An Integrated Investment Appraisal of a Road Project in Zimbabwe

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Abstract

Public resources are finite and as such should be employed efficiently. There is an opportunity cost in the use of resources in one project over another. Hence, there is a need to ensure that resources are put to their best use given that the same resources can be allocated to alternative uses. Hence, this Road Projects Appraisal serves the purpose of scrutinizing proposed road projects to ensure that public expenditure in the development of road infrastructure in Zimbabwe leads to the achievement of development objectives and socio-economic growth. The road project appraisal manual (RPAM) provides step by step guidance on how to formulate, prepare and appraise proposed road projects.

Keywords: Cost Benefit Analysis, Road, Public Investment, Zimbabwe

JEL Classification: D61, H54, O55, L92, R42

INTRODUCTION

1.1. Purpose of the Manual

Public resources are finite and as such should be employed efficiently. There is an opportunity cost in the use of resources in one project over another. Hence, there is a need to ensure that resources are put to their best use given that the same resources can be allocated to alternative uses. Hence, the Road Projects Appraisal Manual (RPAM) serves the purpose of scrutinizing proposed road projects to ensure that public expenditure in the development of road infrastructure in Zimbabwe leads to the achievement of development objectives and socio-economic growth.

The RPAM is an instructive tool in the origination of road projects. The RPAM was designed with the objective of providing guidance as well as to strengthen the institutional and technical capacity of Contracting Authorities (CAs) and Sanctioning Authorities (SAs) who play a role in the formulation, planning, appraisal, selection, budgeting, and implementation of road projects.

The RPAM provides step by step guidance on how to formulate, prepare and appraise proposed road projects. Furthermore, the manual outlines the processes and procedures undertaken in selecting and budgeting for projects that have been earmarked for implementation.

1.2. Relationship of the Manual to the Public Investment Management Guidelines

The RPAM supplements the Public Investment Management (PIM) Guidelines. The PIM Guidelines provide guidance on:

i. A standardised approach to PIM, to facilitate and streamline the development, appraisal, selection and implementation of proposed Public Investment Projects (PIPs);
ii. The roles and responsibilities of various institutions involved in the PIM System (PIMS);
iii. The processes and procedures of the PIMS; and
iv. The sequencing, timing and linkages of various activities required for the smooth function of the PIMS.

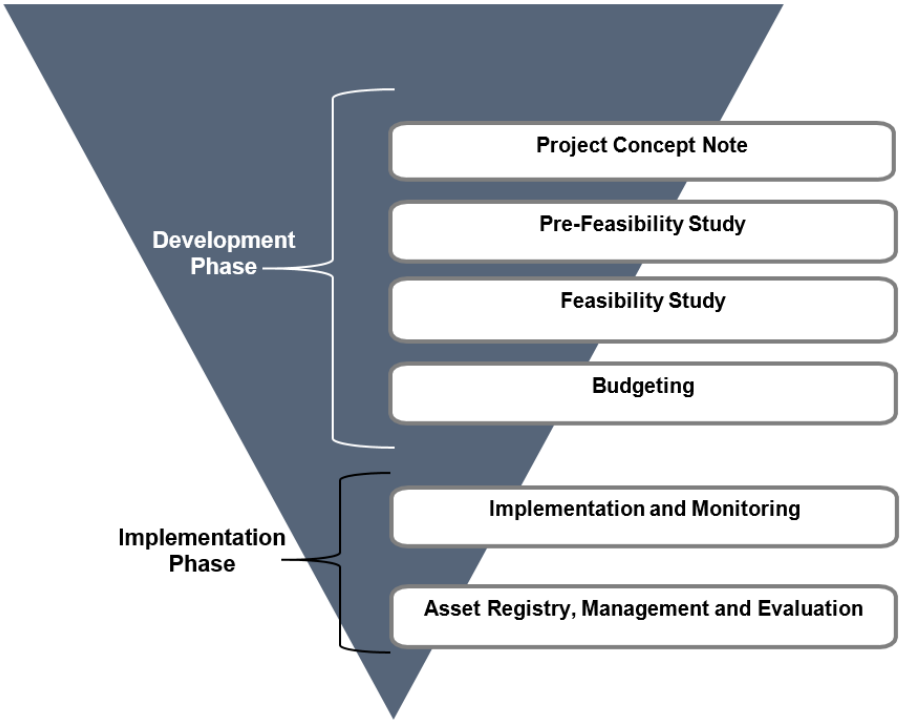
1.2.1. The Public Investment Management System (PIMS)

The PIMS encompasses how PIPs should be prepared and developed from inception to implementation and includes all the institutional processes, procedures and approvals required to get projects financed and executed.

1.2.1.1. Project Cycle

The PIMS provides a framework/system that governs the identification, formulation, appraisal, selection, budgeting, and implementation of proposed PIPs, this framework is known as the 'Project Cycle' which is presented in Figure 1. The project cycle was created to optimize the use of public resources and ensure value for money, it consists of two distinct phases; the development phase and the implementation phase. Each phase comprises of a number of different stages, which are carried out sequentially.

Figure 1. Project Cycle



To operationalise the PIMS, the RPAM has been developed as a practical guide on how to undertake the project development phase of the project cycle. Hence, the RPAM mainly focuses on how CAs should identify, formulate and appraise road projects.

1.2.1.2. Institutional Framework

The efficient and effective management of public resources with regards PIPs requires the harmonious coordination of a broad range of institutions. Key institutions in the road sector involved in the development, selection and budgeting of road projects as are as follows:

A. Contracting Authorities (Road Agencies):

i. Department of Roads (under the authority of the Ministry of Transport and Infrastructural Development)
ii. Rural District Councils
iii. Urban Councils
iv. District Development Fund

B. Sanctioning Authorities:

i. Ministry of Transport and Infrastructural Development (MoTID)

ii. Zimbabwe National Roads Administration (ZINARA)
iii. Zimbabwe Investment and Development Agency (ZIDA)
iv. Ministry of Finance and Economic Development (MoFED)
v. Traffic Safety Council of Zimbabwe (TSCZ)

1.2.1.3. PIM Calendar

In undertaking the development phase of the project cycle, CAs should keep in mind key dates of the PIM Calendar. Figure 2 outlines the PIM Calendar which merges project activities, PIM activities and the budgeting activities and outlines the sequencing and linkages of these various activities and their timelines in order to facilitate the smooth functioning of the PIMS. The PIM Calendar allows for the seamless coordination of the processes and procedures undertaken by various institutions who are involved at various stages of the project development phase of the project cycle.

Figure 2. PIM Calendar

		March – April	May - June	July	August - September	October	December	January – February
Treasury	Budget Activities	Budget Consultations	Preparation of Macroeconomic Fiscal and Expenditure Framework for next 3 years	Issues Budget Call Circular		Draft Budget Estimates are prepared	Budget Approval	
	PIM Activities		Decision on Pre-Feasibility Studies		Decision on Feasibility Studies			Decision on Project Concept Notes
LMs	Budget Activities	Development or updating (on rolling basis) of strategic plans, expenditures, and revenues for next three years	Revised strategic priorities and expenditures	Prepare Budget submissions			Preparation of Budget Implementation Plans	
	PIM Activities	Submission of Pre-Feasibility Studies		Submission of Feasibility Studies		Submission of Project Concept Notes		

2. PROJECT CONCEPT NOTE

2.1. Project Information Sheet

A Project Concept Note (PCN) entails the transformation of a project idea/proposal into a business case that can be considered for implementation. The objective of the PCN is to present justification of the worthwhileness of a proposed project, as well as to assess its consistency with the Government's strategic goals. A PCN is a presentation drawn up to outline why a proposed project should be undertaken and if it is to be funded through the Government's budget why this project over all other projects should be allocated financial resources.

In preparing a PCN, the CA should follow the requirements stipulated in the PIM Guidelines and the PIM Manual, the details of which can be found on pages 40-56 and pages 3-9 respectively. This chapter of the RPAM outlines the information and steps (in addition to those in the PIM Guidelines and Manual) required in preparing a PCN for a proposed road project to be screened and approved by the Sanctioning Authority (SA).

2.2. Project Information Sheet

A project information sheet is the cover page of the PCN and consists of information that gives an overview of the project and its objectives. A typical project information sheet should contain the details highlighted in Table 1.

Table 1 Project Information Sheet Data Requirements

Data Requirements	Description
Project Identification Number (ID)	The ID should clearly communicate the Line Ministry responsible for the project, the relevant department within the Line Ministry that the project falls under and the year of project initiation. The ID should be unique and comprise of the following details in alphanumeric order; Line Ministry/Department/Sequence Number/ Year An example of a project ID is shown below. **ID: MoTID/DoR/001/2018**
Line Ministry and Contracting Authority	The Line Ministry functionally responsible for the project and the contracting authority tasked with implementing the project should be clearly identified in the project information sheet as illustrated below. **Line Ministry: Ministry of Transport and Infrastructural Development**

	Contracting Authority: Department of Roads
Project Title	A short and succinct project title which captures the essence of the project should be included in the project information sheet, as shown in the example below. **Project Title: Route 99 Road Rehabilitation and Improvement**
Project Location	The location of the project inclusive of the district and province should be included in the project information sheet as shown in the example below. **Location: Unit-B/Chitungwiza/Harare-Province**
Project Objective	A clear sentence that describes the fundamental reason for the proposed project and the direct benefits of implementing the project. An example is shown below. **Project Objective: "Reduce direct and indirect cost of travel for the users of Route 99, therefore, promoting economic growth in the area."**

2.3. Status before Project

This section shall provide the accurate description of the current situation of the road. For road rehabilitation projects describe the existing conditions of the road including International Roughness Index (IRI). The clear description of the challenges and problems currently faced by the intended beneficiaries of the road shall be provided in this section. Some examples of this may be as follows:

I. High traffic on the road resulting in the congestion and increased number of accidents.
II. Low access to health care and educational facilities due to a lack of a good road to the neighbouring city where these facilities are located.
III. High vehicle operating costs faced by road users due to the deterioration of road conditions.

2.4. Status after Project

This section shall provide the accurate description of the situation if the project is implemented. It should also constitute a discussion on how the challenges and problems identified in the previous section will be addressed and the benefits that society will reap as a result of the project. It focuses on the benefits that are achieved solely due to the implementation of the project excluding those that could arise in the absence of the project. Some Examples of this are as follows:

I. Benefit: Improved access to health care and educational facilities as a result of improved roads.
II. Benefit: Reduced vehicle operating costs faced by road users due to the improvement of a dilapidated road. Reduced time travelers are spending on the road.
III. Reduced pollution.

2.5. Justification

The justification for undertaking the project involves providing a comprehensive analysis of the counterfactual situation and how it will be addressed in the implementation of the project as outlined in the preceding sections. Project justification entails a comparison of the anticipated outcomes and the expected costs of the road project. A proposed road project is justifiable if the anticipated outcomes outweigh the expected costs.

