

# INFRASTRUCTURE PLANNING AND APPRAISAL GUIDELINE



**national treasury**

Department:  
National Treasury  
**REPUBLIC OF SOUTH AFRICA**



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## **LIST OF ABBREVIATIONS**

CBA	Cost Benefit Analysis
CEA	Cost Effectiveness Analysis
CER	Cost Effectiveness Ratio
CF	Conversion Factor
CIDB	Construction Industry Development Board
CIF	Cost, Insurance and Freight
CSCF	Commodity Specific Conversion Factor
CUA	Cost Utility Analysis
CV	Curriculum Vitae
DCF	Discounted Cash Flow
EIA	Environmental Impact Assessment
ENPV	Economic Net Present Value
EOCK	Economic Opportunity Cost of Capital
EPC	Engineer, Procure, Construct
ERR	Economic Rate of Return
EXT	Externalities (Impacts on stakeholders)
FEP	Foreign Exchange Premium
FIDPM	Framework for Infrastructure Delivery and Procurement Management
FIRR	Financial Internal Rate of Return
FNPV	Financial Net Present Value
FOB	Free On Board
FS	Feasibility Study
IAMP	Infrastructure Assets Management Plan
IDP	Integrated Development Plan
IIA	Integrated Investment Appraisal
IRR	Internal Rate of Return

KPI	Key Performance Indicator
MFMA	Municipal Finance Management Act 56 of 2003
NDP	National Development Plan 2030
NEMA	National Environmental Management Act 107 of 1998
NPV	Net Present Value
NRF	Net Resource Flow
NT	National Treasury
PFMA	Public Finance Management Act 1 of 1999
PFS	Prefeasibility Study
PGDS	Provincial Growth and Development Strategy
PPA	Public Procurement Act
PPP	Public-Private Partnership
PPPFA	Preferential Procurement Policy Framework Act 5 of 2000
SANRAL	South African National Roads Agency Ltd
SCM	National Treasury's Note on Supply Chain Management
SIPDM	Standard for Infrastructure Procurement and Delivery Management
SMART	Specific, Measurable, Achievable, Relevant, and Time-Bound
SOE	State-Owned Enterprise
TPP	Traditional Procurement Project
U-AMPS	User-Immovable Asset Management Plans
VAT	Value Added Tax
WUL	Water Use License



## **TERMS AND DEFINITIONS**

**Bottom-Up Project:** A project developed in response to specific, observed or urgent needs of the population.

**Commodity Specific Conversion Factor:** The ratio of the economic value of a commodity to its financial value.

**Coping Cost:** Coping costs are costs incurred by households on different activities to cope with the lack of/insufficient natural resources.

**Cost Benefit Analysis:** An appraisal technique used to analyse projects that generate benefits that can be monetised.

**Cost Effectiveness Analysis:** An appraisal technique used to analyse projects whose benefits are challenging to monetise and projects where the objective is to select the investment of a combination of projects to deliver a specific quantity of a good or service at minimum cost.

**Cost Effectiveness:** Achieving the desired objective at the lowest cost possible when compared with other options.

**Cost-Utility Analysis:** An appraisal technique used to analyse projects that generate more than one kind of benefit and whose benefits are challenging to monetise.

**Demand Analysis:** It is used to identify and quantify the present and future aggregate demand for the goods and services produced by the project. It is used to establish the nature and the volume of the **need for** the project.

**Economic Opportunity Cost:** The value of utility that can be derived were the same resources used in the next best alternative to the proposed project or programme.

**Economic Resource Flow Statement:** A statement used to organize and present the economic inflow and outflow of a project.

**Financial Cash Flow Statement:** A statement used to organize and present the project's financial cash flow structure. It is generally divided into two sections, the cash inflow and the cash outflow.

**Foreign Exchange Premium (FEP):** The proportion with which the economic exchange rate exceeds the market exchange rate.

**Gantt Chart:** An illustrative chart used to present the schedule of activities to be carried out by the project.

**Infrastructure Investment Project:** Spending on new assets; replacements; maintenance and repairs; upgrades and additions; and rehabilitation, renovation and refurbishment of assets.

**Infrastructure:** a) Immovable assets, which are acquired, constructed or result from construction operations; or b) Movable assets, which cannot function independently from purpose-built immovable assets.

**Integrated Investment Appraisal (IIA):** A methodology of conducting investment appraisal that incorporates the financial, economic, stakeholder and risk analyses of the project together.

**Megaprojects:** Projects that involve a unique set of processes consisting of coordinated and controlled activities aimed towards the construction or acquiring of new immovable or movable assets, or an upgrade of existing infrastructure.

**Nominal Value:** The value of goods and services as obtained in the market. It is determined by the interaction between demand and supply of the good or service, as well as the general price level or inflation.

**Non-Traded Goods:** These are goods and services whose prices are not determined in the world market. Their prices are instead determined in the domestic markets.

**Problem:** This refers to the difference between the undesired situation (existing) and the desired situation that gave rise to the project idea.

**Project Objective:** This is the solution that the project seeks to provide to the identified core problem(s).

**Project Outcome:** Outcomes are the likely or realised short-term/medium-term effects of the project's outputs. Outcomes are used to identify (a) what will change, (b) who will benefit and (c) how it will contribute to the goals of the National Development Plan.

**Project Output:** This relates to products, capital assets and services that result from a project. Outputs are limited to the specific, direct deliverables of the project.

**Project Resource Requirements (Project Needs):** This refers to the cost of the inputs and resources required to implement the infrastructure project.

**Project Sponsor:** The public institution or organization responsible for the planning, appraisal, preparation, implementation, monitoring and evaluation of the project.

**Project:** A unique set of processes consisting of coordinated and controlled activities with start and end dates, performed to achieve the project objective.

**Real Value:** The actual value of goods and services. It does not include the impact of inflation. Real values of goods and services are obtained from nominal values by adjusting for inflation.

**Routine Project:** Are planned and approved maintenance and rehabilitation actions intended to ensure that an asset performs a required function to a specific performance standard over its expected useful life.

**Status Quo:** The current state of things, i.e. “without” the project.

**Top-down Project:** A project that is considered a top priority by the government. It is typically contained in policy documents such as the National Development Plan or other relevant planning documents.

**Traded Goods:** Goods whose prices are determined in the world market.

**Wage Premium:** Refers to the wage paid by the project over and above the normal market-related wage as determined in the labour market. This wage premium is a financial cost to the project, but it is a benefit to the labour. Therefore, it represents a transfer of resources within the economy.

# 1. INTRODUCTION

## 1.1. Purpose of the Guideline

This Infrastructure Planning and Appraisal Guideline (the Guideline) is meant to support public institutions, embarking on infrastructure investment projects, to meet the requirements of the Framework for Infrastructure Delivery and Procurement Management (FIDPM). The Guideline's specific objectives are to assist public sector officials with the actual **methodology** of preparing and appraising an infrastructure investment project.

The FIDPM issued in October 2019 by the National Treasury, replaces the Standard for Infrastructure Procurement and Delivery Management (SIPDM). The FIDPM gives minimum requirements for Portfolio processes, Programme processes, Operations and Maintenance processes and Project processes.

The Infrastructure Delivery Management System (IDMS) is a government management system for planning, budgeting, procurement, delivery, maintenance, operation, monitoring and evaluation of infrastructure. It comprises a set of interrelated elements that establish processes that transform inputs into outputs.

The FIDPM prescribes the minimum requirements for the implementation of the Infrastructure Delivery Management System (IDMS) through:

- a. IDMS processes consisting of portfolio, programme, projects, operations and maintenance of infrastructure; and
- b. Infrastructure Procurement Gates.

Projects can either be “top-down” or “bottom-up”. **Top-down Projects** are described as top priorities of the government. These projects are usually explicitly mentioned in the National Development Plan (NDP), National Infrastructure Plan, Provincial Growth and Development Strategy (PGDS), Departmental Infrastructure Plans (DIP), User-Immovable Assets Management Plans (U-AMPS), Infrastructure Assets Management Plan (IAMP), Integrated Development Plans (IDP), Infrastructure Procurement Strategy (IPS), or other relevant planning strategy/documents. **Bottom-up Projects** are developed in response to specific, observed or urgent needs. These projects are not necessarily stated in the NDP or other planning documents, processes or strategies. They are designed to address particular service needs of the citizens, and they contribute to the macro objectives of the State. Regardless of the origin of a project, it must be subjected to a thorough analysis prescribed in this Guideline.

## 1.2. Scope of the Guideline

The Guideline applies to organs of state, which are subject to the Public Finance Management Act (PFMA), or implement infrastructure projects on behalf of other organs of state in terms of section 238 of the Constitution of the Republic of South Africa, 1996. The Guideline applies to all public infrastructure projects.

While the FIDPM provides the framework for project implementation and includes planning, appraisal, procurement, construction, handover, and closeout, the Guideline provides guidance on how the different project appraisal stages should be undertaken.

Figure 1 presents the stages of a project cycle as prescribed by FIDPM, for routine and megaprojects.

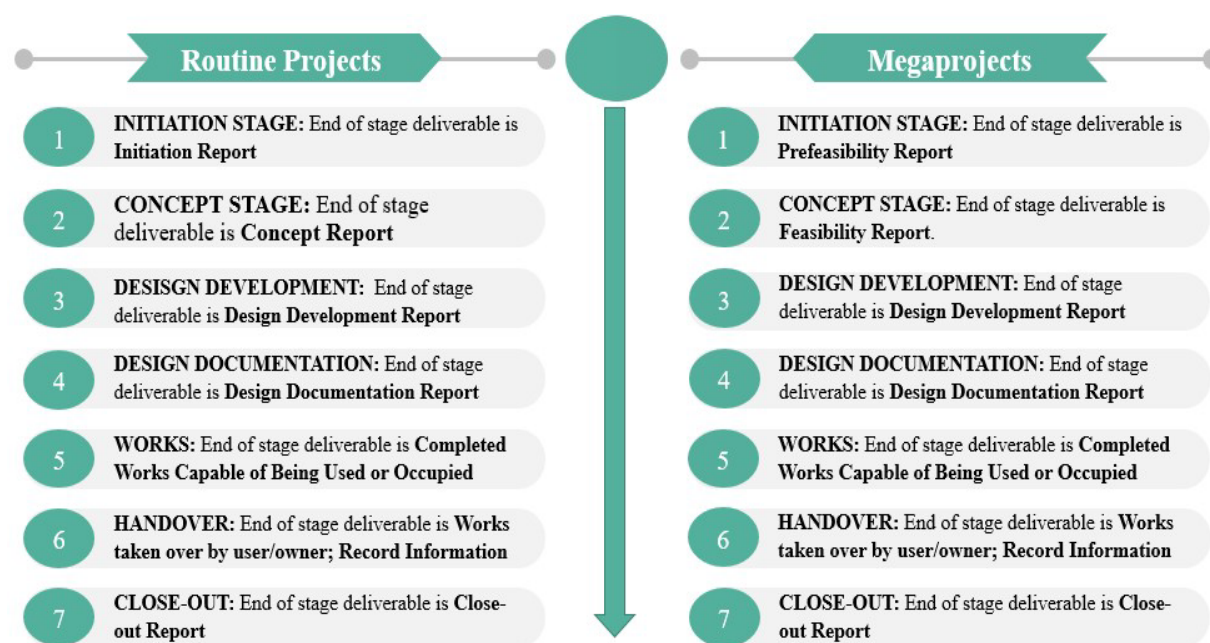


Figure 1: Project Stages (as prescribed by FIDPM)

The Guideline focuses on the Initiation and Concept stages of project development, as outlined in the FIDPM. Initiation Report and Prefeasibility Report are the deliverables of the Initiation stage for routine and megaprojects, respectively. The practical outcome of these reports is a decision supporting (or rejecting) the allocation of funding for the Concept Stage. The Concept Report and Feasibility Report are the Concept stage deliverables for routine and megaprojects, respectively. These reports are used to make recommendations on whether or not a project should be funded, reviewed or that no further expenditure be incurred on its development.

Approaches to some aspects of project development, such as the Procurement Strategy, Baseline Risk Assessment, Health and Safety Plans and Environmental Impact Assessments are extensively covered in other documents and are therefore not repeated here. However, Annexure C presents a list of documents where guidance on these aspects can be found.

### **1.3. Organization of the Guideline**

Figure 2 shows the scope and organization of the Guideline based on the FIDPM trajectory of project development, starting with Project Initiation and ending with Project Approval, Review, or Rejection. Each step in the Flowchart is numbered according to where in the Guideline the details of how this step should be executed is found.

At the end of each stage of project development, there is a Gate Review where a project is evaluated based on the information presented in the end of the stage deliverable. After the Gate Review process, a project is either approved to proceed to the next stage, sent back for review or abandoned altogether for one or more specific reasons.

All projects are expected to undergo the Initiation and Concept Stage of development before proceeding to the Procurement and Implementation stages. For routine projects, deliverables of the Initiation and Concept stages are Initiation and Concept reports, respectively. For megaprojects, deliverables of these stages are Prefeasibility and Feasibility reports, respectively.

Chapter 2 describes the Initiation Report and gives guidance on how the Initiation Stage requirements, as prescribed by the FIDPM, can be met. The chapter ends with a checklist of the Initiation Report's key components, which will help in the assessment of the project idea. If approved, the Initiation Report will serve as the basis for the development of the Concept Report.

Chapter 3 describes the Concept Report. The Concept Report builds on the Initiation Report by assessing additional aspects of a Project such as the Analysis of Options, Detailed Cost Estimates, and an Implementation Plan for the preferred option. The chapter ends with a checklist of the Concept Report's key components, which will assist in decision making.

Chapter 4 presents how a Prefeasibility Report should be prepared for megaprojects, in compliance with the requirements of the FIDPM. The chapter ends with a checklist of the key components of the Prefeasibility Report, which will assist in the assessment of the megaproject idea.

Chapter 5 provides guidance on the preparation of a Feasibility Report for megaprojects. The Feasibility Report builds on the key findings of the Prefeasibility Report and includes additional elements (not included in the PFS Report), such as the Implementation Plan, Complete EIA, Institutional Capacity Assessment, and Procurement Strategy.



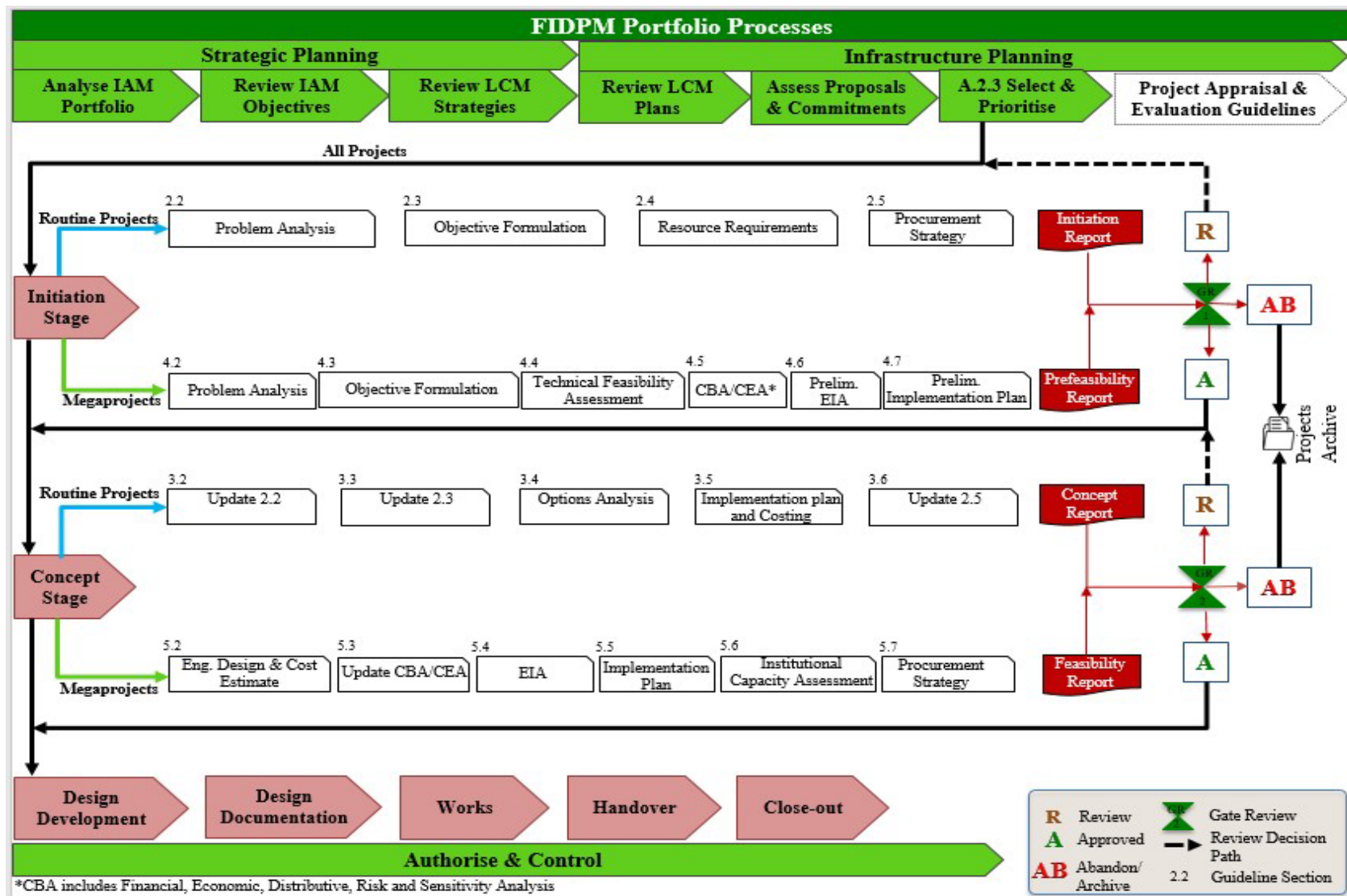


Figure 2: Stages of Project Development Flow

#### **1.4. Infrastructure Appraisal and Impacts of Climate Change**

The impacts of climate change are felt across the globe, and in South Africa, where more frequent and extended droughts, higher temperatures and heat days, more variable and more intense rainfall events are increasingly prevalent. The infrastructure planning and appraisal process should identify climate-resilient properties of infrastructure projects and assess their incremental costs and benefits. Climate change impacts will change the without project scenario and as a result, cause the net benefits of alternative technologies to change. These costs and benefits should be estimated and considered in the selection and prioritization of infrastructure projects.

