general government and the EU collect FRW 500 million as taxes and duties on imports, excluding VAT. Export taxes, duties and other monetary compensatory amounts on exports are nil, as well as import and export subsidies.

International trade detailed data and main national accounts tax aggregates are provided both by Eurostat and national statistics institutes. Hence, in this example:

- \( M = \text{FRW} \ 25,000 \text{ million} \)
- \( X = \text{FRW} \ 20,000 \text{ million} \)
- \( TM = \text{FRW} \ 500 \text{ million} \).

The SCF formula leads to the following result:

\[ SCF = \frac{25,000+20,000}{25,000+20,000+500} = 0.989 \]

The variables in the SCF formula generally do not undergo significant variations on a yearly basis. For this reason, the SCF could be either computed for a single year, or as an average of a number of years.

**Application of Conversion Factors to project inputs**

Transforming inputs market prices into shadow prices is completed, in practice, through the application of Conversion Factors. These are defined as the ratio between shadow prices and market prices. They represent the factor at which market prices have to be multiplied to obtain inflows valued at shadow price. Formally:

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In economic theory, the long run marginal cost is defined as the change in the long run total costs of producing a good or service resulting from a change in the quantity of output produced. Long run total costs can go down (economies of scale), or go up (diseconomies of scale).
\[ k_i = \frac{v_i}{p_i} \iff v_i = k_i \cdot p_i \]

where: \( p_i \) are market prices for the good \( i \), \( v_i \) are shadow prices for the same good and \( k_i \) are the conversion factors.

If the conversion factor for one good is higher than one, then the observed price is lower than the shadow price, meaning that the opportunity cost of that good is higher than that captured by the market. Conversely, if the conversion factor is lower than one, then the observed price is higher than the shadow price, due to taxes or other market distortions which add to the marginal social value of a good and determine a higher market price.

In principle, Conversion Factors should be made available by a planning office and not calculated on a project-by-project basis. When national parameters are not available, project-specific calculations can be made but these must then be consistent across projects. At least, corrections should be applied to depurate market prices from fiscal factors, e.g. an excise tax on import. The following box provides an example.

In the absence of evidence of market failures, the CFs should be set equal to 1.

**EXAMPLE: CONVERSION FACTOR FOR MATERIALS**

As an example, let us assume that concrete is an input cost of the investment project. If the unit price of concrete used for the project is FRW 10 million, which includes 18% VAT and an import tax rate of 7% (regardless of the country of origin), a simplified way to estimate the shadow price is to use the conversion factor (CF) computed as follows:

\[ CF = \frac{1}{(1+i)} \cdot \frac{1}{(1+VAT)} \]

where \( i \) is the import tax rate of the input good entering the CBA. Thus, the shadow price (SP) can be estimated by multiplying the CF by the observed market price (MP) of this good:

\[ SP = \frac{1}{(1+i)} \cdot \frac{1}{(1+VAT)} \cdot MP \]

The CF will amount to \( CF = \frac{1}{(1.07)} \cdot \frac{1}{(1.18)} = 0.935 \cdot 0.847 = 0.792 \) and the shadow price would be equal to \( SP = 0.792 \cdot 10 \text{ million} = 7.92 \text{ million FRW} \).

Since the import tax rate could differ depending on the type of good considered, in order to compute the shadow price of the aggregated item ‘materials’ the project appraiser could use the average tax rate applying to those materials which are more commonly used in investment projects, such as bricks, iron, tubes, concrete, bituminous materials, plastics and other chemical products (e.g. paints), wood, etc. The same approach can also be applied for other cost items. An Input-Output matrix or the Use Table of a given economy can be used to breakdown aggregated input factors such as civil works, equipment, materials, etc. into their main sub-components, in order to disentangle the traded components to which the border price rule applies, and then compute the conversion factor as a weighted average.
The shadow wage

Current wages may be a distorted social indicator of the opportunity cost of labour because labour markets are imperfect, or there are macroeconomic imbalances, as revealed particularly by high and persistent unemployment or by dualism and segmentation of labour conditions (e.g. when there is an extensive informal or illegal economy). The project promoter, in such cases, may resort to a correction of observed wages and to the use of conversion factors for computing shadow wages.