2.6. Strategic Considerations

List guiding National strategies or Government objectives, sectorial and development strategies of MoTID and any other strategic considerations that the project impacts.

Any proposed road project should be in line with national and sectoral objectives. Also the PCN should spell out how a project will contribute to the achievement of the defined objectives. For example; an economic plan that promotes accelerated economic growth, development and, wealth creation has been developed for the nation of Zimbabwe.[1] This plan outlines the objectives of transportation infrastructure development and management. Two of the main objectives that are defined in the Government of Zimbabwe's (GoZ) economic plan are;

i. To improve the road network
ii. To improve safety and security on the road transport network

Following the guidance provided in Articles 191-208 of the PIM Guidelines, a road project's PCN must clearly demonstrate how the project's expected outputs align to national and sectoral strategic considerations aimed at the achievement of the intended objectives (as those outlined in the preceding section).

2.7. Preliminary Cost Estimates and Sources of Funds

PCN should outline the proposed cost estimate and cost schedule of the project. Guidance on completing this section of the PCN is provided in Articles 209-218 of the PIM Guidelines. At the PCN stage, the project will still be in its preliminary phase therefore the cost estimates and cost schedules should be based on a proxy of projects of a similar nature and scope constructed in the

[1] Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZimAsset), "Towards and Empowered Society and a Growing Economy" – October 2013 to December 2018, Government of Zimbabwe, October 2013.

recent past. These cost estimates should include capital, operating and maintenance expenditures. Where the costs of similar projects constructed in the past are used as proxies for the proposed project, an adjustment to the project costs must be made to reflect the real and inflationary changes in costs over time.

An important aspect linked to project costs is how the anticipated costs will be financed. Articles 219-225 of the PIM Guidelines outline the issues that should be considered when looking at how to finance a project. The PCN should include an outline of the proposed sources of funds. Funding for capital expenditures can be garnered from various sources such as the national or local budget, equity, debt and/or funding from development partners or private sector parties.

Additionally, the cost of conducting a pre-feasibility study (PFS) of the project should be included in the PCN. This amount should be a reasonable estimate based on similar PFSs conducted on similar projects.

2.8. Outcomes, Outputs, and Activities

2.8.1. Outcomes

The outcomes of a project should be defined according to Articles 226 and 227 of the PIM Guidelines. Project outcomes are the results that the CA has set out to achieve through the implementation of the project, they represent the achievement of the objectives and goals defined at project inception. These outcomes may not necessarily represent a change; project outcomes may maintain the status quo or prevent an undesirable situation from occurring. The expected outcomes of implementing a proposed road project should be identified and presented in this section of the PCN in order of priority. Road projects have numerous outcomes, most of which can be summed up under the umbrella term "improvement of the road network."

2.8.2. Outputs

The outputs of a project should be defined according to Articles 228, 229 and 230 of the PIM Guidelines. Project outputs represent the various components of the aggregated result in the completion of the project and the achievement of project outcomes. In this section of PCN, all the expected project outputs must be clearly defined and linked to the attainment of the project objectives and outcomes. The targeted outputs of a road project for instance, maybe a tar surfaced road built to regional and international standards that has a useful life of 25 years.

2.8.3. Main Activities

Project activities should be defined in line with Articles 231, 232 and 233 of the PIM Guidelines. Activities that include a series of specific tasks are required to produce project outputs. Activities transform a project's inputs into outputs. The activities required to produce the project's outputs

must be listed in sequential order and split up in line with the various phases of the project as this is vital to project implementation and delivery.

2.9. Implementation Plan

A project implementation plan should be developed in line with the requirements defined in Article 239 of the PIM Guidelines. At the PCN stage, the project implementation plan should be indicative and propose an implementation strategy that is reasonable given the information available, timing, scale, and scope of the project. The various activities required to successfully implement and deliver the project should be scheduled using a Gantt Chart, showing the timing, sequencing, and inter-dependencies among activities. Each of activities to be carried out under the implementation plan should include the following components:

i. The name of the activity
ii. A summary of the scale and scope
iii. A list of all the activities that must be completed before the initiation of the next activity
iv. The commencement and completion date the activity
v. The cost of undertaking each activity

The resources required for the successful execution of each activity; including human resources, financial resources, physical resources and other resources should be identified, and their procurement should be included as part of the implementation plan.

2.10. Financial Effectiveness

A projects financial effectiveness is defined in Articles 234-235 of the PIM Guidelines. An indication should be made of whether a proposed project is expected to generate financial revenues. Road projects, in general, do not generate any financial revenues except toll roads which require that road users pay an explicit price for the use of a given road. In case of a public road that is not tolled, the financial effectiveness of the road project is negative and equal to the present value of the investment and operating costs over the expected life of the road.

In the case where a road project does generate revenues, it's financial performance should be gauged using profitability indicators. However at the PCN stage, the information required to derive the profitability indicators may not be available. In this case, the project's financial effectiveness shall be discussed in the context of the Annual Average Daily Traffic (AADT). The PCN should indicate the anticipated demand for a road project by outlining a preliminary traffic forecast. An approximation of the toll revenues can be derived based on the proposed toll tariff and the AADT projections. Revenue projections should be compared against anticipated capital and recurrent costs to measure the financial performance of the project.

2.11. Socio-Economic Effectiveness

List key/direct economic costs and benefits to government and society. Consider full impacts on Zimbabwean citizens over the full lifecycle of the assets that will be created. The main socio-economic benefits of the road projects shall be directly linked to the project objectives. Road projects among others may result in several categories of economic benefits:

a) Reduction in travel times;
b) Reduction in vehicle operating costs;
c) Reduction in the costs and burden of road accidents;
d) Reduced pollution;
e) Reduced maintenance expenditures on the road;

Whenever applicable list and discuss broader indirect effects of the road construction project on the economy and society. Please specify if these indirect effects will result in quantifiable impacts, such as environmental costs.

Indicate and discuss the distributional impacts of the project. List all stakeholders and specify if they are expected to gain or lose because of the project. Specify if the project is expected to result in different impacts according to age, gender, ethnic group or health conditions.

Discuss the economic effectiveness of the project. Focus on a comparison of economic costs and benefits. While cost-benefit analysis is required from the PFS onwards, attempt to weigh the socio-economic benefits of the project against the cost of resources required to implement the project.

2.12. Environmental and Social Impact Assessment

2.12.1. Environmental Impacts

Environmental Impact Assessment (EIA) is required for highway projects at the PFS and FS stages of the project appraisal process. However, a project impact on the environment is an important component of the decision-making process. The CA shall consider highlighting the potential environmental impacts that will result if the project is implemented.

2.12.2. Social Impacts

The Contracting Authority may highlight any social impacts that may arise from the project. This may include any poverty aleviation impacts of the road project or connection to the remote areas to the centers through expansion of the road infrastructure.

2.12.3. Gender Analysis

Men and women have different transport needs, and road projects that do not address the needs of men and women equitably may not be optimal. The PCN shall provide a starting point of gender analysis by presenting the gender disaggregating data whenever possible. In this section discuss the socially constructed roles of men and women according the project's outputs and outcomes.

2.13. Preliminary Climate Change Risk Assessment

Road projects are vulnerable to changes in the frequency and intensity of extreme weather events caused by climate change. Table 2 presents some of the potential climate change risks and their likely impact(s) on road infrastructures.

Table 2: Potential change risks and their likely impacts of road projects

Climate change risk	Likely impact(s) on infrastructure
Increase in intense precipitation events	• Damages to roads, underground tunnels, and drainage systems due to flooding • Damages to road infrastructure due to landslides • Overloading of drainage systems
Increases in temperature and heat waves	• Deterioration of pavement integrity • Thermal expansion of bridge expansion joints and paved surfaces
Increases in drought conditions	• Damage to infrastructure due to increased susceptibility to wildfires • Damage to infrastructure from mudslides in areas deforested by wildfires
Sea level rise and storm surges	• Damage to highways, roads, underground tunnels, and bridges due to flooding, inundation in coastal areas, and coastal erosion • Damage to infrastructure from land subsidence and landslides • More frequent flooding of underground tunnels and low-lying infrastructure • The decreased expected lifetime of highways exposed to storm surges

Source: Asian Development Bank's Guidelines for Climate Proofing Investment in the Transport Sector

Projects that tackle climate change risk and its related impacts can be grouped into three categories:

- **Adaptation Projects:** Projects that address the impacts of climate-related risks are adaptation projects. They include climate-proofing components designed to reduce or minimize the physical and socio-economic impacts of an anticipated climate event. For instance, a road project exposed to the risk of flooding due to stronger or more frequent storms can be climate-proofed by incorporating a drainage system (or increasing the capacity of the existing drainage system) along the entire length of the road. Such a project

reduces the expected damage that floodwater would cause to the road and the ensuing interruptions to traffic flow and economic activity.

- **Resilience Projects:** Projects whose objective is to ensure that communities can withstand current and future climatic conditions. A resilience project increases the capacity of communities to resist, respond to, and recover from natural hazards and maintain essential infrastructure function, both in the short- and long run. For example, a project designed to increase vegetative land cover and preserve forests, which help regulate the hydrologic cycle and minimize the severity of floods, is a resilience project.

- **Mitigation Projects**: Projects that aim to reduce the rate at which climate change occurs are mitigation projects, with primary objective or secondary benefits of reducing greenhouse gas emissions (GHGs) that cause climate change. For example, public transport projects may reduce GHG emissions over the long term since such projects result in a reduction in the use of more polluting trucks, cars, and small vehicles.

Contracting Authorities should screen projects for climate-related risks. Different international organizations have developed several risk screening tools to assess climate change risks at the project level. Screening projects for climate change risk at the PCN stage is a critical foundational step in managing climate risk. The outcome of these preliminary assessments provides insights for CAs in their decision-making about whether there is a need to examine further the project's exposure to climate change risk.

BOX 1: Climate Change Risk Screening Tools

The integration of climate risk management into project appraisal process has received increasing attention in various development agencies and development banks. Risk screening tools are being developed, and there is a growing body of projects implemented by these agencies and banks that explicitly include climate risk management.

- *World Bank's Climate Change Knowledge Portal (CCKP)*

CCKP is an online platform with available global climate data and analysis based on the latest Intergovernmental Panel on Climate Change (IPCC) reports and datasets. These datasets are processed outputs of simulations performed by multiple General Circulation Models (GCMs) developed by climate research centers around the world and evaluated by the IPCC for quality assurance. Climate risk projections can be generated from these datasets made publicly available on the World Bank's CCKP for preliminary climate risk screening of a project at the PCN stage.