Furthermore, South Africa is committed to transit to a low carbon economy. There are many different interventions to reduce carbon emissions; some are costlier than others. Hence, undertaking a cost effectiveness analysis of options will enable the country to achieve its environmental goals in a way that minimizes the total resource costs used to mitigate these emissions. Therefore, infrastructure projects that are identified in response to this commitment shall demonstrate (a) their alignment with the strategy/commitment of the Government to achieving a low carbon economy and (b) economic feasibility or cost-effectiveness.

## **2. INITIATION REPORT**

### **2.1. Introduction**

The first stage of project development is the Initiation Stage. At this stage, the Project Sponsor identifies and defines the problem that the project intends to solve. The Sponsor also proposes and assesses the possible solutions to address the problem in a practical, responsible and cost-effective way. For routine projects, the key findings of the Initiation Stage are presented in an Initiation Report. The Initiation Stage ends when the Initiation Report is approved.

The Initiation Stage involves the following steps:

1. Problem analysis and formulation of a solution;
2. Formulation of project objective(s) and strategic alignment;
3. Project resource requirement assessment; and
4. Formulation of the preliminary procurement strategy.

The Initiation Report serves as the basis for the development of the Concept Report.

### **2.2. Problem Analysis and Formulation of the Solution**

A thorough analysis of the problem to be solved helps shape the solutions, set the project's objectives, identifies the project activities, and later plays an important role in assessing whether the project solved the problem. Problem analysis involves:

- Problem identification;
- Stakeholders analysis and consultations;
- Analysis of the causes and effects of the problem; and
- Development of a solution (i.e. the project in its totality – this might involve a combination of a number of smaller individual projects that will have an impact on the focal problem)<sup>1</sup>.

#### **2.2.1. Problem Identification**

A problem arises when there is a difference between reality (the status quo or undesired situation) and the desired situation. Therefore, the first step in problem analysis is identifying and describing the undesirable reality (the core problem). A precise definition of the problem that is to be solved by the project is vital to the appraisal, planning, implementation and successful completion of the

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<sup>1</sup> It must be noted that the solution does not always have to be an infrastructure solution

project. The Project Sponsor must first identify and state the problem in a clear and precise manner. This involves two steps:

- a) Establish what the “status quo” scenario is - this is the existing undesired situation; and
- b) Establish what the “with project” scenario would be – this refers to the desired future outcome if something is done about the existing situation.

The first step in the identification of the problem is to describe the current situation (status quo) that exists and which the proposed project intends to resolve. A Status Quo Analysis is used to draw out the key challenges or the potential opportunity, which would not be resolved without some form of external intervention, i.e. the project. One of the outputs of the Status Quo Analysis is the cost of maintaining the Status Quo. It also sets the yardstick against which the future impact of the project is measured. The critical challenges of the Status Quo should be quantified and presented with as much details as possible and using verifiable statistics.

The sources of information used in the above analysis should be clearly stated. These sources may include the NDP, Sector Investment Plan (SIP), PGDP, MGDG other relevant policy documents, other existing studies, interviews with the relevant stakeholders and local civic leaders etc.

Problem identification and development of the ‘status quo’ scenario allow the Project Sponsor to list and account for any supplementary infrastructure that is critical to achieving the project objective(s). This, in turn, will assist in the cross-functional planning and ensure that:

- the rationale behind the project is clearly communicated to relevant stakeholders;
- the progress of the project is easily monitored to ensure that it does not derail from its objective(s); and
- every stakeholder understands their role in the achievement of the project objective(s).

The establishment of the “status quo” and “with” project scenarios allows the Project Sponsor to first define and then monitor the project objective. Furthermore, a well-defined objective with established indicators and targets also helps in the monitoring and evaluation of the project and how it contributes to the project area, as well as a specific infrastructure sector and other project planning strategies.

Box 1: Illustrative example of identification of core problem

***Despite the improvements that have been experienced in the health sector of South Africa, recent data from Statistics South Africa suggests that the health and wellness indicators in a South African province are not moving in the same (positive) manner as the rest of the country. The attention of the Department of Health has been drawn to the increasing rate of mortality and morbidity in this province.***

*The mortality rate in the Province was reported to have grown to 100 per 1000 people over the last three years. Further investigation revealed that approximately 10% of the deaths are as a result of waterborne diseases, 20% as a result of HIV/AIDS and other related diseases were found to be responsible for 55% of the deaths; the remaining 15% are not disease-related. If nothing is done, given the situation in the province and the current trend, the mortality rate is expected to reach an unacceptable level of 200 per 1000 people in the next year.*

*To address the high mortality rate Government designed a program that consists of three main areas of intervention:*

- a) Provision of potable water supply to reduce the level of waterborne diseases,*
- b) Awareness-raising campaign to reduce HIV/AIDS infections,*
- c) Improvement of access to quality health services.*

*Each of the areas of interventions above may, in turn, include several individual projects.*

## 2.2.2. Stakeholder Analysis and Consultation

Stakeholders are the individuals and organisations who are directly and/or indirectly impacted by the project. Stakeholders play a vital role in problem analysis and formulation of the solution as they provide clarity on the nature of the problem and the possible solutions based on real experiences. They also play a critical role in the success or failure of the project.

The basic premise behind stakeholder analysis is that different stakeholder groups have different concerns, capacities, aspirations and interests. Therefore, there is a need to recognise these varying factors and take them into consideration in the process of identifying the problem, setting the objective(s) and selecting the preferred options that optimise stakeholder needs.

Project stakeholders can be direct or indirect. Direct stakeholders are those who are directly impacted financially or economically by the project. Examples of direct stakeholders include:

- a) the target population affected by the problem the project intends to solve,
- b) the Project Sponsor who is directly involved and responsible for the preparation and implementation of the project,
- c) treasury departments and local and provincial authorities that will collect direct and indirect taxes from the project, or provide subsidies, and
- d) existing providers of goods or services that will be provided by the project.

Indirect stakeholders, on the other hand, are stakeholders who may not be directly impacted but have an interest in and play a role in the success or otherwise of the project. Examples of these stakeholders include broader reference population in the area, public institutions that will grant certain rights (e.g. land rights) to the project before it can be implemented, local civic organisations that have interest in the project, etc.



A Stakeholder analysis, therefore, involves the identification of all project stakeholders (direct and indirect), an assessment of each stakeholder's level of interest in the project and their ability to influence the success of the project positively or negatively, as well as the development of a stakeholder consultation plan/strategy. A Stakeholder Analysis should answer the following question about each stakeholder or group:

- a. Who is the stakeholder?
- b. How much does the problem/project impact the stakeholder?
- c. How much influence does the stakeholder have on the project?
- d. What is important to the stakeholder?
- e. How can the stakeholder contribute to the project?
- f. What is the role of the stakeholder in the project?
- g. How could the stakeholder jeopardize the project or individual components of the project?
- h. What is the strategy of engaging the stakeholder throughout the project?

Project Stakeholders may be identified from previous analysis done during the development of strategic plans such as the NDP, Provincial and Regional Strategy Plans, Municipal Integrated Development Plans (MIDPs), etc. In the absence of stakeholder information in these Plans, a Stakeholder Identification study should be conducted to identify all stakeholders and assess the problem's impact and the solution on each Stakeholder.

Box 2: Illustrative Example of Direct and Indirect Stakeholders

***One of the solutions proposed to address the high level of waterborne diseases identified in Box 1 is the supply of potable water to the target areas. The target population are the households who had inadequate access to potable water. These direct stakeholders would be impacted positively. However, the water vendors who currently supply water to households will be negatively affected or entirely displaced by the project. Example of Indirect Stakeholders are municipalities or local governments that need to be consulted before the implementation of the project can begin.***

### 2.2.3. Analysis of Causes and Effects of the Problem

Identification of the causes and effects of the core problem(s) faced by the project beneficiaries gives an in-depth understanding of the nature of the problem and plays an important role in the formulation of the solution(s). The Project Sponsor should brainstorm and consult with a wide group of stakeholders as possible to develop a comprehensive understanding of the causes and effects of the problem(s). One of the tools that can be employed in analysing the problem and

identifying the causes and effects is the Problem Tree<sup>2</sup>. The steps involved and an illustrative example of a Problem Tree are presented in Annexure A.

#### **2.2.4. Formulating a Solution**

Understanding the needs and challenges of the beneficiaries, other stakeholder interests, and the causes and effects of the problem(s) gives direction and insight to the formulation of a solution that would solve the problem<sup>3</sup>. Note that the solution itself might involve a combination of several small projects.

### **2.3. Formulation of the Project Objective(s) and Strategic Alignment**

The project's objective is to solve the problem identified in the Problem Analysis and deliver the expected benefits in a cost-effective way. The Project Objective(s) are conceptualized using the results from the Problem Analysis. The Solution to the core problem becomes the Objective of the project. At the same time, the “cause and effect” relationships developed in the Problem Analysis are transformed into “means to end” relationships in the Project Objective(s).

It is important to identify Project Outcomes that are directly related to the Project Objective(s). A common mistake made by Project Sponsors is when broad economic impacts are considered in the analysis, which are not directly aligned with the specific objective(s) of the project. For instance, while of tremendous importance, employment creation is rarely the direct objective of an infrastructure project. Infrastructure projects are created to address specific problems faced by the population. While any infrastructure project will create employment, not every project will be economically feasible and, therefore, sustainable. The task is to identify economically feasible projects that will create sustainable employment opportunities. For the purposes of meeting government's socio-economic targets, employment numbers should however be quantified and recorded under employment categories such as “construction”, “permanent”, “temporary”, etc.

The analysis of the objective(s) of the project must include the definition of the outputs that would be produced by the project, the expected outcomes, and how these outcomes will help to achieve the overall objective(s) of the project. Project Sponsors must show that the objective(s) align with the organisation's priorities and aspirations, the sector development plan, and the other

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<sup>2</sup> The problem tree gives a framework for understanding the problem, both in terms of need (i.e. quantifying the demand) and its urgency (i.e. emergency, short-, medium-, long-term), to be solved. When presenting the problem in the Initiation Report more details (and verifiable statistics) behind the analysis should be presented.

<sup>3</sup> The solution might be a non-infrastructure solution

development strategies. This alignment is commonly demonstrated through the use of Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART) indicators.

The analysis and formulation of the objective(s) of a project can be carried out using an Objective Tree. The procedures of developing an Objective Tree and an illustrative example are presented in Annexure A.

Box 3: Summary of the Good Practices and Common Mistakes encountered in Problem Analysis.

### **GOOD PRACTICES**

- ✓ *Present existing infrastructure and status quo (current situation) with relevant, verifiable statistics. This might include statistics from different but relevant sectors.*
- ✓ *Be very specific about how beneficiaries of the project would be affected.*
- ✓ *Avoid vague and generalized description of the impacts of the current situation on the beneficiaries and how the project is expected to bring about a change.*

### **COMMON MISTAKES**

- ✗ *The assumption that it is not important to state the current situation in the problem analysis of top-down projects and that such projects should just be funded and implemented without a rigorous project appraisal process.*
- ✗ *Presentation of socio-economic context and statistics without a clear explanation of how they relate to the project and impact the important stakeholders*
- ✗ *Confusion of project objectives with outputs. For example, suppose the core objective of a project is to improve the access of people to potable water. In that case, the construction of a dam and/or construction of distribution systems are not objectives of the project. They are the means/outputs through which the objective of improving access to potable water(end) will be achieved.*

## **2.4. Analysis of Project Resources Requirements (Project Needs)**

The analysis of the project resource requirements at the Initiation Stage involves three activities:

1. Preparing a list of project alternatives (options) capable of achieving the project objective(s);
2. Preparing preliminary cost estimates for each of these options; and
3. Establishing a detailed plan for the preparation of the Concept Report.

A clear definition of the objective(s) of the project makes the analysis of the project resource requirement easier. Activities and outputs that do not contribute to the achievement of the project objective should be removed to minimize the project cost.

At this stage of the analysis of the resource requirements of the project, it suffices to identify major inputs of the project (project needs), cost of these inputs, and provide resulting estimates of the financial, logistics, human and other resources that are necessary for the successful implementation and completion of the project. This can be done through:

- a) Benchmarking with similar projects that were carried out in South Africa in the recent past;

- b) Consultations and brainstorming sessions with stakeholders; and
- c) Desk studies of the experiences of similar projects in other countries.

The source(s) of information should be stated and should be verifiable.

The box below illustrates how alternative solutions to the problem introduced in Box 1 are formulated.

Box 4: Illustrative Example of the Formulation of Alternative Solutions to a Problem

***Following the identification of a core problem, the cause-effect relationship, as well as the means-end relationships, the Department of Health has identified 50 areas considered as “hot spots” and have come up with several options (alternatives) that can be used to achieve the objective.***

***Option 1***

***Construction of a clinic in each of the identified areas in the province and the installation of boreholes to improve access to potable water supply.***

***Option 2***

***Development of 10 mobile clinics. Each mobile clinic is expected to move into different areas within the province and serve 5 different areas.***

***Option 3***

***A combination of the construction of 20 clinics, and the development of 6 mobile clinics, depending on the need of nature of the selected areas in the province, and improved awareness and provision of supplies needed for water purification.***

***Option 4***

***Development of innovative management solutions that can be used to optimize the current infrastructure with little upgrades and renovations.***

## 2.5. Preliminary Procurement Strategy

The procurement strategy is the plan of how the necessary inputs of the project would be obtained in a cost-effective manner. The plan begins with the identification of the project resource requirements and continues through planning, preparation of specifications/requirements, budget considerations, selection, contract award and contract management. The preliminary procurement strategy should focus on the project's major inputs, their specifications, potential sources of supply, installation and operating requirements, cost, and possible sources of funds. At this stage, the procurement strategy should attempt to capture at least 70% of the total project cost. The final procurement strategy would be developed at the Concept Stage.

Guidance on how to develop a procurement strategy that meets the requirement of the FIDPM are given in the Public Procurement Act (PPA). The Public Finance Management Act (PFMA),

Municipal Financial Management Act (MFMA), Municipal Supply Chain Management Regulations, National Treasury’s Note on Supply Chain Management (SCM) also give guidance on the requirements that must be met by the procurement strategy.

## 2.6. Gate Review

The Initiation Stage of routine projects development is complete when the Initiation Report is approved. The Initiation Report should describe and quantify when possible, the problem(s) that the project aims to solve, the objective(s) of the project and how they align with government priorities, the resource requirement (needs) of the project, and the preliminary procurement strategy that would be employed by the Project Sponsor.

Table 1 presents a checklist of the major elements of the Initiation Report. Project Sponsors must ensure that these requirements are met.

Table 1: Initiation Report Checklist

Assessment Criteria	Yes	No	More Analysis Required
<b>GENERAL REVIEW</b>			
Does the project provide a solution to a specific problem?			
Is the “status quo” scenario credible?			
Is the project objective(s) aligned with the priorities of the Project Sponsor and National Government objectives?			
Are there other projects in the pipeline that were approved on the merits of addressing the same problem?			
<b>Additional Comments:</b>			
<b>FORMULATION OF PROJECT OBJECTIVE(S)</b>			
Does the “with project” scenario effectively address the stated problem?			
Are the project objective(s) measurable?			
Are the project beneficiaries identified?			
Are all relevant stakeholders consulted in the formulation of the project objective(s)?			
<b>Additional Comments:</b>			
<b>PROJECT RESOURCE REQUIREMENTS AND PROCUREMENT STRATEGY</b>			



Does the preliminary procurement strategy align with PPA and other legislative requirements?			
Are the project resource requirements analyzed adequately?			
Can the cost of the project be minimized by removing redundant or unnecessary components of the project?			
<b>Additional Comments</b>			

### **3. CONCEPT REPORT**

#### **3.1. Introduction**

The Concept Stage is the second stage of project development. This stage focuses on the identification and analysis of the design alternatives (in terms of scope, scale technology) of the solution that was identified in the Initiation Stage. The Concept Stage aims to identify the option that is best suited to meeting the project objective(s). At the end of this stage, a preferred design option is selected, and the rationale behind the selection of the option is described clearly. The Concept Stage also involves the preparation of an Implementation Plan, which stipulates the activities required to deliver the preferred option, the timing, the scope, the cost, and the legal documents and approvals required for the implementation of the project. For routine projects, the key findings of the Concept Stage are presented in a Concept Report. The Concept Stage ends when the Concept Report is approved through the relevant process, e.g. For municipalities, the approval is done by the Councils.