WAGE DISORTION EXAMPLES

- In the private sector, labour costs for a private company may be lower than the social opportunity cost because the State gives special subsidies to employment in some areas.
- There may be legislation fixing a minimum legal wage, even if due to heavy unemployment there may be people willing to work for less.
- There are informal or illegal sectors with no formal wage or income, but with a positive opportunity cost of labour.

The shadow wage measures the opportunity cost of labour. Typically, in an economy characterised by extensive unemployment or underemployment, this may be less than the actual wage rates paid. In particular:

- for skilled workers previously employed in similar activities, the shadow wage can be assumed equal or close to the market wage (net of income tax);
- for unskilled workers drawn to the project from unemployment, it can be assumed equal to or not less than the value of unemployment benefits or other proxies when unemployment benefits do not exist;
- for unskilled workers drawn to the project from informal activities or an underemployment situation, it should be equal to the value of the output forgone in their previous activities.

In the absence of national/regional data, a shortcut formula for determination of the shadow wage is illustrated in the box below.

SHADOW WAGE: SHORTCUT FOR ESTIMATION

A practical solution to determine the shadow wage can be the reduction of unit labour costs by a percentage determined by the share of income taxation: \( SW = W \times (1-t) \)

where: \( SW \) is the shadow wage, \( W \) is the market wage and \( t \) is the income taxation.

For example, if the market wage is 500,000 FRW per month and there is an income taxation of 25%, then the shadow wage is 500,000 \( \times 0.75 = 375,000 \) FRW.

If a country is suffering from a high unemployment rate, the shadow wage may be inversely correlated to the level of unemployment. The following formula might be adopted for unskilled manpower used on project construction sites in order to take into account an ‘unemployment effect’, i.e. the excess supply of labour compared to the market clearing level in the case of a persistently high unemployment: \( SW = W \times (1-t) \times (1-u) \)
where: $u$ is the unemployment rate of the region.

If we assume an unemployment rate of 50%, our example shadow wage would become $500,000 \times 0.75 \times 0.5 = 187,500$ FRW.

For more detailed SW formulas at regional level see Del Bo et al. (2011).

**Project outputs**

The concept of marginal WTP is commonly used to estimate the shadow price of the project output. In other words, to evaluate the project direct benefits, related to the use of the goods or services rendered. The WTP measures the maximum amount that people would be willing to pay for a given outcome that they view as desirable. Different techniques, including revealed preference, stated preference and benefit transfer methods, exist to empirically estimate the WTP. The adoption of one or another method depends on both the nature of the effect considered and the availability of data.

In absence of WTP estimates derived directly from users, or in the impossibility to adopt a benefit transfer, other proxies of WTP can be used. A commonly accepted practice is to calculate the avoided cost for users to consume the same good from an alternative source of production. For example, in the case of water supply projects, the avoided cost of water transported in tank lorries; in wastewater, the avoided cost of building and operating individual septic tanks; in energy, the avoided cost of substitute fuels (e.g. gas vs. coal) or alternative generation technologies (e.g. renewable energy sources vs. fossil fuels). The following box provides an empirical example of the application of this methodology.

In practice, the economic analysis evaluation of the project’s direct benefits is carried out by replacing the financial revenues, in the form of user fees, charges or tariffs, with the estimation of the users WTP for project outputs less changes in supply costs. This operation is grounded on the following reasons:

- in sectors not exposed to market competition, regulated, or influenced by public sector decisions, the charges paid by the users may not adequately reflect the social value of actually or potentially using a given good. A typical example is a publicly provided good, e.g. health care, for which an administered tariff is paid by users;
- in addition, the use of a good or service may generate additional social benefits for which a market does not exist and therefore no price is observed. For example, time savings and prevention of accidents for the users of a new, safer, transport service.

For both reasons, the WTP provides a better estimate for the social value of the good or service than the observed tariffs. Also, the WTP is used for the projects providing outputs that are not subject to charges (e.g. a free recreational area).

For the evaluation of some outputs, when the WTP approach is not possible or relevant, long-run marginal cost (LRMC) can be the default accounting rule. Usually WTP is higher than LRMC in empirical estimates, and sometimes an average of the two is appropriate.
Users’ marginal Willingness-To-Pay (WTP), which measures the maximum amount consumers are willing to pay for a unit of a given good, is used to estimate the direct benefit(s) related to the use of the goods or services rendered by the project.