- *AWARE for Projects*

AWARE for Projects is an online tool that allows screening investment projects for climate risk. Asian Development Bank (ADB) and European Investment Bank (EIB) use this tool for climate risk screening across a wide range of project types and sectors. Using this tool does not require climate change expertise. The user simply locates the project anywhere on a world map and answers a few questions on how climate may influence the success of any given project, and the tool will generate a detailed report to guide further discussions and assessments of climate risk.

Climate risk screening consists of answering the following questions:

- Is the project located in an area prone to climate change-related events? Do climate change scenarios suggest that the frequency and severity of these events are likely to increase?
- Does climate change pose a high degree of risk to the project? For example, do increases in the frequency and intensity of precipitation events cause a rise in water levels influencing the project and its associated facilities?
- What will be the implications of climate risk screening for the project's costs, including the cost of rehabilitation of infrastructure, cost of service disruptions (due to road closures) both to the project and the users of the service?

In conducting climate risk screening, it is essential to determine how climatic conditions will change in the area where the project will be located. The assessment of climate-proofing options requires interaction between different experts and involves:

a. Establishing a baseline of the existing climatic conditions in the project's locale using historical weather data;

b. Identifying data needs and required expertise; for example climate change specialists use climate change models (also known as General Circulation Models, GCM) to project how climatic conditions will evolve over the project's economic life.
c. Determining which weather variable(s) and their expected change will impact the project and its stakeholders.
d. Constructing the most likely scenario of how climatic conditions will change and how they will impact the project.

Climate risk screening is a preliminary assessment intended to identify if the project is exposed to and vulnerable to climate change risk. Detailed climate risk assessments should be conducted at the PFS stage for projects that are anticipated to be significantly impacted by climate change over their economic life, as indicated by the climate risk screening results at the PCN stage. If a detailed climate risk assessment is undertaken at the PFS stage, CAs should draw up Terms of Reference (ToRs) for such an assessment, and its cost should be included as part of the project's overall capital cost.

BOX 2: Illustrative Example of Preliminary Climate Risk Screening

Project Summary

The local government of Mashonaland East plans to build a 30 km road to connect two small cities. To date the residents from the two cities have had to travel through a neighboring town to reach the other, making the cost of traveling to and from quite costly. The new road will provide a more direct connection route between the cities and is expected to lower the travel cost, i.e., lower vehicle operating costs and shorter travel times. The project is expected to have a capital cost of $25 million with no climate proofing components (preliminary cost estimate). The O&M costs of the road over its economic life are anticipated to be $ 1 million per annum.

Summary of Climate Risk Screening

A preliminary climate risk screening aims to provide an initial assessment of the possible level of sensitivity of the project location and project components to climate variables such as temperature and rainfall intensity. For the project in this example, project officers, based on expert judgment, determine that the drainage system and road pavement are sensitive to the following climate change risks:

1. Changes in precipitation and flood patterns: Historical data shows that the chances of the occurrence of a flood in the project's location are once every 10 years, i.e., 10%. According to climate change models developed by climate specialists, the frequency of floods in the area is likely to increase. It is anticipated that the probability of flooding will increase to 20%, i.e., the risk of a flood will increase from once every 10 years to once every 5 years. In addition, the severity of damage is also likely to increase.

2. Increase in the number of very hot days and heat waves: There is a projection of increases in temperatures and increases in the number of dry days. Although significant increases in temperature can deteriorate the pavement integrity, climate experts' evaluations indicate that this is not a significant risk factor to the project.

With the only option of connecting the two cities being the neighboring town, there will be at least two costs caused by road closures due to flooding: (1) the socio-economic costs related to the increased travel costs when the road is out of service (increased travel times measured by VOT and increased operating costs measured by VOC); and, (2) the cost of repairing or rehabilitating the road. It is estimated that the total costs associated with the occurrence of a flood are $5 million. Assuming the 20% chance of occurrence per year, the probability-adjusted cost of a flood amounts to $1 million (20% × $5 million) per year, expressed in real values.

2.14. Sources of Information

A detailed list of all the primary and secondary sources of the information used to draft the PCN should be included, and references provide for all critical input data and assumptions used for the preliminary appraisal.

2.15. Assessment of the PCN

The assessment of the PCN consists of two phases. The first phase entails an internal assessment of the PCN by the Line Ministry. The internal assessment shall attempt to answer two questions:

1. Is the project consistent with National and Sectoral development strategies?
2. Do the expected socio-economic benefits of the project exceed its economic costs?

Once the PCN has passed the internal screening, it should be submitted to the IMC through the MoFED for the second phase of the screening process. It should be noted that PCN submissions are made in October, according to the Public Investment Management and Budgeting Calendar defined in Article 129 of the PIM Guidelines.

The external assessment of the PCN by the IMC is a three-step process aimed at assessing the project's alignment with the Government's objectives and priorities. It also entails an evaluation of resource availability to fund the project with consideration of resource allocation to projects from other sectors vying for the same pool of resources. The three steps carried out in assessing the PCN are as follows:

i. The first stage is to assess the compliance of the CA with the submission process and other procedural requirements stipulated in the PIM Guidelines and this Manual. In exceptional cases, the IMC may accept early or late PCNs submissions. CAs are required to submit PCNs in compliance with the PCN form outlined in the PIM Guidelines (PIM Guidelines, Article 173). In case of missing information, the IMC may postpone the PCN pending the submission of the complete information.
ii. At the second stage of the assessment, the IMC will assess the project's alignment with the National and Sectoral Strategic Objectives. Projects that are not in line with the National development strategies and sectoral development plans will get postponed. In exceptional cases, CAs may justify projects that are not directly aligned with the strategic development plans. Such cases, for instance, may include projects that are designed to mitigate force majeure situations, such as droughts, floods, earthquakes, Et cetera.
iii. The last stage involves the IMC assessing the affordability of the project as well as the likelihood of the expected economic benefits of the project exceeding the cost of resources.

The IMC's decisions on PCNs shall be issued in January-February. Only projects whose PCNs pass both the internal assessment by the CA and the external assessment by the IMC should be allowed to progress to the PFS stage. PCNs approved by the IMC are valid for a period of three

(3) years. Once a project's PCN expires the project should be reappraised and resubmitted to the IMC for consideration following the internal and external screening processes described above.

3. PRE-FEASIBILITY STUDY

The Pre-feasibility Study (PFS) phase involves the refinement of all elements of the PCN stage described in the previous chapter by providing information on different aspects of a project in greater detail. Wherever possible, data from the PCN should be updated with more accurate estimates in preparing the PFS. The PFS emphasises technical, financial and socio-economic viability of various options through which the project can be undertaken in order to identify the preferred option. CAs shall undertake a PFS of the proposed project or outsource the preparation of the PFS to a third party in cases where, for instance, the CA does not have the technical capacity to do so.

The preparation of the PFS shall follow the requirements stipulated in the Public Investment Management Guidelines. The details on how CAs shall fill the PFS Form are provided on page 57-70 of the PIM Guidelines. This Section of the Manual provides further details on the following items:

a) Cost-benefit analysis to fill Financial Effectiveness, Socio-Economic Effectiveness, Fiscal Effectiveness, and Risk Analysis sections of the PFS form.
b) Details on Preliminary Environmental and Social Impact Assessment.

3.1. Cost-Benefit Analysis to Fill Financial, Socio-Economic, Fiscal Effectiveness, and Risk Analysis sections of the PFS form

3.1.1. Identification of Project's Alternatives

This section should describe the options that were considered during the development of the proposal. The purpose of options appraisal is to develop a cost-effective solution that delivers a solution to the problem being addressed by the project. Creating and reviewing options helps decision-makers understand the potential range of solutions that may be considered. Each alternative should be clearly described together with a summary of its associated advantages and disadvantages and a quantification of the preliminary costs and benefits of each option relative to the objectives of the proposal. In this section limit the options analysis to 3 to 5 best project alternatives that were considered. The summary should explain why the preferred option meets the objectives more effectively than other options, and how the preferred option gives the best value-for-money for the government. The evidence contained in the supporting documentation should be summarised and referenced to support the argument that the preferred solution is the best solution. The submission of the results of this section should be portrayed as in Table 3.

Table 3 Project Alternatives Assessment

Options	Title	Comments	YYYY	YYYY	YYYY	n	Total
Option 1	Capital expenditure						
	Recurrent expenditure						
	Total Cost (TC)						
	Present Value of TC @ discount rate:						
	* Advantages:						
Option 2	Capital expenditure						
	Recurrent expenditure						
	Total Cost						
	Present Value of TC @ discount rate						
	* Advantages:						
Option n	Capital expenditure						
	Recurrent expenditure						
	Total Cost						
	Present Value of TC @ discount rate						
	* Advantages:						
Conclusion:	Specify the best option and discuss its advantages against other shortlisted options. Consider justifying the best project alternative through evaluation of the most appropriate technology, scale of the project and timing of the project.						

** Discuss advantages of this option vs. other shortlisted options. An example may include justification for the road dualization to allow vehicles travel at free flow speed given the AADT projections.*

Cost-benefit analysis shall be conducted for the selected best alternative. If several alternatives are considered feasible by the options analysis, cost-benefit analysis needs to be performed for every option.

3.2. Conducting Cost-Benefit Analysis

3.2.1. Methodology

This manual uses the Integrated Investment Appraisal (IIA) Methodology to appraise road projects. IIA incorporates financial, socio-economic, stakeholder and risk analysis in the evaluation of a proposed road project.

IIA starts with an appraisal of the financial profitability of the proposed road project (Financial Module). Financial analysis is conducted on an incremental basis by taking the difference between the "with-road" and "without-road" scenarios. A socio-economic appraisal of the project (Economic Module) builds on the financial module. The economic appraisal of the project is rooted in the principles of applied welfare economics, which requires that socio-economic benefits and costs to be assigned monetary values and are assessed using typical investment metrics such as Net Present Value (NPV) and the Internal Rate of Return. Socio-economic analysis just like financial analysis is conducted on an incremental basis. Following the socio-economic appraisal, an analysis of the project's impacts on various project stakeholders is conducted and is built based on the socio-economic module. The aim of the stakeholder analysis is to identify whom amongst the project stakeholder's gains or losses as a result of the project and by how much. Once the project's impacts have been quantified, they are allocated amongst the project's stakeholders (Distributional Analysis).

Using IIA, the benefits, costs, externalities, and risks accruing to each of the project's stakeholders can are properly identified and assessed. The inclusion of the risk analysis enables the identification of project specific risk factors that may hamper the implementation and or viability of the road project, allowing for mitigation measures to be formulated. IIA provides a framework to appraise a road project systematically and enables the identification of project strengths and weakness.