The process of project conceptualization involves the following four steps:

1. Problem analysis and formulation of the solution;
2. Formulation of the project objective(s) and strategic alignment;
3. Options analysis; and
4. Preparation of the implementation plan and project costing.

The following sections describe how the Conceptual Development of a routine project should be undertaken as well as the development of the Concept Report.

#### **3.2. Problem Analysis and Formulation of the Solution**

The Problem Analysis and Formulation of the Solution data are extracted from the Initiation Report. These should be used and adjusted where necessary. At this stage, the Project Sponsor should not substitute the problem identified in the Initiation Stage with another problem. However, the Project Sponsor may review the analysis of the problem causes and effects and the strategic alignment of the solution recommended in the Initiation Report.

#### **3.3. Formulation of the Project Objective(s) and Strategic Alignment**

The Formulation of the Project Objective(s) and Strategic Alignment of the objective(s) is also extracted from the Initiation Report. These should be used and adjusted where necessary. At this stage, the Project Sponsor should not substitute the objective(s) identified in the Initiation Stage

with another objective(s). However, the Project Sponsor may review the analysis of the project objective(s) and the strategic alignment of the objective(s) presented in the Initiation Report.

### **3.4. Options Analysis**

Options Analysis involves the identification and analysis of various strategies that can be used to achieve the project's objective(s). Options Analysis is used to assess and compare the identified options based on specific criteria. The Project Sponsor should, for every option, answer a range of questions such as:

1. Is the proposed technical solution practically implementable, sustainable, and does it provide a solution to the stated problem?
2. Are there significant adverse environmental and social consequences of the proposed solution? Can they be mitigated, and at what cost?
3. Are there sufficient human and administrative resources to deliver the project and assure adequate operation of the facilities?
4. Is the implementing authority capable of delivering the project within time, scope and budget?
5. Are there any legal barriers that may jeopardize project implementation or operations?

The objective of assessing the various options is to ensure that the best strategy is adopted to meet the objective(s) of the project. The analysis should be done along the following qualitative dimensions while taking into consideration the requirements of the criteria in Table 2 below:

- a. **Technical Feasibility and Cost Effectiveness:** This entails the analysis of the technical and engineering design of the options, how appropriate they are to satisfy the project objective(s) and their effectiveness per Rand of investment. The technical feasibility analysis focuses on assessing the appropriate location, scale, scope, and technology of the available design options. It should consider geographic, climatic, topographical, and market conditions, among others, that the project will operate in. The Cost Effectiveness analysis considers every option to identify the option that is technically sound and achieves the project's objective(s) at the lowest cost. After due consideration of each option using some form of qualitative ranking, the option that is technically most suitable for delivering the project objective(s), and cost-effective should be identified.
- b. **Preliminary Environmental Impact Assessment:** This assessment focuses on the potential impacts of the project on the environment. This assessment aims to identify the impacts of the possible options on the environment and rank them in order of the severity of the impacts.
- c. **Human Resource Assessment:** The human resource assessment seeks to identify the labour and managerial needs of the possible options. Human resource assessment involves the following steps:

1. Identification of the human resources requirement of the alternative approaches;
2. Disaggregation of the labour requirements by levels of knowledge, skills and sources (local or foreign);
3. Analysis of the availability of human resources to meet the requirements of the alternatives; and
4. Reconciliation of the technical and administrative requirements of the alternatives with the supply constraints on human resources.

**d. Institutional Capacity Assessment:** This involves the analysis of the alternatives in terms of the capacity of the Implementing Institution, which could be different from the Project Sponsor. This analysis is done in light of the technical, human resource capabilities and experience needed to implement the alternatives. The Project Sponsor must demonstrate that the Implementing Institution has the capacity and capability to implement the preferred alternative. In cases where there is a need to obtain additional technical or human resources, the Project Sponsor, after consulting with the Implementing Institution, should state how these will be catered for and if there is an adequate budget to do so.

**e. Legal and Regulatory Due Diligence:** This involves assessing each alternative to check alignment with the existing statutory and regulatory framework and to identify legal barriers (if any) and approvals that must be obtained for effective implementation and operation of each alternative.

Table 2 presents a checklist of the key factors that should be considered in the assessment of each proposed option. The option that meets all (or most of) the required assessment criteria is selected as the preferred option.

Table 2: Options Analysis Checklist

Assessment Criteria	Yes	No	More Analysis Required
<b>TECHNICAL FEASIBILITY AND COST EFFECTIVENESS</b>			
Has the proposed technical solution been successfully employed before? Is it matured and market-tested?			
Are there proven ways of managing the potential risks associated with the technical solution?			
Is the cost-effective scale of the technical solution aligned with the estimated demand for the project output?			
Are the geographical, climatic, and topographical conditions of the target location favourable for the proposed technical solution?			
Is the technical solution cost-effective compared to other available alternatives?			

Does the technical solution provide the same quality or/and characteristics of the output compared to other available alternatives?			
<b>Additional Comments:</b>			
<b>PRELIMINARY ENVIRONMENTAL ASSESSMENT</b>			
Are there standard environmental impacts that are attributed to this technical solution?			
Are there other significant adverse environmental impacts?			
Are there proven ways to mitigate all the adverse environmental impacts?			
<b>Additional Comments:</b>			
<b>HUMAN RESOURCE ASSESSMENT</b>			
Can the technical and administrative human resource requirements of the solution be met?			
<b>Additional Comments:</b>			
<b>INSTITUTIONAL CAPACITY REQUIREMENT</b>			
Does the implementing authority have experience in implementing the solution?			
Does the implementing authority have the required expertise and infrastructure to implement the solution?			
Does the implementing authority have the legal authority to implement the solution?			
<b>Additional Comments:</b>			
<b>LEGAL AND REGULATORY DUE DILIGENCE</b>			
Does the solution have significant legal and regulatory hurdles?			
Does the solution have sufficient merit for obtaining the necessary approvals?			
<b>Additional Comments</b>			

Upon identifying and analysing the alternatives (options) that can be employed to bring about the project objective(s), the best option is selected. It must be pointed out that the preferred alternative at the end of the options analysis might be a combination of two or more of the identified and analysed options. Whichever option is selected, the rationale behind the selection should be detailed in the Concept Report.

### 3.5. Implementation Plan and Project Costing

After selecting the preferred option, the next step is to prepare the project implementation plan that is technically feasible, given the timing, scope, and scale of the project. The Project Implementation Plan proposes the most reasonable strategy to implement the project taking into account the information available. The implementation plan provides a detailed description of the steps to be taken in the strategy to achieve the objective(s) of the project, and it includes the following:

- a) The cost plan;
- b) Indicative schedule for construction;
- c) Schedule of supporting infrastructure such as access roads, electricity, water, etc.;
- d) Maintenance services schedule;
- e) Baseline risk assessment for the project;
- f) Health and safety plan;
- g) Description of the statutory permissions, funding approvals and utility approvals required to proceed with the works; and
- h) Any other project-specific studies and documentation.

The following general principles should be employed in developing each of the above steps of the Implementation Plan.

1. Identify the activities that need to be carried out in line with the preferred option. This also includes the statement of the scope, scale and the preliminary cost estimate of these activities (where applicable).
2. Rank the identified activities in terms of their importance and order of implementation.
3. Develop an activity schedule (Gantt chart) to show the timing, sequencing and inter-dependencies among activities. Each activity in the plan should have:
  - Activity name;
  - Activity scope summary;
  - List of activities that need to be completed before the initiation of this activity;
  - Starting date;
  - Completion date;
  - Activity specific expenses; and
  - List of activities that can commence following the completion of the current activity.

### **3.6. The Procurement Strategy**

The Procurement Strategy takes into consideration the findings and recommendations from each major stage of project development in determining the necessary inputs of the project and how these would be obtained in the most cost-effective manner. The Procurement Strategy details the project needs, procurement planning requirements, preparation of specifications/requirements, budgeting, selection, contract award and contract management.

The general principles of a Procurement Strategy are:

- i. Best value for money;
- ii. Fairness, integrity and transparency;
- iii. Effective competitive process;
- iv. Cost-effectiveness; and
- v. Alignment with the interests of the government.

In the Concept Report, the Project Sponsor should develop a full Procurement Strategy. Guidance on how to develop a Procurement Strategy that meets the requirements of the FIDPM is given in the Public Procurement Act (PPA). Other documents like Public Finance Management Act (PFMA), Municipal Financial Management Act (MFMA), Municipal Supply Chain Management Regulations, National Treasury's Note on Supply Chain Management (SCM) and other relevant documents give guidance on the requirements that must be met by the procurement strategy.

### 3.7. Gate Review

The Concept stage is completed after the development and approval of the Concept Report. The key elements from the Initiation Report should be transcribed to and made an integral part of the Concept Report. In line with the objective(s) of the project, the Concept Report presents the analysis of the different options that were considered by the Project Sponsor and the rationale behind the selection of a preferred option. It also presents the strategy that would be employed in the procurement and implementation of the preferred option. Table 3 presents the checklist of the important questions that must be answered and presented in the Concept Report.

Table 3: Concept Report Checklist

Assessment Criteria	Yes	No	More Analysis Required
<b>GENERAL REVIEW</b>			
Does the project provide a solution to the same problem that formed the basis for the Initiation Report's approval?			
Is the "status quo" scenario credible?			
Does the project objective(s) align with the priorities of the Project Sponsors and National Government objectives?			
Are there other projects in the pipeline that were approved on the merits of addressing the same problem?			
Are there significant environmental concerns? Are there plans to mitigate adverse environmental impacts?			
<b>Additional Comments:</b>			
<b>FORMULATION OF PROJECT OBJECTIVE(S)</b>			

Does the “with project” scenario effectively address the stated problem?			
Are the project objective(s) measurable?			
Are the project beneficiaries identified?			
Are all relevant stakeholders consulted in the formulation of the project objective(s)?			
<b>Additional Comments:</b>			
<b>OPTIONS ANALYSIS</b>			
Did the options analysis consider a reasonable range of alternatives available to address the core problem?			
Are the options’ cost estimates accurate and reasonable?			
Was operation and maintenance costs (O&M) of different options considered in selecting the preferred alternative?			
Did the analysis consider all major environmental impacts for every alternative?			
Are the selection criteria for the preferred option adequate for this type of project?			
Is the preferred option technically feasible in achieving the project objective?			
Is the project scale reasonable given the magnitude of the problem being addressed?			
<b>Additional Comments:</b>			
<b>IMPLEMENTATION READINESS</b>			
Are there any major statutory or regulatory constraints that may prevent efficient project implementation and/or operations?			
Are there any jurisdictional conflicts between government entities/institutions that need to be resolved before the project can proceed to implementation?			
Are land rights secured? If not, is there a detailed plan on how the land rights will be secured?			
If the project involves multiple public institutions, is there a stakeholder coordination plan?			
Does the Project Sponsor/Implementing Institution have an excellent record of successfully delivering projects of similar nature?			
Are there any other constraints that may prevent efficient project implementation or operation?			
Is the baseline risk assessment for the project in accordance with the requirements of the Construction Regulations?			



Are there necessary health and safety plans?			
Can funds for the project be secured?			
<b>Additional Comments:</b>			
<b>PROCUREMENT STRATEGY</b>			
Does the procurement strategy align with PPA and other legislative and requirements?			
Does the strategy demonstrate sound demand, acquisition, logistics, and disposal management plans?			
Is the strategy fair, equitable, transparent, competitive and cost-effective?			
Does the strategy include an adequate monitoring and evaluation plan for the procurement process?			
<b>Additional Comments</b>			

### **3. PRE-FEASIBILITY REPORT**

#### **4.1. Introduction**

For megaprojects, the components of the Initiation Stage are presented in the Prefeasibility Report. Megaprojects require the approval of the Prefeasibility Report for them to proceed to the Concept Stage. The key objective of the Prefeasibility Study (PFS) is to weed out economically unfeasible megaprojects. A PFS involves the following steps:

1. Problem analysis and formulation of the solution;
2. Definition of the project objective(s) and strategic alignment;
3. Technical feasibility assessment;
4. Cost Benefit Analysis (CBA) and/or Cost Effectiveness Analysis (CEA);
5. Preliminary environmental impact assessment; and
6. Preliminary implementation plan.

Ultimately, the PFS helps determine whether or not the megaproject can proceed to the feasibility stage (FS). The key differences between a PFS and an FS are presented in Table 4. A list of risk parameters or assumptions that need to be verified at the FS stage through primary data sources is also an important output of the PFS.

Table 4: Prefeasibility Study vs. Feasibility Study

Steps in Project Appraisal	Pre-feasibility Study	Feasibility Study
<b>Use of Data:</b>		
Secondary data sources	✓	✓
Primary data sources	✗	✓
<b>Project Background:</b>		
Description of Status Quo	✓	✓
Project Beneficiaries	✓	✓
Problem Statement	✓	✓
<b>Feasibility:</b>		
Demand Analysis	✓	✓
Option Analysis including Regulatory	✓	✓
Financial Analysis	✓	✓
Economic Analysis	✓	✓
Stakeholder Analysis	✓	✓
Risk Assessment and Sensitivity Analysis	✓	✓
<b>Implementation Readiness:</b>		
Engineering Studies and Cost Estimates	✗	✓
Preliminary Environmental and Social Impact Assessment	✓	✗
Environmental and Social Impact Assessment	✗	✓
Implementation Plan	✗	✓
Procurement Plan	✗	✓

## 4.2. Problem Analysis and Formulation of the Solution

The appraisal of megaprojects starts with the description of the social and economic environment surrounding the project and the analysis of the problem that the project intends to solve. Details of the procedures and description of how to conduct a problem analysis are discussed in section 2.2 of the Guideline.

## 4.3. Formulation of the Project Objective(s) and Strategic Alignment

The identification and description of the social, economic, political and institutional context of the project, as well as the analysis of the problem that the project intends to solve, serve as the basis for the development of the objective(s) of the project. Section 2.3 of the Guideline presents the steps for formulating the objective(s) of the project.

## 4.4. Technical Feasibility Assessment

The technical and environmental analysis of the project includes the following:

- i. Demand analysis;
- ii. Options Analysis; and

- iii. Technical design and cost estimates.

#### 4.4.1. Demand Analysis

A Demand Analysis is used to establish the need for the project. Therefore, it should be focused on the problem(s) of the target beneficiaries as identified in Section 4.2. of the Guideline. The demand analysis should indicate whether the project scope is too large or too small and whether the intervention needs to be expedited, postponed or re-scoped. The analysis is carried out in two stages:

- **Analysis of Current Demand:** This is based on the statistics provided by service providers, regulators, departments, ministries, and statistics agencies such as. For projects where there is no demand data, a primary survey of the current demand must be carried out. It must be noted that tariff policies (where they exist) are important determinants of the nature and volume of demand. Therefore, when the current demand analysis is being conducted, Project Sponsors should include alternative demand scenarios under different tariff policies.
- **Analysis of Future Demand:** This is based on reliable forecasting models that consider the different socio-economic factors, trends, cyclical variations, alternative supply, and elasticity of demand (price and/or income)<sup>4</sup>. The factors that drive future demand for the outputs produced by projects may vary from one infrastructure sector to another. The selection of the demand forecast technique should be driven by the nature of the demand for the project output. The final estimate must be reasonable and logically defensible. Whenever possible, a case should be made to justify the final estimate using examples from South Africa or other countries

#### Box 5: Illustrative Example of Current and Future Demand

*The children of a newly established township with no school have to travel, using public transport at an individual daily cost of R40 each, for an average of 30 minutes to reach schools in neighbouring townships. The projected number of children in the township will reach 2000 within the next ten years.*

*The estimate of the maximum number of children could be based on the land area of the township, the number of houses that could be built in the area (each on an area of 375 sq. m plus an allowance for streets, pavements and services), the average number of children per household, are assumed to be 2.4. The local rural/urban migration rate could be used to estimate when the area would reach capacity.*

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<sup>4</sup> Price Elasticity of demand is change in quantity of a good or service demanded as a result of a change in the price of the good or service

#### **4.4.2. Options Analysis**

The Options Analysis involves the assessment of the alternative options that could be implemented to meet the estimated demand for the project output. The steps and procedures for the Options Analysis that are iterated in section 3.2 (Concept Stage) of the Guideline should be used. The PFS, however, proceeds further into the economic analysis (using either CBA or CEA) of the preferred alternative(s). It is recommended that the number of possible alternatives that would undergo the economic analysis should not be more than three to minimize the cost and time of assessment. A detailed financial analysis is not required at this stage, and the financial analysis model should only be prepared for the preferred alternative if necessary, for instance, if PPP modality is being considered. However, the budgetary/fiscal analysis (project lifetime costing) should be included as it is a must-have element of the economic assessment.