3.2.2. Project Model Requirements

a) Financial, economic and stakeholder analysis model must be created in Microsoft Excel format. Title of the model should clearly indicate the model construction date, e.g., "Road 25 PFS YYY-MM-DD.xlsx". An electronic copy of the Excel file has to be submitted to the IMC.
b) None of the project model parts should be hidden or locked making the model updating impossible.
c) The model should follow a clear and logical structure. It should contain a table of parameters, calculations, financial statements, and financial, economic and stakeholder results (model outputs). Only calculation formulas should be used, and no hard-coded values are allowed except for the values in the table of parameters.
d) The table of parameters shall contain all required inputs to make calculations and derive model outputs. Links to external files that are not accomplishing the project model are not allowed.
e) The project model shall be constructed in a way that allows an analyst to change any input in the table of parameters, while the model will automatically calculate impacts of these changes on the model outputs. It should also allow conducting sensitivity analysis.
f) If the model outputs are derived from the several models (several excel files), the dynamic links between all files must be created to effectively link to all the models.

g) The project model should be detailed enough, i.e., should contain break down of the project output (in case of few), expenditures and income items, Et cetera. The model shall be integrated therefore linking financial, economic and stakeholder analysis together.
h) References to the model inputs used in the table of parameters shall be attached to the model.
i) Model inputs shall contain:
    - Lifetime of the project assets;
    - Project evaluation period;
    - Base year of the evaluation;
    - Project start date;
    - Road construction costs;
    - Routine Maintenance: occurs on an annual basis
    - Periodic Maintenance: may be conducted once every 3 years
    - Major Maintenance: maybe conducted once every 10 years
    - Value of passengers time for different categories of vehicles;
    - AADT by categories of vehicles;
    - Vehicles operating costs for different categories of vehicles;
    - Model type (quarterly, semi-annually, annually);
    - Financial discount rate;
    - Economic discount rate;
    - Macroeconomic parameters (inflation rate, exchange rate, real change in prices and salaries);
    - Taxes and other fiscal payments (if applicable);
    - Sources of funds;
    - Gear ratio;
    - Interest rates;
    - Depreciation rate for project assets;
    - Other key inputs.
j) In case of tolled roads, the project model should contain main financial statements, i.e., profit and loss statement, balance sheet, sources, and uses of funds and cash flow statement.
k) Profit and loss statement shall be constructed following the accounting and tax rules of Zimbabwe. The statement shall include revenues, earnings before interest taxes and depreciation (EBITDA), earnings before interest and taxes (EBIT), and net income.
l) The cashflow statement shall include revenues, capital expenditures, and operational expenditures. Interest and dividends payments must be included in separate lines of the cashflow.
m) If part of the project is financed through the loan, the cashflow shall clearly indicate Cash Flow Available for Debt Service (CAFDS). In this case, Debt Service Capacity Ratios (DSCRs) and Loan Life Coverage Ratios (LLCRs) shall be estimated.
n) Any past expenditures on the project shall be treated as a sunk cost and not included in projected cashflows. Such expenditures, however, shall be clearly specified in the supporting documents.

o) The sources of funds shall be linked and reconciled to the uses of funds in the Sources and Uses of Funds statement.
p) Debt service payments should be projected considering possible delays in the payment of accrued interest.
q) It is recommended to forecast cashflows in the currencies in which they are realised (receipts and expenditures are made), and then translate them to a single, final currency.
r) The discounted cash flows shall be calculated from total investment and owners point of view. The cashflows shall be of the same kind (with or without inflation). The financial discount rate should reflect the minimum required rate of return on investments expressed in the same currency as the cash flow currency.
s) When calculating the project's net present value (NPV), all cash flows, including residual values should be discounted to the base year (initial year of the forecast period).
t) The description of the financial model is made in the form of an annex to the financial model. The description should include:
    - Description of the structure of the financial model;
    - A description of the working mechanism of the macros used in the financial model (if applicable);
    - Main assumptions and baseline data for financial forecasts, indicating sources of information;
    - Other information necessary for understanding the structure, principles of construction, operating mechanism, and other features of the model.

3.2.3. Traffic Forecast

Traffic forecasting is the cornerstone of road infrastructure CBA, as the financial and economic viability of a road project depends on the current and expected future demand for the road. It is therefore crucial that the demand projections for new road projects for the "without-road" and "with-road" scenarios be robustly modelled to have reliable traffic forecasts, from which the future benefits are accurately estimated.

Traffic forecasts attempt to determine the behaviour and choices of road users based on several demand factors. Socioeconomic factors such as income, employment, foreign trade and economic growth will have an impact on the demand. Road specific characteristics will affect travel times and vehicle operating costs. Changes in travel time and vehicle operating costs will influence demand. The traffic forecast model must, therefore, take into account socioeconomic factors and the reaction to costs changes that shape demand.

Traffic forecasts are made based on the existing levels of traffic which can be obtained from existing historical data or by conducting a traffic count by the type of vehicles traveling along the road. AADT forecasts should be further categorised according to the following classifications were applicable:

i. **Existing Traffic:** traffic that already utilised the road before the project and which would continue to make use of the road even after the implementation of the road project
ii. **Diverted Traffic:** traffic that abandons its current route due to the benefits of traveling on the new and improved road
iii. **Generated/ Induced Traffic**: this traffic would not exist without the project and is usually the result of an increased number of trips by new road users

Traffic forecasts are prone to uncertainty. Traffic forecasts should, therefore, quantify the level of uncertainty associated with their projections of demand in future periods.

3.2.4. Impact on the Road Network

Road projects are not stand-alone assets; rather they are part and parcel of the overall portfolio of the road network of a given geographic area. As such, a proposed road project must take into consideration its relationship(s) to other roads within a defined network and how it impacts/affects traffic flow, accessibility, trip destination, trip frequency and land use. Depending on the status and strategic importance of a road, it's impacts may go beyond the specific region in which it is located therefore spilling over into adjacent and neighboring areas.

A road can have a complementarity or substitutability function in relation to other roads within the network, therefore, a new road project may result in the alleviation or worsening of congestion. An evaluation should be made as to how and if possible to what extent the proposed road project will promote and improve the efficiency of the road network. In the long run, roads that improve the overall network of an area may encourage changes in the land use and the location of business and residential sites. These changes may, in turn, influence the frequency of trips and the possible redistribution of the trip origins and destinations.

3.2.5. Financial Cash Flow Statements

Financial analysis is necessary if the road project is expected to generate revenues as would be the case in a toll road or if funding from the private sector is considered as a source of capital for a proposed road project. In cases where there is no financial revenues, analysis of the sources and uses of funds will suffice. The main aim of financial analysis is to measure the profitability of the road project. In the case of a PPP road project, if the project does not yield a return in line with private sector expectations; financial analysis can then be used by the public sector to measure the amount required to make the project attractive for the private investor to undertake the investment. The financial analysis evaluates the expenditures and revenues generated by a project from the perspective of an individual entity rather than the society as a whole.

3.2.5.1. Weighted Average Cost of Capital Estimation

The discount rate is a key variable in conducting the financial analysis of a road project as it is used to evaluate the financial performance of the project. Financial performance indicators such

as Financial Net Present Value (FNPV) and Financial Internal Rate of Return (FIRR) are computed based on the discount rate. Application of the correct discount rate in the financial analysis is critical to making the right decision about a project, as a small variation in the discount rate can significantly alter the results of the financial analysis and affect the final decision on the project.

The discount rate represents the opportunity cost of funds that are invested in a road project. The discount rate depends on the financing used to meet the capital expenditure required to undertake the road project. The appropriate discount rate applicable to road projects financed through the use of debt and equity is the weighted average cost of capital (WACC). WACC is the return that private sector investors require to provide the amount of debt and equity capital required to undertake investment in the road as opposed to a similar asset or investing their capital in the market. An estimation of the WACC should be made based on the proposed capital structure of the project and the rate of return required for the debt and equity components.

3.2.5.2. Toll Rate Estimation

Road infrastructure delivered under a "paying-user" framework and will, therefore, charge tolls to the users of new road facilities as a means of recouping capital expenditure. This is usually in the case of paying-user schemes under joint venture projects and PPPs. Toll rate estimation can be a bit tricky when the private sector is involved in the provision of road infrastructure. The toll structure and rates applicable to a given road are set by a road agency or public-sector institution such as the local or central government, or may be done by the private sector playing a regulatory role. In both cases, there will be negotiations over the applicable toll rates as the public sector will be concerned about charging toll rates that are affordable; while the private sector will be interested in a toll rate that makes undertaking the investment financially attractive.

Project costs, the amount of debt financing utilized, the concession period, traffic forecasts and the required return of the investor have an impact on the expected toll rate that will make the project attractive to the private sector. These factors are therefore the key inputs in estimating the toll rate acceptable to the private sector. On the other hand, toll rates have an impact on the affordability and subsequent use of the road. If toll rates are set too high, they may lead to a decline in demand. Conversely, if toll rates are set too low, the project may become unviable for the private sector.

The estimation of toll rates must, therefore, take into consideration the concerns of both the public and private sectors objectives. The estimated toll rate must balance off the need for affordability for road users and viability for the private sector. At the PFS stage, toll rate estimates may be based on projects of similar scope and nature implemented in the recent past and adjusted to fit the nuances of the proposed project.

3.2.5.3. Constructing Financial Cash Flow Statement

Financial analysis is conducted using the discounted cash flow (DCF) methodology. This method requires the construction of a cash flow statement in order to carry out a financial analysis of a

project. A typical cash flow statement is organised into two distinct sections. The first section is dedicated to summarizing all of the receipts generated by the project, whereas the second section is concerned with project expenditures. In case of the road projects that do not have tolls, the financial cash flow statement only contains the section with the project expenditures. The main components of the two sections of the cash flow; receipts/revenues (inflows) and expenditures (outflows) are outlined below.

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

i. Operational revenues
ii. Changes in accounts receivable
iii. Residual value if the road's economic life exceeds the analysis period

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

i. Capital expenditures
ii. Operational expenditures (including income tax liabilities)
iii. Maintenance expenditures
iv. Changes in working capital (accounts payable and cash balances)

Following the cash flow structure outlined above, the financial analysis of a road project requires that two cash flows to be constructed; one for the "without-road" and the other for the "with-road" 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-road" scenario from the corresponding "without-road" scenario.

The incremental cash flow is what is used to conduct the financial analysis by calculating the net cash flow, which is simply the difference between the total inflows and outflows. When debt financing is part of the capital structure, the incremental cash flow should be constructed from two points of view;

a. **Total Investment Point of View / Lenders Point of View:** This cash flow statement does not include debt and equity financing and the repayment of debt.Therefore to evaluate the projects ability to meet its debt service obligations debt coverage metrics, namely; Debt Service Coverage Ratio (DSCR) and Loan Life Coverage Ratio (LLCR) are used.
b. **Equity Point of View:** This cash flow statement is constructed to evaluate the profitability of the project from the shareholders' perspective as measured using the FNPV and FIRR metrics and includes debt financing and repayment. In contrast to the total investment point of view cashflow, the equity point of view cash flow includes debt financing and debt repayment.