#### **4.4.3. Technical Design and Cost Estimates**

Although a detailed engineering study is not required at the PFS stage, it is essential to undertake (or commission) preliminary technical design in order to derive cost estimates of the preferred alternative(s). The technical design takes the following into account:

- i. The description of the proposed location of the project and how it impacts the choice of the design;
- ii. The size and nature of the demand for the outputs that are expected to be produced by the project – this determines the scope and scale of the project;
- iii. The technical design itself – the technology to be adopted, design standards and specifications, etc.; and
- iv. Relevant socio-economic, political and institutional indicators.

At the PFS stage, it suffices to use current publically available information or information available from professionals such as estimators, engineers, architects, or quantity surveyors who have experience on similar projects (similar design, scope and scale) to derive the cost structure of the project(s). In cases where similar projects have not been undertaken locally, projects that have been carried out internationally can be looked at, and the cost estimates obtained and adjusted for the South African context. It is important to ensure that the cost estimates obtained from international sources are adjusted for such factors as differences in real wages between the two countries and other relevant socio-economic factors.

#### **4.5. Cost Benefit Analysis/Cost Effectiveness Analysis**

For megaprojects, the preferred alternatives identified in the options analysis described in section 4.4.2. are further subjected to a CBA and/or CEA to assess their economic viability, before a decision is made on proceeding to the Concept Stage – where a Feasibility Study is conducted.

The first decision an analyst should make is whether or not to undertake a CBA or a CEA on the project. A CBA methodology is employed when the costs and the benefits of the project can be monetized. On the other hand, there are projects where the objective is to select the investment of a combination of investments to deliver a specific quantity of a good or service at minimum cost (e.g. number of megawatts of electricity). Electricity generation projects or water supply projects, for instance, tend to be appraised using cost-effective analysis. In these cases, there is either a policy commitment to deliver a certain quantity of the service or the value of the output to the consumers has been determined to be greater than the expected costs. In other circumstances, when it is challenging to measure the benefits of a project in monetary terms yet from a social perspective, there is a goal to supply the service, such as for some health projects, the CEA analytical tool is employed.

#### **4.5.1. The Methodology of Financial and Economic Analysis.**

The approach adopted in this Guideline is a microeconomic methodology to conduct the CBA/CEA using an Integrated Investment Appraisal (IIA) approach. This enables the assessment of welfare changes due to the project and estimation of the project's impact on all segments of the society via the calculation of economic performance indicators such as the economic net present value (ENPV), the economic rate of return (ERR) and Cost-Effective Ratios (CER). Only projects that are economically feasible and cost-effective should proceed to the Concept Stage. If a project's economic feasibility cannot be demonstrated, the Project Sponsor shall provide a strong justification for the project approval.

The IIA approach begins with the construction of the financial cash flow statement for the project expressed in the projected values of nominal prices for each of the future periods. For most public sector projects, the financial cash flow statement is limited to the expected financial expenditures (i.e. expected investment and O&M costs) over the life of the project. For other projects, it involves the estimation of the financial expenditures and the financial receipts over the life of the project. The gap between the required financial expenditures and the expected financial receipts overtime should be used by an analyst to assess the magnitude of the financial support that the project requires. Projects with financial receipts that are substantially larger than the financial expenditures needed to build and operate them and generate a positive financial net present value (FNPV) when the appropriate discount rate is employed do not usually require financial support. The private sector can in fact, undertake these projects. However, government's financial support is needed for projects that have cash expenditures that are relatively larger than the cash receipts they generate.

After the estimation of the components that make up the financial cash flow statement for the project, an economic analysis needs to be undertaken to determine if the project is an efficient use of South Africa's resources. The economic analysis focuses on the assessment of the change in the welfare of the society as a result of the project. The economic analysis is based on the principles

of applied welfare economics<sup>5</sup>. These principles serve as the basis for the assignment of monetary values to the socio-economic benefits of projects.

The financial and economic analyses are conducted on an incremental basis - the difference between “with project scenario” and “status quo scenario.” CBA/CEA is undertaken using an incremental approach in three logical steps:

1. Definition of the “without project/status quo” scenario - projections are made of all cash flows related to assets' operations over their lifetime. In cases of investments aimed at improving an already existing facility, the “without project” scenario should include the costs and revenues/benefits to operate and maintain the existing service level and any improvement investments that were programmed to take place anyway. In the case of entirely new assets creation, the “without project” scenario is one with no operations.
2. Projections of cash flows are made for the “with project” scenario. 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 facility (at least three previous years) as the basis for the “without-project” scenario and to make the financial projections of the “with-project” scenario. Otherwise, the incremental analysis is very vulnerable to manipulation.
3. The difference between the cash flows in the “with project” and the “without project” scenarios are estimated, and the financial and economic performance indicators are calculated.

Once financial cash flows and economic resource flows are derived, the externalities, which are generated by the project are quantified at the project level as the difference between economic and financial cash flows. These externalities are usually items such as benefits accruing to a stakeholder whose valuation of the increased service is greater than the financial cost they incur to obtain the service. Alternatively, it might be a tax paid by either a producer or a consumer, which the government receives. These externalities are then distributed to relevant stakeholders so as to determine the magnitude of losses or gains that accrue to the stakeholders of the project.

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<sup>5</sup> See “Three Basic Postulates for Applied Welfare Economics”, A. Harberger, 1971. Most of the economic values that differ from their financial values because of taxes and subsidies can be derived through the application of standardized Commodity Specific Conversion Factors (CSCFs). These CSCFs will be provided by the National Treasury and kept up to date as a web based tool kit for the economic appraisal of investment projects in South Africa.

For CBA, this relationship is illustrated using the equation below for the case when all present values are calculated using a common discount rate:

$$ENPV = FNPV + \sum PV(EXT_i)$$

Where ENPV and FNPV are economic and financial Net Present Value, respectively, PV (EXT) is the present value of the externalities or stakeholder impacts.

Box 6: Good Practices and Common Mistakes in Economic Analysis of Infrastructure Projects

<b>GOOD PRACTICES</b>	
✓	<i>Include direct employment impacts reflected through a wage premium<sup>6</sup> paid by the project in the estimation of ENPV.</i>
✓	<i>Reflect external environmental costs or benefits, e.g. reduction in carbon emission, in the ENPV.</i>
<b>COMMON MISTAKES</b>	
✗	<i>Exclude the cost of domestically produced inputs.</i>
✗	<i>Exclude labour costs paid by the project.</i>
✗	<i>Include the full amount of wages paid by the project as an economic benefit.</i>
✗	<i>Include indirect effects such as impacts on secondary markets.</i>
✗	<i>Include broader effects such as regional growth and secondary employment creation.</i>

Lastly, a sensitivity analysis is conducted to see how changes in key project variables alter the outputs of the project's financial, economic, and stakeholder analysis. The following sections discuss the details of the financial, economic, stakeholder and risk assessment modules of the IIA approach.

#### 4.5.2. Financial Analysis Module

From the Government's perspective, the viability of an infrastructure project is determined based on its economic benefits and costs, rather than solely on the results of a financial feasibility analysis. However, the financial analysis provides the basis for the economic appraisal of a project and should be conducted in a way that allows the analyst to consistently convert the financial cash flows of a project into its economic resource flows of costs and benefits. When appraising the financial feasibility of infrastructure projects, they can be disaggregated into three categories:

1. Traditional Procurement Projects (TPPs) that are funded by the government;
2. Public-Private Partnerships (PPPs) that are governed by project finance principles; and

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<sup>6</sup> Wage premium refers to the wage paid by the project over and above the ongoing wage as determined in the labour market. This wage premium is a financial cost to the project, but it is a benefit to the labour. Therefore, it is a transfer within the economy.



3. State-Owned Enterprise (SOE) projects that are governed by a set of public administration and corporate finance principles.

The financial analysis section focuses on the analysis of TPPs and the relationship between TPPs and PPPs. It should be noted that details of the financial appraisal of PPPs are laid out in the National Treasury's PPP regulations. The financial analysis of SOE projects is governed by a more complex set of public administration and corporate finance principles. These principles are not covered in this Guideline. However, the vast majority of SOEs would only be able to raise capital with the implicit or explicit state guarantees. Therefore, economic viability must guide the investment decision on the SOE executed projects as well.

#### **4.5.2.1. Financial Analysis for Traditional Procurement Projects**

The financial analysis of TPPs is used to:

- a) determine the lifetime financial cost of the project;
- b) estimate the quantitative volume of services;
- c) determine if the project is financially self-sustainable over the operating period; and
- d) assess the impact on budgetary expenditures to finance the project.

In the case of projects that provide services without significant financial charges, the financial analysis is critical to arriving at the costs of constructing and operating the facility. These costs are important in:

- the estimation of the amount of funds required to cover the costs of the facility throughout its lifetime;
- arriving at estimates of the fiscal budget and public sector budgeting;
- securing other sources of funding, such as from donor agencies.

For such projects, the inability to secure reliable financing sources for the operation phase (not only the construction phase) will jeopardize the project.

#### **4.5.2.2. Financial Analysis for Public-Private Partnership Projects**

A public-private partnership (PPP) is a partnership between the public sector and the private sector for the purpose of delivering a project or service traditionally provided by the public sector. It has become an alternative for the provision of public goods and services and is ingrained in the public investment management systems of countries. However, before a PPP procurement modality is considered, the project must have been confirmed to increase the wealth/welfare of the country, i.e. has a positive ENPV, and that the financial, technical, operational and other risks will be transferred to the private sector because of its capacity to manage these risks better.

### Estimation of Cost Recovery Tariff

This is an important output of the PFS for PPP projects where users of the project would be charged a user fee. Cost recovery tariff is the minimum financial price at which the private sector partner will generate the required rate of return on its investment. It should be noted that any form of fiscal support, either through direct subsidies, tax incentives, or guarantees, should result in the final tariff being lower than what the cost recovery tariff would otherwise be.

### Estimation of Financial Viability Gap Support

A PPP project can be supported through a viability gap fund. Viability gap funding is the support given by the government in the form of cash contribution to projects that have been considered economically viable but lack financial feasibility. This support is usually given when there are no other viable options to make a project financially feasible. The relationship below shall guide the analysis of the financial viability gap.

$$ENPV = FNPV + \sum PV(EXT_i)$$

Any form of direct financial support from the Government is a transfer from the budget to the private sector investors. While it increases the financial returns, it also must be reflected as a negative externality on the fiscal side. Therefore, the decision to provide financial viability gap support shall be guided by:

- a) Evidence that expected economic NPV is positive; and
- b) No other options for making the project financially feasible exist.

#### 4.5.2.3. Constructing a Financial Cash Flow Statement

The financial analysis evaluates the expenditures and revenues generated by a project using the discounted cash flow (DCF) approach. This method requires the construction of a cash flow statement. The financial cash flow is a central piece of the financial appraisal of the investment project. The cash flow statement is a listing of all anticipated sources of cash and uses of cash by the project over the project's life. A typical cash flow statement is organized into two distinct sections. The first section summarises all of the receipts generated by the project, whereas the second section is concerned with project expenditures. The main components of the cash flow are outlined below.

The cash inflows of a project typically consist of the following items:

- i. Operational revenues that are expected to occur in the period;
- ii. Changes in accounts receivable; and
- iii. Residual values of the project's assets if their economic lives exceed the analysis period.

The cash outflows of a project typically consist of the following items:

- i. Capital expenditures;
- ii. Replacement costs for short life machinery and equipment;
- iii. Operational purchases of inputs that are expected to be made in the period;
- iv. Changes in accounts payable and cash balances;
- v. Maintenance expenditures; and
- vi. Income taxes paid (where applicable).

Following the cash flow structure outlined above, a project's financial analysis requires that two cash flows be constructed; one for the “without” and the other for the “with” project scenario. Once these two respective cash flow statements are constructed, the incremental cash flow statement can be derived. It simply entails subtracting the cash inflow and outflow items of the “with” project scenario from the corresponding “without” project scenario. The net incremental cash flow is the difference between the net cash flows of the with and without project scenarios.

Tables 5 presents an example of a typical financial cash flow statement from the total investment perspective. The financial cash flow from the total investment point of view provides the basis for constructing the economic resource flow statement.

Table 5: Financial Cash Flow Statement From Total Investment Perspective (Million Rand)

	Years					
	1	2	3...	...8...	...10	11
Service 1 Revenue	-	-	20.95	26.73	29.48	-
Service 2 Revenue	-	-	23.15	29.55	32.58	-
Change in accounts receivable	-	-	(4.41)	(0.27)	(0.30)	6.21
Residual	-	-	-	-	-	12.00
<b>Total Cash Inflow</b>	-	-	<b>39.69</b>	<b>56.02</b>	<b>61.76</b>	<b>18.21</b>
Capital expenditure	75.00	45.00	-	-	-	-
Replacement cost	-	-	-	30.00		-
Operating expenditure	-	-	12.00	15.32	16.89	-
Maintenance expenditure	-	-	2.25	2.25	2.25	-
Labour expenditure	-	-	10.0	11.04	11.49	
Change in accounts payable	-	-	(0.96)	(0.06)	(0.06)	1.35
Change in cash balance	-	-	4.41	0.27	0.30	6.21
<b>Total Cash Outflow</b>	<b>75.00</b>	<b>45.00</b>	<b>27.70</b>	<b>58.82</b>	<b>30.85</b>	<b>4.85</b>
<b>Net Cash Flow (Before Financing)</b>	<b>(75.00)</b>	<b>(45.00)</b>	<b>11.99</b>	<b>(2.80)</b>	<b>30.90</b>	<b>23.06</b>
+ Loan disbursement	45.00	27.00	-	-	-	-
- Loan repayment	-	-	19.80	15.48	-	-
<b>Net Cash Flow</b>	<b>(30.00)</b>	<b>(18.00)</b>	<b>(7.81)</b>	<b>(2.80)</b>	<b>30.90</b>	<b>23.06</b>

Box 7: Good Practices and Common Mistakes in CBA of Infrastructure Projects

***Good Practices***

- ✓ *Take the opportunity cost of existing assets into account when estimating the capital expenditure of a project that will be using these existing assets.*
- ✓ *Disaggregation of capital expenditures by the amount spent on goods traded internationally, the amount spent on non-traded (domestic) goods, and the amount paid to labour.*
- ✓ *Depreciation expense is an accounting device that spreads the cost of capital assets over the length of life of these investments so that net income in any given year will reflect all the costs required to produce the output. However, the depreciation expense is NOT a cash outflow and should not be included in the project's financial profile.*
- ✓ *A distinction must be made between sales and actual cash receipts, as well as purchases and actual cash payments. Only cash payments and receipts are included in the financial cash flow profile of projects*
- ✓ *The amounts of prepaid expenses at the time they are made should be included in the cash flow statement.*
- ✓ *The residual value of land recorded in the cash flow statement should be equal to the real market value of the land recorded at the beginning of the project unless the project results in some improvement or deterioration to the land.*

***Common Mistakes***

- ✗ *Failure to account for the replacement cost of assets that occurs during the project evaluation period to replace short-life machinery or equipment.*
- ✗ *Failure to account for possible avoided capital costs in the status quo scenario.*
- ✗ *Inclusion of depreciation expense as part of the cash flow profile of the project.*
- ✗ *Mistaking opportunity cost of existing assets for sunk costs<sup>7</sup>.*
- ✗ *Inclusion of interest during construction as part of the project's cash flow profile, even when no interests were paid during construction.*
- ✗ *A separate recording of the change in inventory as part of the cash flow profile of the project.*
- ✗ *Use of inconsistent prices for the construction of the cash flow statement (not accounting for impacts of inflation).*

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<sup>7</sup> The opportunity cost of using an asset in a specific project is the benefit foregone by not putting the asset to its best alternative use. To measure the opportunity cost of an asset, a monetary value has to be assigned to it in such way that should be equal to what has been sacrificed by using it in the project rather than in its next best use. On the other hand, the value of an asset is treated as a sunk cost if the asset has no alternative use.

### 4.5.3. Economic Analysis Module

#### 4.5.3.1. Framework for Economic Analysis

Economic analysis is required to appraise the project's contribution to economic growth and the wellbeing (or economic welfare) of the country's residents. The methodology adopted in the Guideline to evaluate the economic benefits and costs of projects is built on the three postulates of applied welfare economics<sup>8</sup>:

- 1) When a project produces a good or service (output), the economic benefit of each unit is measured by the consumer's willingness to pay for that unit.
- 2) The economic cost of each incremental unit of an input is the price at which the supplier would just barely be willing to supply that unit.
- 3) In measuring the economic efficiency of projects, the Rand values of the net economic benefits are added up, regardless of who are the beneficiaries of the project to arrive at the net economic benefits of a project at every point in time. The distributional characteristics of the project are measured, and impacts are allocated via the stakeholder analysis of the project.