3.2.5.4. Cash Flows/Model Outputs – Alternative Investment Criteria

The primary investment criterion that should be used to measure a project's financial performance is the FNPV. A financially viable project implies a positive FNPV when the real net cash flow is discounted using the appropriate opportunity cost of funds (i.e required return on equity). From the government perspective, the financial returns resulting to the private investors shall never exceed the minimum rate of return required to attract such an investment. It implies that the toll rate shall always be capped at a minimum rate that allows private sector investors to break-even. Moreover, the financial gains to the private sector shall never be allowed to result in a negative economic net present value of an investment project.

An alternative investment criterion that can be used to gauge a project's financial performance is the FIRR. Based on this criterion a proposed project should only be accepted if the FIRR is greater than the opportunity cost of funds. It is important to note that FNPV and FIRR often result in conflicting conclusions about a project, in such cases; it is recommended that decisions are made based solely on FNPV.[2]

Projects that utilise debt financing must be evaluated in terms of their ability to service their debt obligations (interest and principal) solely from their net cash flow. Two investment criteria are used to gauge the project's ability to meet its debt obligations; the first criterion is the Annual Debt service coverage ratio (ADSCR) and the second criterion is the Loan Life Coverage Ratio (LLCR). Both these debt service ratios (ADSCR and LLCR) should be greater than one or greater than or equal to a benchmark set by a financial/lending institution. Ratios that meet the above criteria indicate a project with a healthy cash flow can meet its debt obligations after meeting all of its operating expenditures.

The debt service capacity ratio (DSCR) is the ratio of cash available for debt service to interest and principal payments. It helps to determine the project's ability to meet its debt servicing obligations. The cash available for debt servicing is derived from the total investment point of view cashflow statement. The debt service capacity ratio (ADSCR) is calculated on a period to period basis as follows:

$$\mathrm{DSCR}_t = \frac{\mathrm{CFADS}_t}{\text{Scheduled Debt Service (Principal + Interest)}_t}$$

Where: CFADS_t is net cash flow of the project before financing for period ***t,*** and Debt Service includes interest and scheduled principle payment for period ***t***.

[2] For a detailed discussion on the problems related to the IRR criterion the reader should refer to: Jenkins, G.P., Kuo, C.Y., and Harberger, A.C., "Chapter 4: Discounting and Alternative Investment Criteria", Cost – Benefit Analysis for Investment Decisions, (2012)

Loan Life Coverage Ratio (LLCR) measures the number of times the nominal cashflow over the scheduled life of the loan can repay the outstanding debt balance. The PV of nominal cash flow is estimated using the nominal interest rate on the loan as a discount rate.

$$\mathrm{LLCR_t} = \frac{\mathrm{PV\ (CFADS_t : CFADS_n)}}{\mathrm{Debt\ Balance\ Outstanding\ _t}}$$

Debt service coverage ratios are used by an analyst to evaluate the projects ability to repay its debt.

3.2.6. Use and Source of Macroeconomic Variables

3.2.6.1. Inflation

Planning for cost escalation due to inflation is essential, and it should be part of the financing plan. Inflation has direct impacts on the financing of road projects, real desired cash balances, accounts receivable, accounts payable and nominal interest payments. It also has tax impacts on interest expense deduction and depreciation expenses. If inflation is not adequately planned for at the appraisal stage, it can affect the project outcomes drastically. The latest inflation figures can be got from the ZIMSTAT.[3]

3.2.6.2. Economic Opportunity Cost of Capital

The economic opportunity cost of capital (EOCK) or the social discount rate is the minimum economic rate of return that either a private or public-sector investment must earn if it is to contribute to the growth of the economy. The economic cost of capital reflects the real rate of return forgone in the economy when resources are shifted out of the capital market.

The EOCK is an economic price for the valuation of savings and investments and their augmentation of economic production in the coming years. Investment projects use various inputs or real resources, such as land, labour, and capital, to produce outputs that society is willing to pay for, whether directly or indirectly. Considering that the decision to fund a public project will supersede private investments and consumption and use market information, the EOCK is used as a hurdle rate to determine the desirability of implementing projects. Economic net benefits and costs, and economic externalities of the investment over the life of the project should be discounted

[3] http://www.zimstat.co.zw

by the EOCK. The EOCK shall be published or provided in a circular by the Treasury. If not available, it is recommended to use 12% as the EOCK.[4,5]

3.2.6.3. Foreign Exchange Premium

When funds are sourced in the capital market and used to purchase either tradable goods or non-traded goods, investment and consumption by others in the market are displaced. It results in the government losing tariff revenues, VAT, and other indirect taxes. Such loses must be accounted for during the economic valuation of tradable inputs of a road project. By calculating the foreign exchange premium (FEP), it is possible to adjust the financial price of tradables, along with other distortions like tariffs and VAT to find the economic value. FEP shall be published or provided in a circular by the Treasury. If not available, it is recommended to use 10.7% as the FEP[6]. As an example, the steel used in the road construction has an economic cost that is 10.7% higher tha the financial price paid by the project.

3.2.7. Economic Prices

3.2.7.1. Estimation of Economic Prices

Economic prices may differ from financial prices for several reasons. Financial prices are market prices, which are affected by the various tariffs, taxes, and subsidies. Financial and economic prices also differ because of consumers' valuation of an item may be greater than the financial price they pay.

Financial prices of inputs used in road projects need to be adjusted to reflect the economic cost of resources that society pays to obtain these items. Most commonly this will include adjustment for taxes, subsidies, and FEP.

On the other hand, the output of the road will either have no financial value (public road) or the financial value is equal to the toll rate charged. In both cases, the economic value of the road output is different from the financial value. Estimation of the economic value of the road project output requires an analyst to capture the cost savings and other benefits that the road brings to the users.

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[4] For ***economic analysis***, USAID and other development institutions (including the Millennium Challenge Corporation, the World Bank, and the Asian Development Bank) use discount rates between 10% and 12% range. USAID CBA Guidelines, 2015.

[5] "Musings on the Social Discount Rate", A. Harberger, 2015 estimates social discount rate of 10% for healthy developing countries

[6] The 5.5% is the result of a quick estimation done using 2017 data from ZIMSTAT and ZIMRA.

Finally, non-tax distortions such as air pollution may also generate significant external costs or benefits (if pollution is reduced) which should be assessed and accounted for in the economic analysis, whenever feasible.

3.2.7.2. Tradable versus Non-Tradable Inputs of Roads Projects

While the principles underlying the estimation of economic prices are the same for all goods and services, the estimation method used for internationally tradable goods is different from that used for non-tradable goods. A good or service is considered tradable when an increase in demand (supply) by a project does not affect the amount demanded (supplied) by domestic consumers (producers). The increase in demand (supply) by a project is eventually reflected as an increase (decrease) in imports or a decrease (increase) in exports depending on whether the project is demanding or supplying the importable or exportable commodity. Steel and cement are perfect examples of the internationally traded goods.

Importable goods include imported goods and all goods produced and sold domestically that are close substitutes for either the imported goods or potentially imported goods. An increase in demand for an importable commodity by a project increases demand for imports. Alternatively, when the project produces an importable commodity, there will be a reduction in imports. It should be noted that an import duty raises the financial market price for importable goods whether imported or produced domestically.

Exportable goods include exported goods and domestic consumption of goods of the same type or close substitutes for the exported goods. An increase in demand for an exportable commodity by a project results in a reduction in exports, while the production of an exportable by a project increases exports.

In turn, a good or service is considered non-tradable when the economic price of a project input or output is based on demand for this item as well as the supply of the good in the domestic market. A good or service is non-traded if the domestic price of the good or service is higher than its FOB export price and it is also lower than its CIF import price. There are also cases where high import duties or restrictive import quotas are imposed on certain goods so that the goods that are normally internationally traded cannot be traded.

3.2.8. Economic Benefits of Roads Projects

3.2.8.1. Value of Time

Road infrastructure that improves road conditions, alleviates congestion and improves transport routes and network efficiency results in time savings for road users. Reduction in travel times makes up the majority of the benefits that stem from road infrastructure projects.

A market price for time does not exist, therefore, the VOT for road users can only be inferred through estimation. The VOT varies based on the purpose of travel. Valuation of travel time is split up into work and non-work travel times.

The VOT for work and business-related travel is based on the average hourly wage rate of vehicle occupants and is computed by dividing the average annual wage by the average number of hours worked per annum, multiplied by the travel time between the origin and destination of the particular journey as illustrated below.

$$VOT = Travel\,Time \times Average\,Hourly\,Wage\,Rate$$

a. $Travel\,Time = Average\,Speed \div Total\,Length\,of\,Road\,Section$
b. $Average\,Hourly\,Wage\,Rate = Annual\,Wage\,Rate \div Average\,Number\,of\,Hours\,Worked\,per\,Annum$

The value of non-work travel time is priced at a cheaper rate than work-related travel. For example, the value of non-work commuting time could be deemed to be 50% of the VOT spent traveling for work or business-related activities.

The VOT should be recalculated over given time intervals of the analysis period, every 5 or 10 years for instance; to reflect the growth in incomes over time and the growth in traffic and its effect on traffic flow and travel times. Growth in income can be forecasted using an index such as the growth in real GDP per capita.

The VOT are computed for each vehicle class for both the "without-road" and "with-road" scenarios. To estimate the time benefits obtained from a road project, incremental VOT must be computed to measure the VOT savings that result from the implementation of the project. It entails simply subtracting VOT "with-road" from VOT "without-road."

3.2.8.2. Vehicle Operating Costs

Vehicle operating costs (VOC) represent the expenses incurred through the ownership and use of vehicles. VOCs for each type of vehicle is a function of the costs of inputs required to operate and maintain the vehicle. VOCs result due to the conditions of a road such as roughness, gradient, and alignment. Furthermore, the volume of traffic on a road section and traveling speed has a bearing on VOCs. VOCs can be categorized into two distinct components as outlined below.

i. **Fuel Costs:** represent the average costs of fuel expenditures required to operate a vehicle.

ii. **Non-Fuel Costs:** entail the expenditures essential to servicing and maintaining the vehicle in good working condition, and comprise of items such as lubricating oil, tyres and maintenance expenditures.

VOCs should be estimated for both the "without-road" and "with-road" scenarios so that the VOC savings generated due to the road project can be computed. VOC savings are derived by simply taking the difference between VOCs "without-road" and VOCs "with-road."

3.2.8.3. Cargo

The valuation of the benefits of freight vehicles is different from other vehicle types. These benefits arise due to new road infrastructure and include, travel time savings and reliable delivery of cargo, which have knock-on effects on the economy. Freight vehicles carrying cargo have a VOT that is different from all other types of vehicles. As road improvements allow for vehicles to travel faster in comparison to the existing road, the VOT savings associated with cargo carrying vehicles should be assessed. The VOT of freight vehicles is computed differently from other vehicle classes. This calculation takes into consideration the type of commodities being transported, their value, volume, and destination. With this information at hand, delay costs can be estimated based on the willingness to pay for faster delivery. An alternative method to calculate cargo transport VOT is to measure the value of capital cost savings that result from the faster turnaround of freight vehicles. Faster travel allows for freight vehicles to be used more efficiently and will, therefore, result in economic resource savings.

Road projects that foster a reduction in cargo transport costs and time savings produce savings in logistics costs for businesses which can be passed on to the consumer.

3.2.8.4. Change in Road Maintenance Costs

The road maintenance costs for the "without-road" and "with-road" scenarios will be different based on the design, standards, and scale of the new road project as compared to the existing road. Changes in road maintenance costs are calculated by finding the difference between the projected expenditure "without-road" and those of the "with-road" scenarios. Typically, a new road project results in the reduction of road maintenance costs. However, there are instances where maintenance costs of the new road are higher than those of the existing road. This may be as a result of road assets expansion to improve service standards. Changes in road maintenance costs should be captured in CBA, with reductions in maintenance costs being captured as benefits and increases as additional costs.

New road infrastructure will impact the flow and pattern of traffic within a given road network. The maintenance costs of other roads within the network will be affected positively or negatively if the new road is constructed. These impacts are included as part of the overall assessment of the changes in maintenance costs.

3.2.8.5. Non-monetised benefits

CBA is based on monetised benefits and costs that result from undertaking a proposed road project. However, some project impacts are of a non-monetary nature. These include the impacts of vehicle emissions, noise and vibration pollution, the impacts of injury, disability and mortality of humans due to road traffic incidents.

To fully capture the full spectrum of the benefits and costs of a road, non-monetised impacts should be included in CBA. Were possible non-monetised impacts should be expressed in monetary terms. Various methods and techniques exist to convert non-monetary impacts into monetary terms. In cases were non-monetised impacts cannot be expressed in monetary terms, a qualitative evaluation of such impacts should be included in the overall appraisal of the road. It is essential in ensuring that decision-makers presented with the results of the CBA are aware of the costs and benefits of the road that are not valued in the CBA.

3.2.9. Constructing an Economic Resource Flow Statement

The economic resource flow statement translates the financial cash flow of a project into a resource flow profile by converting project receipts and expenditures in their equivalent benefits and costs. The first step in constructing the economic resource flow statement of a road project is to replace financial revenues (toll revenues) with economic benefits resulting to different types of the road users. It shall be noted that the toll revenues shall be projected by the vehicles categories allowing an analyst to replace them with corresponding economic benefits.

Next step is to convert financial expenditures into their economic equivalents through the use of conversion factors. An economic Conversion Factor (CF) is the ratio of the economic price of an expenditure or revenue item to its financial price. An analyst is required to estimate the CFs for all the project's expenditure items.

Once the CFs have been estimated, the economic resource flow statements for the "without-road" and "with-road" scenarios are derived by converting the expenditure items of the financial cash flows into their equivalent economic costs and benefits by multiplying the financial expenditures by their corresponding CFs.

The incremental resource flow statement is then derived by subtracting the "with-road" resource flow statement from the "without-road" resource flow statement. The incremental resource flow statement represents the overall costs and benefits generated by the project from the society perspective as a whole and used to compute the metrics used to measure economic performance, namely; Economic Present Value (ENPV) and Economic Rate of Return (ERR).

3.2.10. Stakeholders Analysis

The objective of the stakeholder analysis is to identify, quantify and allocate the impacts that a proposed road project will have on all its stakeholders. Various stakeholders incur certain costs or derive certain benefits from the implementation of a project. Using stakeholder analysis, the question; "who gains or losses because of the project and by how much?" can be answered.

Stakeholder analysis is conducted by estimating the externalities generated across various groups that are directly or indirectly impacted by the project. It, however, excludes project sponsors and lenders as they have a financial stake in the project. The financial impacts arising from the project are assessed in the financial analysis. Project externalities are derived by finding the difference between the financial and economic value of the project's inflows and outflows.[7] The present value of these externalities, therefore, represents the costs or benefits accruing to each stakeholder.

A stakeholder analysis is composed of the following steps:

1. Identification of externalities.
2. Estimation of the magnitude of the externalities, measured by taking the difference of the economic value of resource flows and the real value of financial cash flows.
3. Estimation of the magnitude of the externalities over the life of the project by finding their present values (PV) using the EOCK.
4. Allocation of the PV of externalities among the project's stakeholders.
5. Summarisation of the distribution of project externalities and net benefits according to the key stakeholders.
6. Reconciliation of the economic resource flow and financial cash flow statements with the projects externalities.

3.2.11. Risk Analysis

3.2.11.1. Uncertainty and sensitivity analysis

A CBA would not be complete without taking into account project risk. As the benefits and costs of a road are projected into future periods, uncertainty exists with regards to their realization and in turn the attainment of the required financial and economic returns as well as the intended outcomes set out for the project. The financial and economic variables that pose a risk to the

[7] The following relationship should be hold when considering the impacts of a project:

$$NPV_e^{EOCK} = NPV_f^{EOCK} + PV^{EOCK} \sum Ext_i$$

Where: NPV_e^{EOCK} is the net present value of net economic costs or benefits

NPV_f^{EOCK} is the net present value of the net financial cash flow

$PV^{EOCK} \sum Ext_i$ is the sum of the present value of all externalities generated by the project

project's overall financial and economic performance should be identified and their impacts assessed at the PFS stage using sensitivity analysis. For example, since traffic forecasts are the backbone of the financial and economic analysis, deviations in anticipated traffic should be tested at different levels to measure their impact on the project's outputs such as FNPV and ENPV. The identification of project risk variables and their financial and economic impacts can be used as the basis for formulating measures to reallocate or mitigate such risks to make the project viable and/or sustainable.

Sensitivity analysis is used to assess the impact of changes in key factors on the results of financial and economic forecasts (NPVs, IRRs). If the sensitivity analysis does not allow the measurement of individual risks, other methods shall be employed including the calculation of the break-even points, the Monte Carlo simulations, scenario analysis, factor analysis and the like.

Key sensitivity factors include the assumptions (initial data/inputs) of the financial and economic model, the actual values of which during project implementation (due to their inability to accurately assess them or their inherent volatility) may deviate significantly from the values embedded in the model. Typical sensitivity factors include investment cost of a road project; baseline AADT; traffic growth rate; toll rate; operating and maintenance expenditures of the project.

The results of the sensitivity analysis should be reported using the "Sensitivity Analysis Forms":

Table 4 Sensitivity Analysis on NPV and IRR

Baseline AADT

	-20%	-10%	0%	+10%	+20%	n
NPV (USD)						
IRR (%)						
ENPV (USD)						
ERR (%)						

AADT growth rate

	-20%	-10%	0%	+10%	+20%	n
NPV (USD)						

IRR (%)						
ENPV (USD)						
ERR (%)						

Investment Cost

	-20%	-10%	0%	+10%	+20%	n
NPV (USD)						
IRR (%)						
ENPV (USD)						
ERR (%)						

Operating Expenditures

	-20%	-10%	0%	+10%	+20%	n
NPV (USD)						
IRR (%)						
ENPV (USD)						
ERR (%)						

3.2.11.2. Scenario Analysis

The one-at-a-time testing of variables in Sensitivity Analysis is not realistic because the interrelationships between variables. Scenario Analysis recognises these interrelationships by allowing some variables to be altered consistently at the same time. Scenarios analysis is commonly used in the road projects to test a simultaneous change in several variables. A most common example would include testing different sizes of a road construction project or different type of the road surface.

3.2.11.3. Risk Reallocation

If a project is implemented in the form of joint venture or PPP a way must be found to redesign or reorganise a project to efficiently reallocate risk to manage it better. It requires not simply a cost perspective, where the aim is to reduce risk to one party by shifting it to others, a zero-sum game, but rather an efficiency perspective where with the right contract, one party can gain substantially without corresponding cost to the other parties. The objective is to reallocate risk to those who can best bear it.

3.2.11.4. Contracts and Revenue Guarantees

Whenever the public sector outsources the provision of infrastructure and services, such as a road from external counterparts (usually the private sector); there is a need to define the relationship between the parties. Contracts are the backbone of PPP transactions, and as such outline the respective rights and responsibilities of each party. Additionally contracts are used to allocate project risks and provide the mechanisms required to remedy breaches and any unforeseen changes. Various contracts are utilised as incentive mechanisms.

Concession agreements allocate the responsibility for the design, construction, financing, operations, and maintenance of a road. These contractual structures come in many different forms such as the two examples listed below:

i. DBFO: This contract between the public and the private sector gives the private sector the right and responsibility to design, build, finance and operate a road
ii. BOT: This contract between the public and the private sector gives the private sector the right to build and operate a road and the obligation to transfer it back to the public sector at the end of the concession period

The private sector also enters into several agreements (contracts) with other counterparts, as it subcontracts some of its responsibilities to parties more suited in handling such activities. Some of these agreements are as follow:

i. EPC: The engineering, procurement, and construction contract transfers the responsibility of construction from the concessionaire to a third party contractor
ii. The concessionaire enters into a financing agreement with the lenders in cases were debt financing is utilized
iii. A shareholder's agreement is entered into between the equity investors

One of the biggest risks of toll roads is that demand will fall short of preliminary forecasts. Revenue guarantees are one of the mechanisms used to allocate and mitigated this risk by compensating the private sector for any losses in revenue should projected revenues deviate from the contractually stipulated amount. Hence, this risk will be effectively shared between the government and the private investor.

The preliminary appraisal conducted at the PFS stage should endeavour to evaluate the design and inclusion of contracts into the proposed project that promotes efficiency and provided the correct incentives to the private sector, in as far as the provision of the final output (road) is concerned.

3.2.11.5. Contingent Liabilities

As a result of contractual agreements entered into by the government in PPP road projects, such as revenue guarantees, the government may be exposed to contingent liabilities. Contingent liabilities represent future expenditures that will have an impact on the budget due to commitments are undertaken in the present to support or make projects more attractive to the private sector.

Contingent liabilities depend on some future event that can trigger contractual obligations to be enforced. For example, a revenue guarantee may come into effect if actual traffic observed once the road is operational is lower than the minimum level agreed on at the signing of the revenue guarantee. Contingent liabilities leave the government exposed to fiscal impacts whose magnitude and timing are uncertain.