The fundamental principle is to reflect the cost or value of goods and services using economic opportunity cost, instead of their financial prices observed in the market as the financial values of the project inputs and outputs may be distorted in the presence of one or more of the following:

1. Fiscal distortions such as import tariffs, taxes, or subsidies, including distortions in labour markets;
2. Non-efficient markets in the presence of monopolies, price controls, and other market restrictions;
3. Tariffs of utilities that are not cost-reflective; and
4. Unavailability of financial prices (i.e. pollution, coping costs, congestion, etc.).

Therefore, to obtain the economic values of the items in the financial cash flow statement, the financial values must be adjusted for all these distortions as applicable. This is done by:

1. Estimating the social value (willingness to pay) of non-marketed goods and services;
2. Conversion from market prices to economic values by multiplying the financial values of the items with the corresponding commodity-specific conversion factors; and
3. Discounting all costs and benefits using the economic opportunity cost of capital.

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<sup>8</sup> Harberger, A.C., "Three Basic Postulates for Applied Welfare Economics," *Journal of Economic Literature* IX, No. 3 (September 1971), pp. 785-797; and Harberger, A.C., "Reflections on Social Project Evaluation" in *Pioneers in Development*, Vol. II, edited by G.M. Meier, Washington: The World Bank and Oxford: Oxford University Press, (1987).

The relationship between financial, economic and distributive analysis is presented in Figure 3 below.

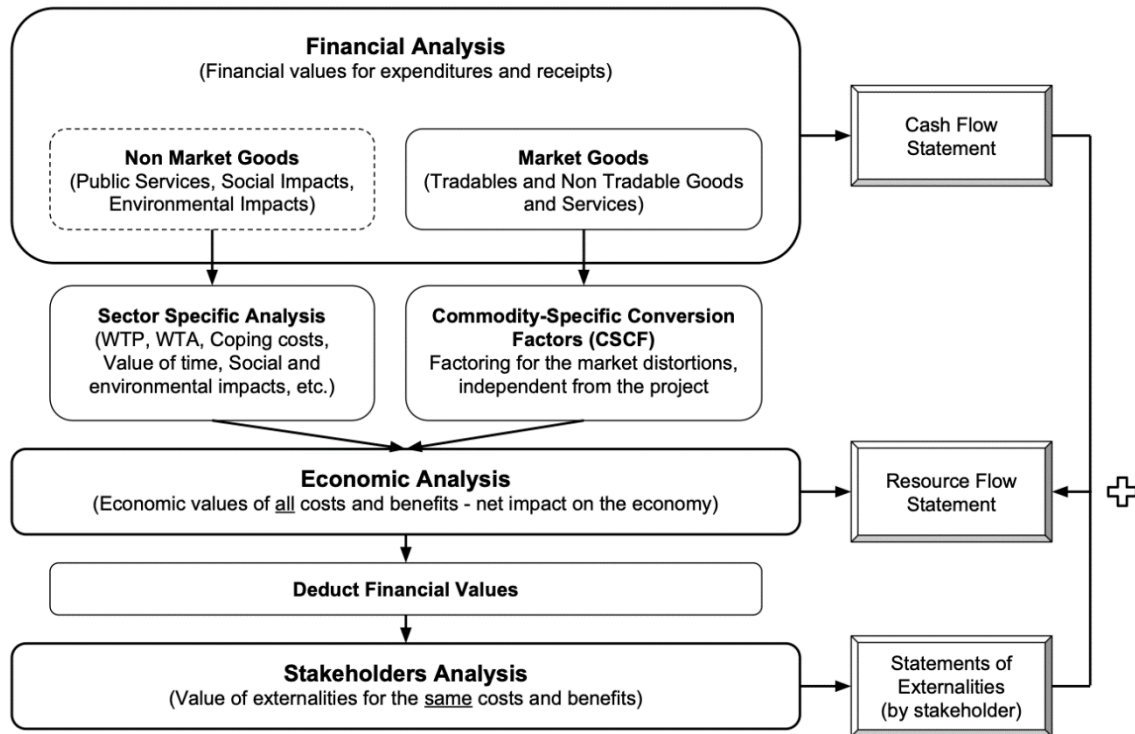


Figure 3: Moving from Financial to Economic Appraisal

Box 8: Illustrative Example of Moving from Financial Analysis to Economic Analysis

*To better understand the nature of economic analysis and its relation to the financial analysis, a case of the rehabilitation and upgrade of a highway that connects two provinces is considered. A PPP funding is being proposed for this project. The financial return to the private sector determines the profitability and financial attractiveness of the project. If the project has a relatively high probability of generating positive Financial Net Present Value (FNPV), it will attract private sector investment.*

*Suppose no one else in the country loses or gains as a result of the project. In that case, the analysis could stop when the financial analysis is completed, as there would be almost no difference between the financial and economic outcomes. However, in practice, there are always significant fiscal distortions as well as other externalities. Therefore, when conducting economic analysis, it helps from a conceptual standpoint to determine who, in addition to the investors, gain or lose as a result of the project.*

*Suppose the highway is tolled. The tolls serve as the source of financial revenues for the project, which underpins the project's financial attractiveness to the private sector/investor. Road users will gain from the project if the project reduces their overall cost of using the road. For instance, if the value of travel time and vehicle operating cost saved after the road is*

*constructed is higher than the toll to be paid, road users will benefit as a result of the project, and these benefits must be included in the economic analysis. Another benefit that should be accounted for in the economic analysis is the savings in the cost that would have been incurred for maintaining the existing road by South African National Roads Agency Ltd (SANRAL), as the maintenance of the new road will be the responsibility of the concessionaire.*

*The project will also pay corporate income tax. This would constitute a financial expense to the project but a benefit to the government and cancel out as a mere transfer in the economic analysis. Similarly, if the government provides subsidies or any form of financial support to the project, it would represent a financial benefit to the project owners but a cost to the government and also cancel out as a mere transfer in the economic analysis. However, these transfers must be accounted for when estimating the fiscal/budgetary footprint of the project.*

*If the road users, SANRAL and the government represent all the parties impacted by the project, then the net economic benefit or cost would be determined by adding all the gains and losses of these stakeholders to the gains or losses of the private investors. If the final result is a net gain (i.e. if the ENPV of the project is positive), then the project increases the net wealth of the economy and should be undertaken; otherwise, it should not be undertaken.*

*Note that it is not compulsory for all stakeholders to benefit from a project for the project to be economically viable. Any project may have both losers and gainers. However, if the gains outweigh the losses, the project is economically feasible and should be undertaken. In this case, the underlying rationale is that a net gain implies that losers as a result of the project could be compensated.*

The financial cash flow statement serves as the foundation for the construction of the economic resource flow statement<sup>9</sup>. The receipts and expenditures recorded in the financial cash flow statement are converted to their economic equivalents. This process is completed in four steps:

1. Estimate the economic value of the project output;
2. Estimate the economic resource cost of the tradable and non-tradable inputs;
3. Estimate the economic opportunity cost of labour; and
4. Discount all costs and benefits using the economic opportunity cost of capital.

#### **4.5.3.2. Estimating Economic Value of Project Output**

When a project produces a good or service (output), the economic benefit of each unit is measured by the consumer's willingness to pay (WTP) for that unit. WTP measures the maximum amount consumers would be willing to pay for a unit of a good or service. An alternative concept that is frequently used is the Willingness to Accept (WTA). It measures the minimum amount of money someone will accept to give up their consumption of a unit of a good or service. In practice, the

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<sup>9</sup> This is used to present the economic benefits and costs of a project



estimation approach to determine the economic value of the project output varies by sector or by categories of projects. For instance, the least cost alternative approach is used to determine the best technology for an on-grid electricity generation plant, and a reduction in the total user costs is estimated to determine the benefits of a motorway rehabilitation project. To obtain values for society's WTP for project outputs that are not traded in markets, Stated Preference and Revealed Preference estimation methodologies are used. Estimating the economic value of the outputs of megaprojects using these techniques is not discussed as it is beyond the scope of this Guideline. These methodologies<sup>10</sup> may require the involvement of external experts from consulting firms or academia.

#### **4.5.3.3. Estimating Economic Resource Cost for Project Inputs**

The economic cost of a project input is the price that the supplier of that input receives from the sale of the input. These minimum prices represent the opportunity cost of these goods. The National Treasury intends to estimate and periodically update economic conversion factors for all tradable and major non-tradable goods and services, including the economic opportunity cost of labour. The use of these standard commodity-specific conversion factors would greatly facilitate the process of undertaking economic appraisals consistently across public sector institutions.

#### **Tradable Inputs**

The inputs used by projects and outputs produced by projects are generally divided into internationally tradable and non-tradable (domestic market) goods. This is the first step in correcting financial prices for fiscal distortions. Internationally traded goods are further classified into importable and exportable goods. When there is a change in the demand or supply of these goods by a country, the domestic price of these items is not changed, but there will be an impact on the foreign exchange market that will affect the demand or supply of foreign exchange. In the case of changes in the demand or supply of importable goods, there will be an impact on the volume of imports that will, in turn, affect the value of import tariffs or indirect taxes collected<sup>11</sup>. On the other hand, a good or service is considered non-tradable when its domestic price is

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<sup>10</sup> Vast professional literature that provides specific methodologies for estimating the economic benefits of many types of infrastructure project exists. These are readily available to project analysts.

<sup>11</sup> A good or service is considered tradable when an increase in demand (or supply) by a project does not affect the quantity demanded by domestic consumers. Tradable goods and services can be either importable or exportable. Importable goods include imports plus all goods produced and sold domestically that are close substitutes for either imported or potentially imported goods. Exportable goods include all production of an item that is exported or partially domestically consumed.

determined by local demand and supply. The approach for estimating the conversion factors for these two categories of goods are different.

If a project uses an imported input, e.g. steel, gas or oil, the economic opportunity cost is the cost plus insurance and freight (CIF) adjusted for the foreign exchange premium and excluding any customs duties or taxes applied once the good enters the national market.

Box 9: Illustrative Example of the Estimation of Conversion Factors

<b><i>Estimation of the Conversion Factor for Steel (Used in the construction of a reservoir for a water project – Importable input)</i></b>			
<b><i>Financial Cost of Steel</i></b>		<b><i>Economic Cost of Steel</i></b>	
CIF Price	R20,000	CIF Price	R20,000
		FEP <sup>12</sup> (6.5% of CIF)	R1,300
Import Tariff (12% of CIF)	R2,400	Import Tariff (12% of CIF)	-
Freight	R500	Freight (66.7% of the financial cost of freight)	R333.5
VAT	R3435	VAT	-
<b><i>TOTAL</i></b>	<b>R26,335</b>	<b><i>TOTAL</i></b>	<b>R21,633</b>
$\text{Conversion Factor} = \frac{\text{Economic Value}}{\text{Financial Value}}$			
<b><i>CF = 0.82 (The economic value of steel, in this case, is 82 percent of its financial value)</i></b>			

A similar estimation is performed for the economic opportunity cost of exportable goods using Free on Board (FOB) prices as a starting point and then adjusting for export taxes or subsidies and taxes or subsidies on handling and transportation.

### Non-tradable Inputs

Estimating the economic resource cost of non-tradable inputs is a complex exercise that requires experts in this field. National Treasury will periodically update and publish economic conversion factors for the major non-tradable inputs.

#### 4.5.3.4. Economic Opportunity Cost of Labor

The structural characteristics of local labour markets, the existence of a legal minimum wage, taxes and social contributions, and the role of unions may result in an economic opportunity cost of labour that may be significantly different from the free market cost. Previous estimates of the economic opportunity cost of labour in South Africa indicate considerable differences between the market value and the actual wage rates paid for labour.<sup>13</sup> It should also be noted that under no

<sup>12</sup> FEP is Foreign Exchange Premium

<sup>13</sup> Hasan Ali Biçak, Glenn P Jenkins, Chun-Yan Kuo and M Benjamin Mphahlele South African Journal of Economics Suid-Afrikaanse Tydskrif vir Ekonomie Vol. 72:5 December/Desember 2004. An operational guide to the Estimation of the Economic Opportunity Cost of Labour in South Africa & Don Ross and K. Field, (2007) South

circumstance is the economic opportunity cost of labour equal to zero, even when a person is unemployed. Estimation of the economic opportunity cost of labour may be a complex exercise, but a reliable estimate can be obtained using the supply price approach:

1. Obtain the minimum pre-tax wage rate the project needs to pay to attract the necessary labour; and
2. Adjust for the distortions such as taxes and subsidies.

#### 4.5.3.5. Economic Analysis Investment Decision Criterion

The Economic Net Present Value (ENPV) uses the economic opportunity cost of capital to convert a stream of economic net resource flows generated by a project to a single value expressed in present value terms. A positive ENPV implies that the expected project benefits are likely to exceed the economic resource cost of delivering the output. In other words, the ENPV measures the change in wealth of the society created by the project. Projects with positive ENPVs should be undertaken. Details on how to estimate Cost Effectiveness Ratios are provided in Annexure B.

$$ENPV_0^{EOCK} = \sum_{t=0}^n \frac{NRF_t}{(1 + EOCK)^t}$$

$$ENPV_0^{EOCK} = NRF_0 + \frac{NRF_1}{(1 + EOCK)} + \frac{NRF_2}{(1 + EOCK)^2} + \dots + \frac{NRF_n}{(1 + EOCK)^n}$$

*NRF<sub>0</sub> is the net resource flow in year 0, ENPV<sub>0</sub> is the Economic net present value at the economic opportunity cost of capital in year 0.*

#### 4.5.4. Stakeholder Impact Assessment Module

The stakeholder impact assessment is used to identify and quantify the impacts that a proposed project is likely to have on its stakeholders. The success of any project is heavily impacted by which parties in the project's sphere of influence gain or lose because of it.

The difference between the financial and economic values of an input or output represents a benefit or a cost that accrues to some party other than the financial sponsors of the project. These differences can be analyzed by undertaking a distributive analysis that allocates these externalities (differences between economic and financial) to the various parties affected. For example, a project that causes the price of a good to fall will create economic benefits that are greater than its financial revenues. This difference between the financial and the economic values will represent a

gain to the consumers of the output and a somewhat smaller loss to the other producers of the good or service competing in the market with the project. The differences between the financial and economic values of inputs and outputs may also arise due to various market distortions such as taxes and subsidies, or because the item is sold to consumers at a price different from the marginal economic cost of additional supply.

A stakeholder analysis is composed of five distinct steps:

1. Measure the net impact of the externalities as the real economic values of resource flows less the real financial values;
2. Measure the values of the various externalities throughout the life of the project and calculate their present values (using the economic cost of capital);
3. Allocate the externalities across the various stakeholders of the project;
4. Summarise the distribution of the project's externalities and net benefits according to the key stakeholders in society; and
5. Reconcile the economic and financial resource flow statements with the distributional impacts. This is done on the premise of the following relationship between the economic analysis and the financial and stakeholder analyses:

$$ENPV = FNPV + \sum PV(EXT_i)$$

Stakeholder analysis allows an analyst to compare development projects based on their impact on poverty alleviation. While poverty alleviation is a benefit of most infrastructure projects, it becomes impossible to rank infrastructure projects based on their implications for poverty alleviation without any merits of comparison.

The magnitude of a project's direct impact on poverty alleviation is a variable that the feasibility study of a project is frequently expected to estimate. When a project reduces the price of a good or service, the consumers of the output can acquire the good at a lower price. This net benefit will be identified and quantified in the stakeholder analysis. If the poor are the consumers, this project will have a poverty alleviation impact. In the case of water, the willingness to pay by the poor to water vendors is often fairly high due to the necessity of water. Often, the poorer areas with limited access to water pay more for marginal supplies of water than the better-off consumers. Thus, a new project that increases the supply of potable water and provides it at a lower price for everyone, but more importantly, to the poorer strata of the society, will contribute to poverty alleviation. To be able to quantify this impact, one needs to evaluate the differences between the economic values and financial prices of the water being consumed by the various income groups.

Another channel for a project to have an impact on the incidence of poverty is through the labour market. When the lower-income groups sell their services to projects that pay a wage rate significantly above the workers' supply prices for their labour, they are likely to be made better off by the project. The differences between the supply price of labour and the financial wage paid will be measured as a distributive externality and can be allocated according to the various labour groups to determine if the project has a direct impact on poverty alleviation.

#### 4.5.5. Risk Assessment and Sensitivity Analysis Module

Risk commonly describes a combination of the probability of a defined threat or opportunity occurring and its magnitude/impact on the project's feasibility. To forecast any uncertain outcome, there is a need to move from the deterministic world, where it is assumed that the values of the variables are known with certainty, to a probabilistic world in which uncertainty prevails. Risk analysis is concerned with the identification of a project's risk variables, the analysis of the impacts of these risk variables on the project, and the interpretation of the results in the presence of uncertainty. The process of risk analysis involves qualitative and quantitative assessment of risks. A list of risk parameters or assumptions that need to be verified at the FS stage through primary data sources is a critical output of the PFS.