3.2.12. Fiscal Impacts

A contingent claims analysis should be included as part of the overall stakeholder impacts accruing to the government. The analysis should endeavour to estimate the value of the anticipated cost the government will have to shoulder if and when a contingent liability comes due. Furthermore, the anticipated cost should be analysed according to how it will impact the government's budget. Based on the contingent claims analysis a provision should be made by the government as part of the overall budget to cover this downside risk if the proposed road project is to be implemented. According to the requirements stipulated in section 4.2.7 of the PIM Manual on page 15, the fiscal impacts that may result from a proposed road project should be reported in the PFS using a fiscal effectiveness form, whose structure and contents are illustrated in Table 5.

Table 5 Project Fiscal Effectiveness

#	Title	Currency	Year 1	Year 2	…	Year n
1.	Revenues					
1)	Dividends from State owned shares					
2)	Fiscal inflows (taxes and other mandatory and non-mandatory payments including:					
2.1)	to State Budget					
2.2)	to Local Authorities' budget					

2.	Outflows					
1)	Capital expenditure					
2)	Recurrent expenditures					
3)	Subsidies					
3.	Contingent Liabilities					
1)	Value of contingent liabilities					
2)	Probability of the contingent liability coming due					
3)	Probability adjusted cost					
3.	**Net Fiscal Impact**					

3.3. Preliminary Environmental and Social Impact Assessment[8]

As stipulated in Articles 298 and 299 of the PIM Guidelines, the appraisal of a road project at the PFS stage should include an Environmental and Social Impact Assessment (ESIA), which is used to determine the impact the proposed project will have on the environment and society directly or indirectly linked to the project. ESIAs are regulated under the Environmental Management Act (EMA)[9], which stipulates the requirements and procedures of preparing an ESIA report. According to EMA, ESIA is only required for highway projects. The CA should, therefore, seek guidance from the Environmental Management Agency (EMA) which is the regulatory authority charged with protecting the environment.

3.3.1. Environmental Impact Assessment

An Environmental Impact Assessment (EIA) is useful in identifying and were possible quantify the potential environmental impacts of a proposed road project. Road projects can have various negative effects on the environment within the area/region where the road is located. Emissions of toxic gases and changes in land use pose the greatest threat to the environment were road projects are concerned. For example, the construction of a new highway may well result in the displacement of flora and fauna and increased volumes of traffic will increase the levels of toxic gases emitted by vehicles which can increase greenhouse effects.

[8] For more information regarding the ESIA the reader should refer to section 4.3. of the PIM Manual on page 17

[9] Environmental Management Act 13 of 2002

Apart from identifying the environmental impacts resulting from a road project, the EIA should also outline the appropriate measures that can be taken to mitigate or manage such impacts.

3.3.2. Social Impact Assessment

A Social Impact Assessment (SIA) is necessary for identifying the direct and indirect, short or long-term impacts that a project will have on the society influenced by the project. Road project can have numerous impacts on society, for example, the emissions of toxic gases will affect the health and well-being of the people who use or live in the vicinity of the road. Similarly, road project may result in the displacement and relocation of people. The SIA should outline appropriate measure that can be taken to mitigate or manage the social impacts that ensure the implementation of a project.

3.4. Detailed Climate Change Risk Assessment

The assessment of projects at the PFS stage of the project cycle consists of four steps, that is;

1. The assessment of the economic viability of a regular infrastructure investment project;
2. Estimating the benefits of climate proofing the project and assessing options to climate-proof the project;
3. The assessment of the economic viability of climate-proofing; and,
4. Decision making.

Step 1: Assessment of the Economic Viability of a Regular Infrastructure Investment Project

The term 'Regular Infrastructure Investment Project' refers to a project that does not include a climate-proofing component and will be referred to from here on out as 'Project A'.

All projects (i.e., 'regular infrastructure investment projects') should be quantitatively assessed with respect to their technical, financial, and socio-economic viability. Net present value (NPV) and internal rate of return (IRR) should be estimated from both financial and economic perspectives:

1. Financial viability: based on financial metrics such as the financial net present value (FNPV) and the financial internal rate of return (FIRR).

2. Socio-economic viability: based on economic performance metrics such as the economic net present value (ENPV) and the economic rate of return (ERR).

BOX 3: Illustrative Example of the Economic Viability of a Regular Infrastructure Investment Project

Project Summary

- The 30 km road project is expected to have a capital cost of $25 million.
- The road will be constructed over a period of 1 year, and its economic life is assumed to be 25 years, with no residual value.
- The O&M costs of the project over its economic life are anticipated to be $1 million per annum.
- The project's benefits, which consist of savings in vehicle operating costs and travel time, are estimated to be $7 million per annum.

NPV of a Regular Project	Note
ENPV = $18.14 million	The project is economically viable as the ENPV > 0. However, the project must be assessed for climate risk before it is implemented to determine if any climate-proof interventions are necessary.

Notes: All values in the tables are expressed in real terms and discounted using an economic opportunity cost of capital (EOCK) of 12%.

Step 2 – A: Estimating the Benefits of Climate Proofing a Project

Before CAs decide to climate-proof a project and spend resources on evaluating the costs and benefits of climate-proofing, a detailed appraisal of the status quo (when climate change is not considered in project formulation) should be undertaken. If the 'Regular Infrastructure Investment Project' is deemed to be economically viable (the project should exhibit an ENPV > 0 as outlined in step 1), a detailed quantitative climate risk assessment should then be conducted.

The climate risk assessment, which is a continuation of the climate risk screening conducted at PCN, is conducted to determine the benefits of climate-proofing the project. The benefits of climate-proofing are the avoided expected costs from climate change impacts that climate change would cause if the project were not climate-proofed (i.e., the cost of repairing damaged infrastructure and the associated economic losses) if a climactic event such as a flood occurs. In the case of a road project, the occurrence of a flood over its economic life will result in the road having to be repaired or rebuilt depending on the severity of the flood. Repairing or rebuilding the road will negatively affect the project's operating and maintenance costs, leading to higher costs than those in which case a flood does not occur, i.e., "without" a climatic event. Similarly, the road project's benefits in the case where a flood occurs will be negatively impacted, as damage to the road leads to interruptions of traffic flow and socio-economic activity facilitated by the road. Road users will face higher vehicle operating costs and longer transit times, leading to lower benefits as compared to the situation where the flood does not occur. Hence, if a flood does occur during the project's economic life, its ENPV is expected to be lower if it is not climate-proofed, i.e., if no intervention is made to address the risk that flooding poses on the project.

The benefits of climate-proofing a project should be estimated based on the most likely climate change scenario, i.e., extreme scenarios such as highly pessimistic or optimistic should be disregarded. A common base case scenario should be developed based on the most likely evolution of climate change over a given period of time. This base case climate change scenario should be utilized consistently amongst projects from all sectors.

BOX 4: Illustrative Example of Estimating the Benefits of Climate Proofing a Project

NPV of a Regular Project (W)	NPV of a Regular Project Adjusted for the Impacts of Climate Change Risk (Y)	PV of the Benefits of Averting Climate Change Impacts on the Project (Z) = (W) – (Y)
ENPV = $18.14 mil.	**ENPV = $14.22 mil.**	**ENPV = $3.92 mil.**

Note: All values in the tables are expressed in real terms and discounted using an economic opportunity cost of capital (EOCK) of 12%.

Should Climate Proofing Options be explored?

Yes, climate proofing the project should be explored because there is a negative impact on the project's ENPV after including the expected costs of flood during the road's economic life. In particular, the present value of benefits (averted climate change impacts) from climate-proofing this road is $3.92 million. Therefore, the road should be climate-proofed if feasible and viable options are available.

Step 2 – B: Assessment of Options to Climate Proof a Project

When adverse impacts of climate change on the project are known, CAs should consider the potential climate-proofing options to reduce or minimize those impacts. Climate-proofing options can range from "doing nothing" to various engineering- and non-engineering adjustments (see Box 5). At this stage, a key consideration is the cost-effectiveness of the chosen option to climate-proof the project. In deciding which climate-proofing option cost-effectively addresses the impacts of climate change on the project, CAs should ensure that the cost of any climate-proofing option does not exceed the benefits from adopting that option.

BOX 5: Climate-Proofing Options in the Road Sector

According to the Asian Development Bank's Guidelines for climate-proofing investments in the transport sector, climate-proofing options can be broadly categorized into three groups:

- **Engineering options (structural):** more robust materials and design specifications generally allow structures to withstand more extreme climate conditions. In particular, engineering climate-proofing options for road projects include:
  - Subsurface conditions: the stability of any road depends on the materials on which it is constructed.
  - Materials specification: each material behaves differently in different climate conditions.
  - Drainage systems
  - Other protective engineering designs such as dikes and seawalls

- **Non-engineering options:** these options are of great importance for the existing infrastructures.
  - More robust O&M procedures, increased maintenance contingency budgets, and early warning systems help to reduce road closures and associated economic losses.
  - Alignment, master planning, and land-use planning
  - Environmental management: environmental buffers can moderate the damages from floods, droughts, and landslides. For example, ensuring increased vegetative land cover and preserving forests can help regulate the hydrologic cycle and consequently minimize the likelihood of future floods.

- **Do nothing option:** Maintaining a business-as-usual or "do nothing" approach should always be retained as a possible option. For example, findings from the preliminary climate change risk screening may indicate that the project's exposure to climate change risk is zero or very low. Or, despite the medium or high degree of climate change risk, the upfront capital investment and recurring O&M costs of any technically feasible climate-proofing option may be so significant as to be outweighed by the benefits associated with the climate-proofing of the infrastructure. In both cases, not investing in climate-proofing in the context of a particular project is the best course of action from both technical and economic efficiency perspectives.

Two inputs are required to evaluate the cost-effectiveness of climate-proofing options:

(1) The effectiveness of each climate-proofing option: the benefits from climate-proofing a project are unlikely to be technically and economically efficient to completely eliminate the project's exposure to climatic risk. Therefore, the benefits of climate-proofing should be adjusted by the chosen option's effectiveness to consider the impact of unmitigated risk or the **"residual risk"** (see the example in Box 6).

(2) The technical design and the estimated cost of each climate-proofing option: This information should be provided by engineers in the project team, based on the outputs of the models used by climate change experts to determine the likelihood and magnitude of climate change forecasts over the project's economic life.

BOX 6: Illustrative Example of Assessing Options to Climate Proof a Project

Climate Proofing Options:

- The road can be designed to withstand flooding by raising its height along segments that are vulnerable to the level of floodwaters expected over the project's economic life. Alternatively, the road can be climate-proofed by installing a drainage system with a higher capacity that drains larger volumes of water.
- The table below shows the options for climate-proofing the road that have been recommended by civil engineers based on climate change data collected from climate experts. The table also shows the estimated costs and benefits of each climate proofing option.