##### 4.5.5.1. Qualitative Risk Assessment

Qualitative analysis is one of the approaches used to assess the project's risks during project preparation and appraisal. Qualitative analysis uses a relative or descriptive scale to measure the probability of a risk event occurring. This can be achieved by using a risk matrix that:

- Identifies the project's risks;
- Defines the rating scales of the identified risks in terms of their likelihood of occurring and the potential impacts of the risks on the success of the project; and
- Aggregates the risks.

Table 6: Risk Assessment Matrix

		Impact				
		Very Low	Low	Moderate	High	Very High
Likelihood	Very Low					
	Low					
	Moderate					
	High					
	Very High					
Risk Level						
Low:			Moderate:		High	
					Very High	

#### **4.5.5.2. Quantitative Risk Assessment**

Quantitative risk analysis takes into account the fact that circumstances may occur, which result in future (actual) benefits/outcomes and costs being different from the expected values. This potential variance is a function of the chance that an actual value will differ from the expected value and the associated consequences. Risks should be quantified (where possible) as the product of:

- The likelihood of the risk impacting upon estimated project costs or benefits; and
- The consequence (i.e. the quantum difference between estimated and risk-adjusted values).

This Guideline proposes two quantitative risk analysis techniques that may be applied to assess the impact of project risk variables when examining the financial and economic viability of projects.

#### **Sensitivity Analysis**

Sensitivity Analysis is a way of methodically testing how responsive a project's selection criteria (NPV or any other relevant criterion) is to a change in key project variables. Sensitivity analysis enables an examination of how sensitive the financial and economic outcomes are to specific assumptions made in the project evaluation.

By conducting sensitivity analysis, an analyst can come up with a shortlist of project variables that require a more detailed assessment. Sensitivity analysis also informs the analyst how much the project can pay for the mitigation of specific risks.

Sensitivity analysis involves the following actions:

- Identifying the variables which can have a significant impact on the outcomes of the project;
- Identifying a likely range for these variables, centred on the most likely assumed values;
- Calculating the impact of different combinations of worst- and best-case assumptions for these variables; and
- Identifying the minimum set of changes in key assumptions which would reduce the net financial or economic benefit to zero and assess the likelihood of these events occurring (also known as break-even analysis).

#### **Scenario Analysis**

Scenario analysis is the extension of the sensitivity analysis that recognizes the interrelationships between project variables. It is conducted by allowing a number of variables to be altered consistently at the same time. Scenarios can be based on macroeconomic factors like the



performance of the economy (e.g., expansion, normal, recession), and other factors tested in the sensitivity analysis. The different types of possible scenarios are as follows:

- The optimistic case: This is a combination of the highest level in the range of probable benefits with the lowest level in the range of probable costs;
- The most likely case (Sponsor Case): is a combination of the benefits and costs with the highest probability of being realised; and
- The pessimistic case: This is a combination of the lowest level in the range of probable benefits and the highest level in the range of probable costs.

Scenario analysis involves the following actions:

- Identify the key sets of circumstances, usually based on major sources of uncertainty, that are likely to determine the success or failure of a project;
- Adjust the values of the variables to be consistent with each scenario;
- Calculate project outcomes for each scenario; and
- Interpret the results. In some cases, the interpretation of the results is straightforward. For example, if the NPV is positive, even in the pessimistic case, accept the project. If the NPV is negative, even in the optimistic case, reject the project. However, if the NPV is sometimes positive and sometimes negative, the results are more challenging to interpret, but a decision can be made from the knowledge of the “downside” and “upside” risk potential.

#### **4.5.5.3. Risk Mitigation**

It is important to identify the mitigation and/or preventive measures that can be used to contain the risks that the project is exposed to. Risk mitigation is any action that can be taken to reduce the likelihood of the risk occurring or minimizing the consequences if it does occur. Mitigation strategies can either seek to prevent the occurrence of the risk (e.g. through specific project structuring) or deal with the risk once it has materialized (e.g. appropriate contingency planning). Mitigation strategies need to seek a balance between the potential cost of the risk occurring and the cost incurred in preventing it or preparing for it. The identification of the risk mitigation measures requires a thorough knowledge of the causes of the risk, nature and the timing of their impacts. There are four possible strategies for dealing with risks that have a negative impact on the project, namely:

- a. Prevent:** This involves taking early action to reduce the likelihood and impact of a risk occurring. For example, the risk of late acquisition of permits and land can be prevented by efficient management.
- b. Avoid:** This involves taking action to either mitigate the probability of the risk or reduce its impact to zero. In either case, this response enables the risk to be circumvented entirely.

- c. **Transfer:** This involves transferring the risk to a third party who now becomes responsible for its management and impact. For instance, in the case of the construction and maintenance of a Highway, the concessionaire could enter into an Engineer, Procure, Construct (EPC) contract with a contractor who becomes liable for any cost overruns or time delays.
- d. **Accept:** Acceptance strategy is chosen where the likelihood and impact of the risk are low, and undertaking a different course of action is not any more cost-effective. This strategy is effected by establishing contingencies in form of resources, money or time to handle the risks. For example, allowance for cost overruns could be made in the estimation of investment cost.

#### **4.6. Preliminary Environmental Impact Assessment**

Where the project falls within one of the categories included in any of the Listed Notices given in the Regulations to the National Environmental Management Act (Act No. 107 of 1998), an Environmental Impact Assessment (EIA) is required. At the PFS stage, a preliminary EIA is required. The preliminary EIA should identify and present key environmental impacts, their magnitude and available mitigation strategies. It should also suggest if further assessment is needed or if there is high uncertainty about the nature of potential environmental impacts. Finally, the preliminary EIA should guide the development of terms of reference for the full EIA, which should be done at the feasibility stage of the project.

#### **4.7. Preliminary Implementation Schedule**

A preliminary implementation schedule can be developed given the preliminary technical design and cost estimate of the preferred alternative(s). Generally, the implementation plan provides a detailed description of the steps to be taken (activities, the period of activity, details of the activity, cost of the activity, etc.) by the preferred strategy to achieve the project's objective(s). However, it is sufficient to give the major milestones the project is expected to reach at the PFS stage and when these milestones will be achieved. These milestones include:

- The approval of the PFS;
- Undertaking the FS and the approval of the FS;
- The expected period of inclusion of the project into the budget; and
- Anticipated date of beginning and completion of construction, operation period, etc.

The preliminary cost estimate should also be given in the Preliminary Implementation Schedule.

#### **4.8. Gate Review**

A megaproject requires the development and approval of a PFS Report before proceeding to the Concept Stage. The Initiation Stage for megaprojects is complete when the Prefeasibility Report

is approved. The Prefeasibility Report contains the problem that the project intends to solve and its objective(s), the results of the preliminary assessment of the financial and economic feasibility of the project, preliminary environmental impact assessment and the preliminary implementation plan. It also contains important project parameters that need to be investigated in the Concept Stage. The Prefeasibility Report is used to determine if a megaproject should proceed to the Concept Stage, where a Feasibility Study is undertaken.

Table 7 presents the key questions that the PFS Report must answer, with supporting analysis and evidence, in line with the requirements of the FIDPM.

Table 7: Prefeasibility Report Checklist

Assessment Criteria	Yes	No	More Analysis Required
<b>GENERAL REVIEW</b>			
Does the project provide a solution to a specific problem?			
Is the “status quo” scenario credible?			
Is the project objective(s) aligned with the priorities of the Project Sponsor and National Government objective(s)?			
Is the cost of the project reasonable?			
Are there other projects in the pipeline that were approved on the merits of addressing the same problem?			
<b>Additional Comments:</b>			
<b>FORMULATION OF PROJECT OBJECTIVE(S)</b>			
Does the “with project” scenario effectively address the stated problem?			
Are the project objective(s) measurable?			
Are the project beneficiaries identified?			
Are all relevant stakeholders consulted in the formulation of the project objective(s)?			
Does the project complement ongoing projects?			
Does the demand analysis show that there is sufficient demand for the project?			
<b>Additional Comments:</b>			
<b>OPTIONS ANALYSIS</b>			
Did the options analysis consider a reasonable range of alternatives available to address the core problem?			
Are the options’ cost estimates accurate and reasonable?			
Was operation and maintenance costs (O&M) of different options considered in selecting the preferred alternative?			
Did the analysis consider all major environmental impacts for every alternative?			
Are the selection criteria for the preferred option adequate for this type of project?			

Is the preferred option technically feasible in achieving the project objective?			
Is the project scale reasonable given the magnitude of the problem being addressed?			
<b>Additional Comments:</b>			
<b>COST BENEFIT/COST EFFECTIVENESS ANALYSIS</b>			
Does the project generate financial revenues?			
If affordability concerns are raised, was affordability analysis carried out?			
Is the project financially sustainable, i.e. are financial revenues sufficient to finance the operations and maintenance expenditures?			
If not sustainable, is there a plan to meet cash flow requirements for the periods where cash flow is negative?			
Is the methodology selected for economic evaluation appropriate for this category of projects?			
Did the economic analysis consider all major externalities such as social, climate change, gender, etc.?			
Have economic indicators (ENPV, ERR, Cost Effectiveness Ratio) been calculated considering correct categories of costs and benefits?			
Is the project economically viable (i.e. ENPV>0, ERR>EOCK)?			
Did sensitivity analysis consider major risk variables?			
Is the proposed risks prevention and mitigation strategy adequate?			
Is there an overall high probability of achieving the objective(s) of the project?			
<b>Additional Comments:</b>			
<b>PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT</b>			
Did the analysis consider all major environmental impacts for this type of project?			
Are mitigation measures for the environmental impacts adequate?			
<b>Additional Comments:</b>			
<b>PRELIMINARY IMPLEMENTATION PLAN</b>			
Is the preliminary implementation plan practical?			
<b>Additional Comments:</b>			

## **4. FEASIBILITY STUDY**

### **5.1. Introduction**

As prescribed by the FIDPM, a megaproject must, after the completion of the PFS and approval of the PFS Report, also undergo a Feasibility Stage (FS) before implementation. The FS builds on the findings and recommendations of the PFS. The FS is undertaken only for the preferred option identified at the PFS.

The objectives of the FS are twofold. First, it refines the CBA/CEA prepared at the PFS stage by using more accurate and detailed investment, operation and maintenance cost estimates obtained from engineering studies. Furthermore, the secondary data used to estimate the benefits of the project in the PFS are often updated with primary data. The second objective of the FS is to prepare the project for implementation. The FS includes the following steps:

1. Problem analysis and formulation of the solution (extract from PFS Report and update if necessary);
2. Definition of project objective(s) and the strategic alignment with sectoral and national development plans (extract from PFS Report and update if necessary);
3. Engineering design and detailed cost estimates;
4. Updated CBA/CEA;
5. Detailed Environmental and Social Impact Assessment; and
6. Detailed Implementation Plan - including procurement and institutional capacity plans.

The first two sections of the FS (Problem analysis, formulation of the solution, the definition of project objective(s) and strategic alignment of the objective(s) with sectoral and national development plans) are contained in the PFS report. These should be extracted and adjusted, if necessary, in the FS report. It is important to note that the problem that the project intends to address as described and approved in the PFS stage should not be changed or substituted for another in the FS stage. However, project sponsors should review the analysis and update the data used in the PFS stage whenever such updates are available and necessary. This section focuses on the additional assessments required in the FS.

### **5.2. Engineering Design and Detailed Cost Estimate**

At the FS stage, the detailed technical description of the preferred alternative should be provided. Preferably, technical professionals from the engineering profession should do the detailed technical description. The technical description should describe how the outputs, which will be used to achieve the project's objective(s), will be produced. The technical description should specifically incorporate:

1. Field surveys of the selected project site which, depending on the project, may include: mapping, topographical and geotechnical surveys;
2. Consideration of zoning rights, town planning requirements and heritage matters;
3. Consideration of environmental conditions that will impact the technical design;
4. A preliminary technical design of the facilities required to provide the project's outputs;
5. A detailed estimate of the project cost should be done; based on the technological solution and preliminary design. The project cost estimate should detail the capital expenditure as well as the operations and maintenance expenses that are expected to be incurred.

It is important to note that the technical design provided at the FS stage is not final, as it is typically not prepared using the level of detail required for final specifications. The main purpose of these preliminary designs is to establish the minimum technical requirements and allow for a more accurate estimate of the project's costs to update the CBA that was carried out in the PFS stage.

### **5.3. Updated Cost Benefit Analysis or Cost Effectiveness Analysis**

The project's total cost estimate is a summation of all of the costs involved in completing a project, from inception to implementation. At the FS stage, it is important to forecast the project costs with as much accuracy as possible because:

- It helps in determining the financial resources necessary to meet the costs of completing the project.
- It helps to ensure that adequate financing of the project's costs will be made available to facilitate the achievement of the project's objective(s).

Various projects and operations have distinct methods of estimating costs, which vary in their composition and preparation methods. The onus is on the cost estimators such as Quantity Surveyors and Cost Engineers to employ the appropriate method. Project planners should therefore, consult professional Cost Estimators when reviewing the project costs.

A project's cost estimate is more than a simple list of costs; it also outlines the assumptions underlying each cost item. The cost assumptions (along with estimates of cost accuracy) are compiled into a report called the Basis of Cost Estimation Report, which also details cost exclusions and inclusions.

The Basis of Cost Estimation Report allows project stakeholders to interpret project costs and to understand how and where actual costs might differ from the approximated costs. Project cost estimates should be broken down into some level of detail with supplementary information. The level of detail and information required for project estimates should be guided by:

- a) Cost estimates for all of the activities that make up the project;
- b) Supporting details, which include assumptions underlying estimates and cost data sources;

- c) The sensitivity of each of the cost components;
- d) Requested changes, which may include newer or more accurate cost estimates;
- e) Updates to the cost management plan, such as those necessitated by changes to the project scope; and
- f) Inputs for subsequent planning processes that use cost estimates.

The cost data obtained from these activities are then used to update the CBA/CEA carried out in the PFS stage. The financial and economic assessment of the project viability is done using the methodologies described in section 4.5. The project's risk profile should be evaluated and adjusted whenever necessary to have a more realistic understanding of the risks that the project is susceptible to and develop mitigation measures that will improve the chances of success of the project.

#### 5.4. Environmental and Social Impact Assessment

Environmental and Social Impact Assessment combines the socio-economic and biophysical impacts of a proposed project on the environment. For projects that require an environmental impact assessment, the EIA should be carried out following the procedures described in the National Environmental Management Act (Act No. 107 of 1998)) (NEMA) and accompanying regulations. The EIA study should be conducted by registered professionals. According to the NEMA, an EIA is a project-based process that consists of eight distinct phases outlined below.

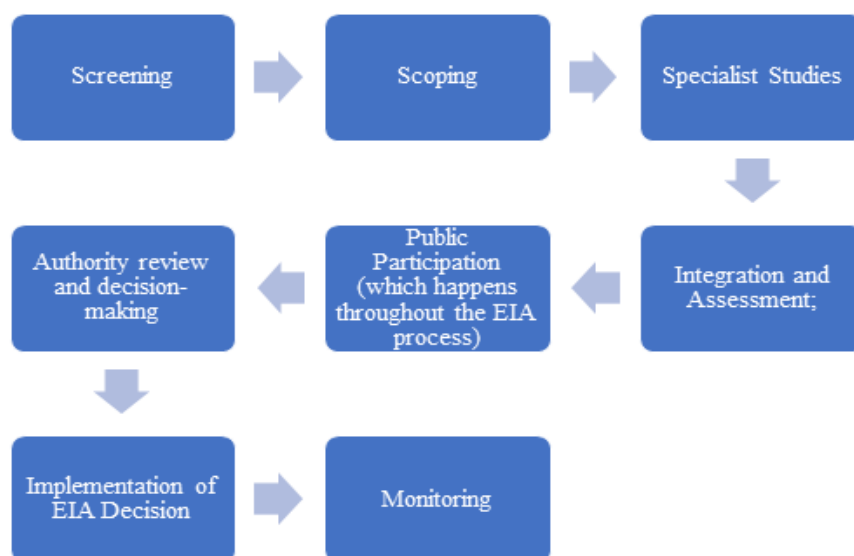


Figure 4: EIA Phases

#### 5.5. Implementation Readiness Assessment



An important function of the FS is the preparation of the project for implementation. This includes the description of the activities that would be undertaken to achieve the objective(s) of the project and an assessment of the capacity of the Project Sponsor (or Implementing Partner) to carry out the activities efficiently and effectively.

#### **5.5.1. Implementation Plan**

The Implementation Plan gives a detailed description, the timing, and the cost of the activities required to produce the project outputs to achieve the project objective(s). Furthermore, the implementation plan should contain the management and governance strategy of the project, as well as the financial control and funding strategies.

The procedure and the requirements of the Implementation Plan are presented in Section 3.5.

#### **5.5.2. Institutional Capacity**

The Project Sponsor should provide a comprehensive assessment of the organizational issues that could affect project delivery, including:

- Human resources requirements for the successful delivery of the project clearly outlining:
  - a) Capacity constraints relating to the project team and the technical advisors and a plan to address such constraints over the project's life; and
  - b) Envisaged strategy for skills transfer from the technical advisors to the project team.
- Project Management Charter that includes:
  - a) The implementing institution's project officer and team, including names of the team members, allocated roles within the project, relevant skills and brief CV's;
  - b) Appointed technical advisors, including allocated roles within the project, relevant skills, and brief CV's, and;
  - c) Budget available for project management.

#### **5.5.3. The Procurement Strategy**

Section 3.6, covers the guideline for developing a Procurement Strategy.

### **5.6. FS Report and Gate Review**

The FS Stage for the development of a megaproject is complete when the FS Report is prepared and approved. The FS Report builds on the PFS Report, with a more refined version of the components of the PFS Report. While secondary data is used in the PFS, the FS is undertaken with more accurate, precise primary data. The Feasibility Report also contains the detailed implementation readiness assessment and the implementation plan.

Table 8 presents the key questions that the FS Report must answer, with supporting analysis and evidence, in line with the requirements of the FIDPM.

Table 8: Feasibility Report Checklist

Assessment Criteria	Yes	No	More Analysis Required
<b>GENERAL REVIEW</b>			
Does the project provide a solution to the same problem that formed the basis for PFS Report approval?			
Are there other projects in the pipeline that were approved on the merits of addressing the same problem?			
Have all the project variables highlighted for further investigation in the PFS been investigated?			
<b>Additional Comments</b>			
<b>ENGINEERING DESIGN AND COST ESTIMATE</b>			
Does the design take the specific heritage, town planning requirements, zoning rights and other environmental considerations into account?			
Does the engineering design take possible site related uncertainties and variations in demand projections into account?			
Is the cost estimate based on the engineering design?			
Is the cost estimate disaggregated into different components?			
Can the cost of the project be minimized by removing redundant or unnecessary components of the project?			
Does the cost estimate give the underlying assumptions and supplementary information?			
Are project activities efficient (do they use the least amount of inputs necessary to achieve the project outputs)?			
<b>Additional Comments:</b>			
<b>UPDATED CBA/CEA</b>			
Is the project economically viable (i.e. $ENPV > 0$ , $ERR > EOCK$ )?			
Is the project financially sustainable?			
Is there a proposal for a PPP procurement modality?			
Is there a request for a viability gap funding and/or subsidies? If yes, can it be approved?			
<b>Additional Comments:</b>			
<b>ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT</b>			
Are all the requirements of the National Environmental Management Act met?			

<b>Additional Comments:</b>			
<b>IMPLEMENTATION READINESS ASSESSMENT</b>			
Are there any major statutory or regulatory constraints that may prevent efficient project implementation and/or operation?			
Are there any jurisdictional conflicts between government entities/institutions that need to be resolved before the project can proceed to implementation?			
Are land rights secured? If not, is there a detailed plan on how it will be secured?			
If the project involves multiple public institutions, is there a stakeholder coordination plan?			
Does the Project Sponsor/Implementing Institution have a good record of successful delivery of projects of similar nature?			
Are there any other constraints that may prevent efficient project implementation or operation?			
Is the baseline risk assessment for the project in accordance with the requirements of the Construction Regulations?			
Are there necessary health and safety plans?			
Can funds for the project be secured?			
<b>Additional Comments:</b>			
<b>PROCUREMENT STRATEGY</b>			
Is the strategy consistent with legislative and PPA requirements?			
Does the strategy demonstrate sound demand, acquisition, logistics, and disposal management plans?			
Is the strategy fair, equitable, transparent, competitive and cost-effective?			
Does the strategy include an adequate monitoring and evaluation plan for the procurement process?			
<b>Additional Comments:</b>			

## **5. CONCLUSION**

The FIDPM prescribes seven project development stages for all types of public infrastructure projects. The Infrastructure Planning and Appraisal Guideline focuses on the Initiation and Concept Stages of the FIDPM. At the Initiation Stage, a project idea is formed, developed, and the rationale for the project explained. At the Concept Stage, the analyses carried out in the Initiation Stage are updated when necessary, possible solutions to the problem are analysed in greater detail, and the preferred project option(s) is prepared for implementation.

### **6.1. Initiation Stage**

The Initiation stage begins with the analysis of the problem that gives birth to the project idea. The purpose of the problem analysis is to describe the undesirable situation faced by a specific group of people (Project beneficiaries) and establish the changes that would occur if there is an intervention. It involves the identification and analysis of the core problem, the beneficiaries and other stakeholders, as well as formulating possible solutions to the project.

Followed by the problem analysis is the objective(s) analysis. Solving the problem identified in the problem analysis and cost-effectively providing the benefits typically serves as the objective of the project. The objective(s) analysis involves the precise formulation of the project objective(s), its alignment to Government priorities and the definition of the outputs that will deliver the objective(s) of the project.

Once the objective(s) of the project has been set, and possible project outputs identified, the next stage is the identification and analysis of possible project options that can be used to deliver the identified outputs and achieve the project objective(s). For routine projects, it suffices to make a list of project options, give their cost estimates and set the tone for further analysis in the Concept Stage. However, for megaprojects, the possible project options are identified and analysed qualitatively, after which the preferred options are further subjected to CBA and/or CEA.

### **6.2. Concept Stage**

At the Concept Stage, elements of the Initiation Stage are updated when necessary, and the preferred project option is prepared for implementation. As the project proceeds into the Concept Stage, it is expected that the understanding of crucial project variables would have improved, and more accurate project data would be available. Therefore, to improve the accuracy and reliability of the appraisal process, the elements of the Initiation Stage should be updated when necessary.

For routine projects, the problem(s) and objective(s) analyses are updated. However, the core problem(s) and objective(s) that provided the basis for the approval of the Initiation Report cannot be changed. Furthermore, a detailed options analysis is conducted for all the project options that

are capable of delivering the project outputs efficiently, and the preferred project option is selected. The preferred option is then prepared for implementation by preparing a detailed implementation plan and a procurement strategy that aligns with all legislative requirements.

For megaprojects, the problem(s) and objective(s) analyses are also updated, without changing the core problem(s) and objective(s) that were approved at the Initiation Stage. Furthermore, a detailed engineering design and cost estimate is developed, and the CBA and/or CEA are updated. When the CBA and/or CEA is completed, and the most preferred option selected, an environmental impact and institutional capacity assessments are conducted. The project is then prepared for implementation by developing a detailed implementation plan and a robust procurement strategy that complies with legislative requirements.

### **6.3. Conclusion**

Government has the vision to create opportunities for social and economic growth through infrastructure investment. However, this vision will not be accomplished if the infrastructure investments are not prioritized and selected in ways that maximize the returns from scarce government resources. Therefore, the Infrastructure Planning and Appraisal Guideline gives guidance and methodologies on how to appraise infrastructure projects, such that projects are selected based on their abilities to achieve the vision of the Government. This Guideline assists public institutions to implement projects that meet the requirements of the FIDPM.

## ANNEXURES

### ANNEXURE A: PROBLEM AND OBJECTIVE TREES

#### Problem Tree

Upon identifying the problem faced by project beneficiaries, a cause and effect relationship of the problem is developed. One of the tools that can be used to analyse the problem that a project wants to solve is the **Problem Tree** that presents the causes and effects of the focal problem(s). A problem tree is simply a representation of the problem, its causes and likely effects set out in hierarchical order. It is the combination of the cause and effect trees.

To develop the cause tree, the following steps are followed:

- i. The first step is to state the main (focal) problem(s) to be solved by the project.
- ii. Identify the causes of this problem. These serve as roots of the tree.
- iii. Establish which of the causes are primary and independent (direct) causes of the problem, and which of them are secondary and indirect. The direct causes are placed just below the focal issue, while the indirect causes go below the direct causes.

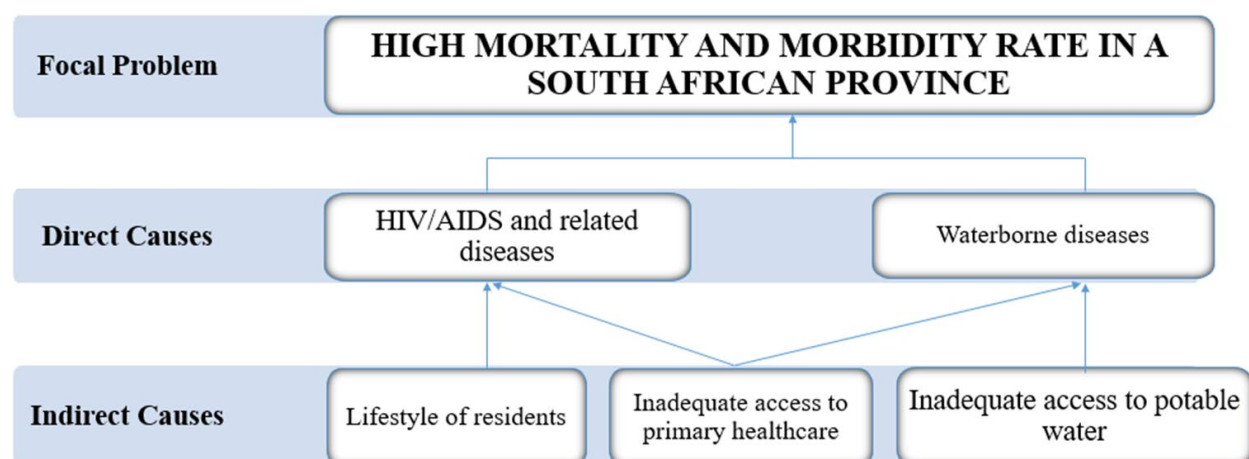


Figure 5: Illustrative Example of a Cause Tree

The process of developing the effects tree is similar to the one employed in the development of the cause tree. The steps are outlined below.

- i. The focal problem identified in the cause tree becomes the root of the effect tree.
- ii. Identify the effect(s) of the problem.
- iii. Rank the effect of the problem as direct or indirect.

- iv. The direct effects are placed directly above the focal problem, and the indirect effects are placed above the direct effects.

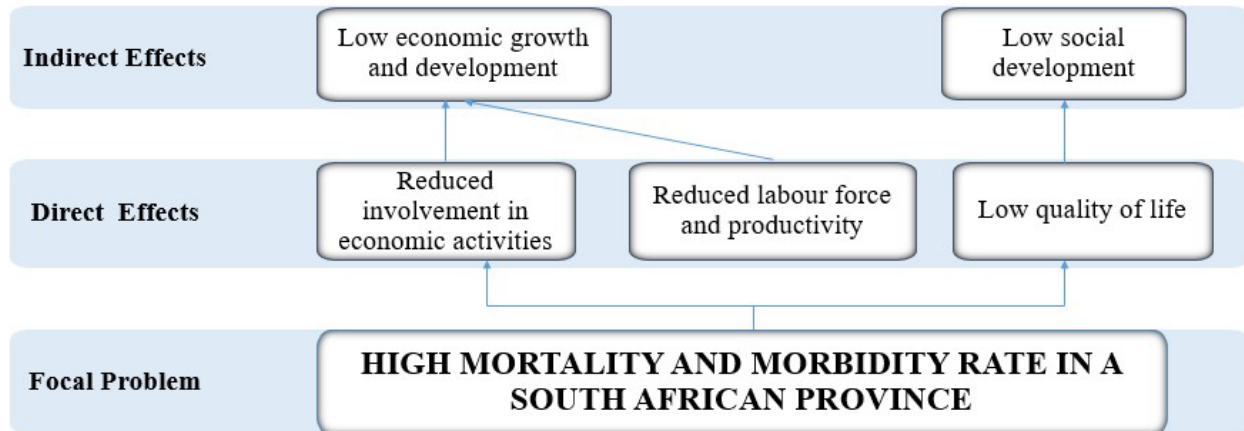


Figure 6: Illustrative Example of an Effects Tree

Once the cause and effect relationships of the focal problem have been established, it becomes easier to develop a comprehensive problem tree.

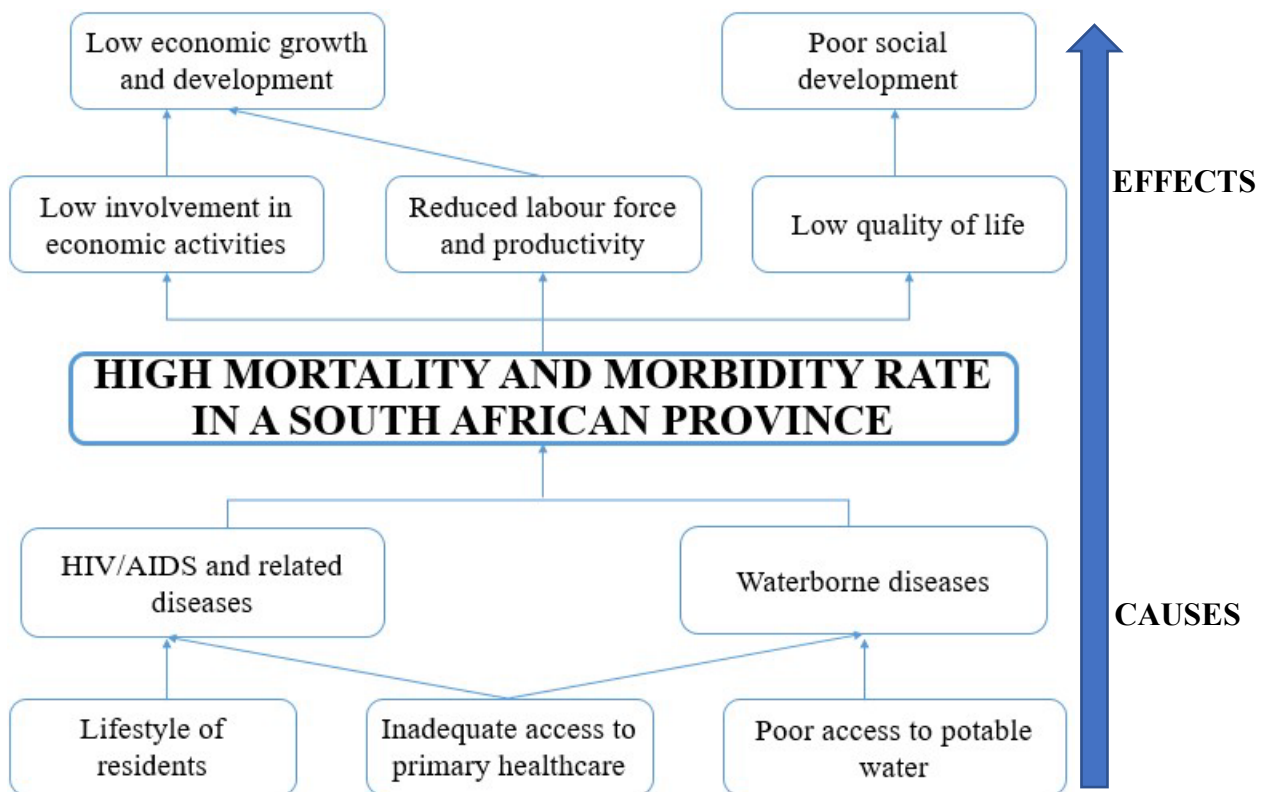


Figure 7: Illustrative Example of a Problem Tree



## Objectives Tree

The analysis of project objective(s) is simplified by using the objective tree. The following steps should be followed in the development of an objective tree:

- The core problem is transformed into a positive statement, which becomes the overall goal (specific objective) the project is set to achieve.
- All negative situations of the problem analysis should be reformulated into positive, realistic, and desirable situations.
- The causes already established are changed into positives, establishing the outputs of the project (means).
- The effects section of the problem tree is transformed into outcomes of the project (ends).
- The validity and completeness of the hierarchy should be ascertained by taking a close look at the means-ends relationship (Note that cause-effect relationships are turned into means-ends relationships).
- Work from bottom up to ensure that cause-effect relationships are changed into means-ends relationships.

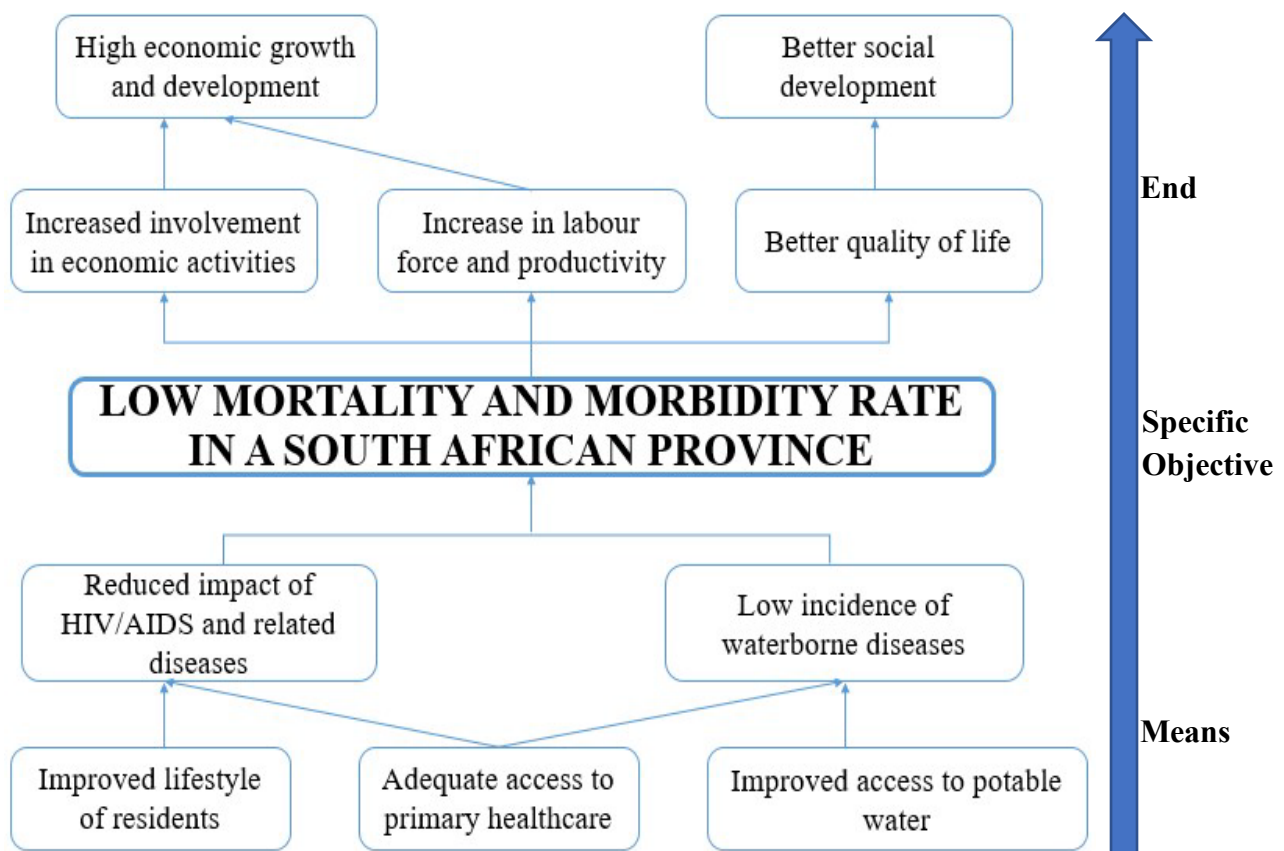


Figure 8: Illustrative Example of an Objectives Tree

Upon completion of the objective tree, the overall objective(s) of the project is established, and the outcomes of the project are identified. Project Sponsors must show that these outcomes align with the organisation's priorities and aspirations, the sector development plan, and the country as a whole. This alignment is commonly demonstrated through the use of Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART) indicators.

## **ANNEXURE B: COST-EFFECTIVENESS ANALYSIS**

### **Methodology**

When a project generates benefits that meet a specific problem and has objectives that are aligned with the priorities of the sector, institution or other Government development strategies, but they (the benefits) cannot be quantified in monetary terms, the alternative options can be assessed based on their abilities to achieve the given outcome at the least cost. It must be noted, however, that CEA has significant limitations.

1. Most of the time, each project has different characteristics. The fact that two projects may be similar in producing benefits does not preclude them from being quite different in many other dimensions.
2. CEA tends to focus on one dimension of economic benefit, thus neglecting other dimensions of benefits that accrue as a result of the project.
3. It does not account for the scale of the project. Scale differences may distort the choice of an “optimal” decision when a strict cost-effectiveness analysis is employed. A project with a smaller size but higher efficiency level may get accepted, while another project may provide more quantity of output at a reasonable cost.

Therefore, analysts should be wary of thinking of CEA as an analytical tool of simple and wide application. It should only be used when necessary.

A standard CEA involves a series of steps similar to those of a CBA. The main difference is that instead of assigning monetary values to the outcomes of the project, they are measured in physical units. The focus is on measuring the costs of the alternatives and finding the least-cost option to achieve a desired quantitative outcome. In a sense, CEA ensures technical efficiency when achieving the desired outcome.

Broadly, there are two ways of computing cost-effectiveness ratios. One way to calculate effectiveness is to estimate the ratio of a project’s costs to its benefits. Another alternative method is to calculate the effectiveness in terms of its cost. However, when several alternative options are being considered to improve the effectiveness of an existing situation, there is a need to compute incremental or marginal cost-effectiveness ratios.

It is important to note that the cost of an option does not only include the financial costs; it also includes the social costs. Therefore, when treating the costs of the options, the analyst must ensure that the costs are measured at their resource costs. They should include not only direct costs but also indirect and intangible costs. For example, in evaluating the impacts of alternative higher education proposals, one must include the foregone earnings of the individuals while they are

attending schools as part of the costs of obtaining a higher education in addition to attendance fees, transportation costs and other project costs. In a project delivering medical treatment, the time patients devote to waiting or travelling to hospitals or clinics should also be counted as components of the project cost.

Furthermore, capital projects typically have large investment outlays initially, and the project's recurrent costs and benefits are spread over subsequent years. Therefore, the benefits and costs in future years of the various competing alternatives should be discounted back to the same calendar year in order to evaluate the alternatives. Because cost effectiveness analysis does not place a monetary value on the benefits, the project analyst has to discount the quantities of the output produced. In other words, both the monetary value of the costs and the units of effectiveness should be discounted by the same rate and to the same calendar year.

## Estimating Cost Effectiveness Ratios

The alternative ways of computing the cost-effectiveness ratios involve the measurement of benefits in some kind of quantifiable manner, e.g. the number of lives saved, the number of additional classes built, and the volume of additional water consumed. One way of computing the effectiveness is to estimate a ratio of costs to its benefit, for example, Rands per school seat. If there are a number of alternative options that can be used to provide school seats, then the costs of each alternative ( $C_i$ ) are divided by the benefits ( $E_i$ ).

$$CE_i = \frac{C_i}{E_i}$$

This ratio can be interpreted as the average cost for the *ith* option of a project per unit of effectiveness. According to this criterion, projects with the lowest ratios are preferred.

### *Illustrative Example*

To improve the delivery of primary health care services to the poorer Districts, the Department of Health has identified two alternatives.

1. A fixed clinic, well-placed near a population center or among a group of communities that offers a reliable service that is theoretically accessible to anyone in an emergency.
2. A mobile unit that is less confined to a certain area of service and may even have several docking stations with access to power and electricity.

The problem of heterogeneity of benefits of the different alternative is solved by defining the project outcome as the number of patients each alternative can serve, over the same period.

The present value (PV) of costs for clinics (capital costs, operation and maintenance cost, other direct and indirect costs, over the project life) is estimated to be about R80 million.

The present value (PV) of the number of patients that would be served by the fixed clinic (given the unique situation of the environment, and the ability of the alternative) over the project life is 20,000 patients.

Similarly, the PV of costs for the mobile unit is about R85 million, and the PV of the number of patients that would be served by this alternative is 22,000 patients.

$$CE_{\text{clinics}} = 4,000$$

$$CE_{\text{mobile units}} = 3,864$$

This means that the average cost per patient for the Clinic alternative is 4,000, and that of the mobile units is 3,864. Therefore, using this criterion, the preferred alternative would be mobile units.

An alternative way of measuring cost-effectiveness ratios is to compute the effectiveness ( $E_i$ ) in terms of its cost ( $C_i$ ). This EC ratio could be considered the average effectiveness produced by a project per unit of cost.

$$CE_i = \frac{E_i}{C_i}$$

This ratio presumes that all the alternatives in question have non-negative benefits ( $E_i$ ). Once the benefits and costs are defined and estimated, the procedure of ranking alternative projects would be to choose the alternative with the highest ratio.

## Marginal Cost-Effectiveness Ratios

The need to estimate marginal cost-effectiveness ratios becomes apparent when several alternative options are being compared with an already existing situation. In such cases, the analysis requires the estimation of the incremental or marginal cost-effectiveness ratios. In the computation, the numerator refers to the difference between the cost of the new and the existing alternatives ( $C_i$  and  $C_o$ , respectively), while the denominator shows the difference between the effectiveness of the new and the existing alternatives ( $E_i$  and  $E_o$ , respectively).

$$\text{Marginal } CE_i = \frac{C_i - C_o}{E_i - E_o}$$

### *Illustrative Example*

To reduce the number of traffic accidents in a province in South Africa, the government implemented a road project (existing option) that has already reduced the number of accidents over the past years. Now, an additional reduction in accidents and resulting fatalities is desired, and this can be achieved in a number of alternative ways.

- I. **Option A** - Improvement of the tracking and prosecution of traffic rule violators. This will involve the installation of more speed cameras and the enrollment of more police officers on the roads alongside the existing safety measures.
- II. **Option B** - Expansion of current road network and construction of pedestrian sidewalks together with the existing measure.
- III. **Option C** – Improvement of the roads (patching up holes in the roads), equipping the roads with additional traffic lights as well as safety signs and markings, together with the existing safety measures.

The existing policy, which has been in place for years, costs R200 million, and it effectively prevents numerous accidents as well as some 500 related deaths a year.

Option A is expected to prevent another 100 deaths and cost an additional R55 million per year.

Option B is estimated to cost an additional R185 million and result in an additional reduction of 1000 fatalities every year.

Option C is expected to cost an additional R115 million, further reduce the number of deaths in a year by 600.

Option	Total Cost (Million Rand)	Incremental Cost (Million Rand)	Total Lives Saved	Marginal Effectiveness (Lives Saved)	Marginal CE Ratios
Existing Policy	200	-	500	500	-
Option A	255	55	600	100	550, 000
Option B	385	185	1500	1000	185,000
Option C	315	115	1000	500	230,000

The average cost of saving a life with the existing policy is R400,000 per year, excluding all other prevented damages and health loss from traffic accidents. The marginal effectiveness of the proposed policy options is such that Option B is the most cost-effective option.

If a budget constraint of R120 million is introduced, then the ranking of the three alternatives will change. Despite being the most cost-effective solution, Option B will no longer be financially

feasible, as its financial obligation is more than the available budget. Options A and C, which are within the budget, would be considered, in which case the preferred option would be option C.

## Minimum Level of Effectiveness

One common solution to the scale problem in cost effectiveness analysis is to introduce a constraint, either on the maximum acceptable cost or on the minimum acceptable level of effectiveness. When the objective is to achieve a minimum level of effectiveness, the analysis simply looks for the lowest cost solution ( $C_i$ ), ensuring the minimum effectiveness level.

Minimize  $C_i$

Subject to  $E_i \geq \bar{E}$

This approach assumes that there is little value in exceeding the target effectiveness level ( $\bar{E}$ ). Any additional units of effectiveness beyond the acceptable level of effectiveness are not valued in the analysis, i.e. only the total cost is minimized but not the cost per unit. This approach results in the selection of the cheapest alternative that satisfies the minimum effectiveness criterion, even if other alternatives offer more units of effectiveness at lower per-unit cost. This rule generally favours projects with a low total cost.

Often, the lowest total cost does not constitute the best policy. Therefore, instead of selecting the cheapest alternative in terms of the total cost, the decision-makers may decide to select the cheapest alternative in terms of the cost per unit. This usually ensures higher effectiveness and likely to result in selecting an alternative with a total higher cost than when the decision-makers only seek to minimize total cost.

Minimize  $CE_i$

Subject to  $E_i \geq \bar{E}$

( $CE_i$  is the cost effectiveness for the  $i$ th option,  $E_i$  and  $\bar{E}$  are the effectiveness of the  $i$ th option and the target effectiveness, respectively.)

## Maximum Budget Available

The other side of the same coin is the problem of maximizing the level of effectiveness subject to a budget constraint. If the budget is fixed, then the intuitive solution is to choose an alternative that generates the most benefits, i.e. maximize  $E_i$  while ensuring that  $C_i \leq \bar{C}$

Again, this rule has a caveat, which has to be solved before used in actual analysis. Any cost savings beyond  $\bar{C}$  are not valued, and selection only looks for maximization of total efficiency, but not efficiency per Rand of spending, i.e. incremental cost savings, are ignored. Strictly speaking, this fails to make a sensible choice in a situation when two alternatives achieve the same



total efficiency but have different costs, both below or equal to the minimum cost  $\bar{C}$ . Since both alternatives have costs below the budget limit and both result in the same total efficiency, then the two alternatives would be ranked the same.

An alternative solution to this problem is to make the project selection based on the lowest  $CE_i$  ratio, which fits the budget constraint:

This rule now effectively places some value on incremental cost savings. It selects the most cost-efficient alternative, subject to a budget limit constraint.

$$\begin{aligned} &\text{Minimize } CE_i \\ &\text{Subject to } C_i \leq \bar{C} \end{aligned}$$

## Cost-Utility Analysis

Cost-utility analysis is frequently employed by policymakers in health, education, defence, security, and many other sectors. A typical case when CUA is necessary is when a set of alternative policy actions must be evaluated, each resulting in multiple outcomes, and a cost-benefit analysis is not possible. A simple cost effectiveness analysis is also not appropriate because it ignores a host of important benefits. Cost-utility analysis (CUA) defeats this limitation by providing a better way of quantifying economic benefits so that different dimensions of benefits are captured in the analysis. This is achieved by the compilation of a composite index of outcomes, i.e., utility level as a measure of benefits. Each type of benefit ( $B_j$ ) is assigned with a weight ( $W_j$ ) based on its relative importance in the utility.

$$CU_i = \frac{C_i}{\{\sum_{j=1}^n (B_j * W_j)\}_i}$$

*Where  $CU_i$  is the Cost-Utility for option  $i$ ,  $C_i$  is the cost of the option, and  $B_j$  and  $W_j$  are the benefit  $j$  and the weight of the benefit relative to other benefits, respectively.*

However, it must be noted that while CUA overcomes one of the limitations of the traditional CEA, in that it can include several economic benefits, it also has its limitations. The major drawback of the cost-utility analysis is that the choice of the weights can get very subjective and is likely to depend on the personal preferences of the analyst conducting the evaluation. The assignment of weights used to rank the different outcomes relative to each other must be done using the same scale of measurement. It is not necessary that the sum of all weights be equal to one, as long as the scale used across the different types of benefits is identical. Once the metric is chosen, and outcomes are ranked relative to each other, the cost-utility analysis becomes very

similar to cost effectiveness analysis, as the major difference between CUA and CEA is how both analytical tools account for the benefits generated by projects.

## ANNEXURE C: GUIDANCE FOR OTHER REQUIREMENTS OF THE FIDPM

The Guideline focuses on the project appraisal stages (Initiation and Concept Stages) that are prescribed by the FIDPM. However, some of these stages' requirements are not discussed in detail in the Guideline as these have been covered in other documents. Table 10 below presents the various requirements of the FIDPM and how public institutions can find guidance on how to fulfil these requirements.

Table 10: Project Stages and Documents for Guidance

Project Stage	Stage Deliverables	Documents for Guidance
Initiation / PFS	<b>Initiation Report / Prefeasibility Report</b>	Appraisal and Evaluation Guideline
	Problem and Objective(s) Analysis	Appraisal and Evaluation Guideline
	Analysis of Project Needs	Appraisal and Evaluation Guideline
	Preliminary Environmental Impact Assessment	National Environmental Management Act (Act No. 107 of 1998)
	Procurement Strategies	PPA, BFI, FIDPM, CIDB Prescripts, PPPFA(2000), PFMA(1999), MFMA (2003), NT's SCM Note
	Technical Feasibility	Appraisal and Evaluation Guideline
	Analysis of Project Needs	Appraisal and Evaluation Guideline
	Technical and Environmental Feasibility	Appraisal and Evaluation Guideline
	Financial, Economic, Stakeholder and Risk Analyses	Appraisal and Evaluation Guideline
	Preliminary Environmental Assessment	Appraisal and Evaluation Guideline
Concept / FS	<b>Concept Report / Feasibility Report</b>	Appraisal and Evaluation Guideline
	Options Analysis	Appraisal and Evaluation Guideline
	Detailed brief, scope and plan	Appraisal and Evaluation Guideline
	Institutional Capacity	Appraisal and Evaluation Guideline
	Viability Evaluation	Appraisal and Evaluation Guideline
	Procurement Plan	PPA, BFI, FIDPM, CIDB Prescripts, PPPFA(2000), PFMA

		(1999), MFMA (2003), NT's SCM Note
	Demand Analysis	Appraisal and Evaluation Guideline
	Risk Assessment and Sensitivity Analysis	Appraisal and Evaluation Guideline
	Baseline Risk Assessment	Occupational Health Safety Act
	Risk Report Linked to Need for Other Studies	Occupational Health Safety Act
	Environmental Impact Assessment	National Environmental Management Act (Act No. 107 of 1998)
	Regulatory Due Diligence	FIDPM
Design Development	Design Development Report	FIDPM
Design Documentation	Design Documentation Report	FIDPM
Works	Works Completion Report	FIDPM, BFI
Handover	Handover Report	FIDPM
Close-Out	Close-Out Report	FIDPM