Climate Proofing Options	PV Costs of Climate Proofing the Project ($ million)	PV Benefits *without adjustments for residual risk* ($ million) (A)	Estimated Effectiveness of the Selected Option (B)	PV Benefits *with adjustments for residual risk* ($ million) (C) = (A) * (B)
Option A: raise the height of road segments that are vulnerable to the risk of flooding	1.50	3.92	70%	2.75
Option B: install a drainage system with higher capacity	3.00	3.92	80%	3.14
Option C: (do option A + B)	5.00	3.92	90%	3.53

Note: All values in the table are expressed in real terms and discounted using an economic opportunity cost of capital (EOCK) of 12%.

Step 3: Assessment of the Economic Viability of Climate Proofing a Project

The climate-proofed project's costs should be weighed against the residual-risk-adjusted benefits to determine the economic feasibility and viability of climate-proofing a project. ENPV is used to measure the economic efficiency of Project B in addressing the impacts of climate change.

In determining the preferred climate-proofing option to implement, CAs should also take into consideration:

a. Technical feasibility,
b. Financial affordability,
c. Capacity and experience of the CA to implement the option,
d. Environmental impacts,
e. Legal implications.

Step 4: Decision Making

As highlighted in the preceding sections, it is crucial to determine if both Project A (a regular infrastructure project "without" climate-proofing) and Project B (a regular infrastructure project "with" climate-proofing) are economically viable. ENPV evaluates the project's economic viability over its entire life, and therefore, it should be used as the primary decision-making criterion. From the economic efficiency perspective, only projects with positive ENPVs should be chosen. Such a decision-making criterion ensures that projects are selected based on economic efficiency in achieving targeted outcomes, not politically motivated objectives.

BOX 7: Illustrative Example of Assessing the Economic Viability of Climate Proofing a Project

Climate Proofing Options	PV Costs of Climate Proofing ($ million) (A)	PV Benefits of Climate Proofing *with adjustments for residual risk* ($ million) (B)	NPV of Climate Proofing ($ million) (C) = (B) – (A)
Option A: raise the height of road segments that are vulnerable to the risk of flooding	1.50	2.75	1.25
Option B: install a drainage system with higher capacity	3.00	3.14	0.14
Option C: (do option A + B)	5.00	3.53	(1.47)

Note: All values in the table are expressed in real terms discounted using an economic opportunity cost of capital (EOCK) of 12%.

When there are multiple options to climate-proof the project, the preferred option should be the most effective and efficient in climate-proofing the project against climate change over its economic life. In other words, it should be the option that maximizes the ENPV of climate proofing.

The decision criteria in the context of projects exposed to and vulnerable to climate change are outlined in Box 8, and an illustrative example is provided in Box 9.

BOX 8: Criteria for Decision Making in the Context of Climate Change

1. If **ENPV Project A < 0, do not proceed with the project.** In such a case, climate-proofing will not be explored as the project will not be implemented given that it is not economically viable.

2. If **ENPV Project A > 0**, and **ENPV Project B < 0, proceed with project A and not project B.** In such a case, climate-proofing is not a viable option as there are no technically and economically efficient climate-proofing options available. Therefore, the best course of action is to implement a regular infrastructure project that is not climate-proofed and deal with the impacts of climate change if and when they occur.

3. If **ENPV Project A > 0**, and **ENPV Project B > 0, proceed with project A and B**. In such a case, climate-proofing the project is a viable undertaking. Hence, the regular infrastructure project should be implemented with a climate-proofing component.

Note:

a. Project A refers to a regular infrastructure project that does not include a climate-proofing component.

b. Project B refers to the climate-proofing option that will enable the project to withstand climate change impacts to a certain degree.

BOX 9: Illustrative Example of Decision Making

NPV of a Regular Project – "without" climate proofing ($ million)	NPV of the Preferred Climate Proofing Option ($ million)	NPV of a Climate-proofed Regular Project ($ million)
14.22	**1.25**	**15.47**

Note: All values in the table are expressed in real terms discounted using an economic opportunity cost of capital (EOCK) of 12%.

<u>Decision on the Project</u>

- As **ENPV Project A > 0** and **ENPV Project B > 0,** the CA should proceed with Project A and B, as climate proofing the project is an economically viable undertaking.

Note:
a. Project A refers to a regular infrastructure project that does not include a climate-proofing component.
b. Project B refers to the climate-proofing option that will enable the project to withstand climate change impacts to a certain degree.

3.5. Assessment of Pre-Feasibility Study

The assessment of the PFS involves checking the robustness and effectiveness of the proposed project according to its ability to meet financial and socio-economic outcomes while adhering to national and sectoral objectives and goals in addressing the identified problem.

The assessment of the PFS consists of two phases. The first phase entails an internal assessment of the PFS by the Line Ministry. The internal assessment shall attempt to answer three questions:

1. Is the project consistent with National and Sectoral development strategies?
2. Out of a number of project alternatives, what is the preferred project alternative and why is this the best strategy of addressing the identified problems?
3. Do the expected socio-economic benefits of the project exceed its economic costs?

Once the PFS has passed the internal screening, it should be submitted to the IMC through the MoFED for the second phase of the screening process. It should be noted that PFS submissions are made between March and April, according to the Public Investment Management and Budgeting Calendar defined in Article 129 of the PIM Guidelines.

The external assessment of the PFS by the IMC is a three-step process aimed at assessing the project's alignment with the Government's objectives and priorities. It also entails an evaluation of resource availability to fund the project with consideration of resource allocation to projects from other sectors vying for the same pool of resources. The three steps carried out in assessing the PFS are as follows:

i. The first stage is to assess the compliance of the CA with the submission process and other procedural requirements stipulated in the PIM Guidelines and this Manual. CAs are required to submit PFSs in compliance with the PFS form outlined in the PIM Guidelines (PIM Guidelines, Article 254). In case of missing information, the IMC may postpone the PFS pending the submission of the complete information.
ii. At the second stage of the assessment, the IMC will assess the project's alignment with the National and Sectoral Strategic Objectives. Projects that are not in line with the National development strategies and sectoral development plans will get postponed. In exceptional cases, CAs may justify projects that are not directly aligned with the strategic development plans. Such cases, for instance, may include projects that are designed to mitigate force majeure situations, such as droughts, floods, earthquakes, Et cetera.
iii. The last stage involves the IMC assessing the affordability of the project as well as the likelihood of the expected economic benefits of the project exceeding the cost of resources.

The IMC's decisions on PFSs shall be issued in May-June. Only projects whose PFSs pass both the internal assessment by the CA and the external assessment by the IMC should be allowed to progress to the FS stage. PFSs approved by the IMC are valid for a period of three (3) years. Once a project's PFS expires the project should be reappraised and resubmitted to the IMC for consideration following the internal and external screening processes described above.

4. FEASIBILITY STUDY

The FS builds on the analysis developed in the PFS. To provide clearer insight into the project's feasibility, the FS should make use of primary data and were such data is not available studies should be undertaken to obtain accurate information about the project's costs and benefits. This data should replace the secondary and/or proxy data from projects of a similar nature which has been used to conduct the PFS. The FS should form a more accurate picture of the project's technical, financial and socio-economic prospects to aid decision makers in allocating resources efficiently.

Preparing a FS entails the same steps as those required to prepare a PFS although the FS defines all the elements of the PFS. It is essential that the traffic forecast be as accurate as possible as it is a critical variable in determining the overall feasibility of the road. The preliminary traffic forecast used in the PFS should be updated with more accurate projections when preparing the FS. The financial, economic, stakeholder, and risk analysis model developed at the PFS stage should also be updated with primary data retrieved from the FS.

The preparation of the FS should follow the requirements stipulated in the PIM Guidelines. Guidelines on how a CA should compile a FS are provided in pages 71-87 of the PIM Guidelines. This Section of the Manual provides further details on the following items:

a) Proposed Financing Modality of Public Investment
b) Environmental and Social Impact Assessment
c) Monitoring, Review, Action and Reporting Plan
d) Project Governance Structure

4.1. Financial Modality of Public Investment

Article 364 of the PIM Guidelines stipulates three modalities of the investment projects such as Public Investment, Joint Venture, and Private-Sector Financing. The assessment of the financial modality of an investment project shall be done in line with Articles 388 and 389 of PIM Guidelines. A road project proposed for tolling is a good candidate to be considered for JV procurement. Projects proposed as JVs shall follow the provisions of the JV Act and corresponding regulations.

4.2. Environmental and Social Impact Assessment

4.2.1. Environmental Impact Assessment

The FS of highway projects should include an Environmental and Social Impact Assessment (ESIA) study in order to identify and quantify the potential environmental and social impacts of a proposed road project. This should be done by updating the preliminary ESIA conducted at the PFS stage with the changes made to the FS based on new and more accurate project data.

Environment Management Act (EMA), 13 of 2002, exists to provide for the sustainable management of natural resources and protection of the environment. It also provides a guide regarding what the Environmental Impact Assessment (EIA) is and how it should be conducted. The EMA defines EIA as an evaluation of a project to determine its impact on the environment and human health and to set out the required environmental monitoring and management procedures and plans.

According to the EMA, EIA report should:

1. Give a detailed description of the project and the activities to be undertaken in implementing it;
2. State the reasons for selecting the proposed site of the project;
3. Give a detailed description of the likely impact the project may have on the environment or any segment thereof, covering the direct, indirect, cumulative, short-term and long-term effects of the project;
4. Specify the measures proposed for eliminating, reducing or mitigating any anticipated adverse effects the project may have on the environment, identifying ways of monitoring and managing the environmental effects of the project;
5. Indicate whether the environment of any other country is likely to be affected by the project and any measures to be taken to minimize any damage to that environment;
6. Have an analysis of the biodiversity impacts of the project, land tenure system, soil as well as a hydrological analysis
7. Attachments of soils, hydrological and topographical maps, and make analysis of the impacts of the project to the current environmental baseline.

When conducting the EIA, public consultations should be done with LMs, certain departments at Local, District, Provincial and National level. These consultations should also include other institutions related to the project as well as the neighbouring land users.

Environmental Management Plan should be submitted to the Treasury during the FS stage. Table 6 below displays how the plan should be presented.

Table 6 Biophysical Environment Management Plan Sample

Impact Statement	Process/Activity responsible for impact	Proposed Mitigation on impact	Monitoring and Management Agency	Management and Monitoring activities	Time frame	Budget

The final certificate from the Director-General should be obtained at this stage. The certificate should be attached as an Annex to the submission of the FS study. It is important to note that this certificate is valid for only two years with the possibility of an extension if deemed necessary otherwise the whole EIA process will have to be repeated.

4.2.2. Social Impact Assessment

The social impact assessment (SIA) is carried out to understand the possible social and cultural impacts of the proposed project. SIA is the process of managing the social issues associated with development. Unlike the EIA, the SIA focuses on social considerations rather than biophysical issues. Social impacts start even before the construction of a project. The following steps are taken during an SIA:

1. Understanding the issues
    a. Forecasting the social changes that may result from the project;
    b. Stakeholder consultations;
    c. Community assets and aspirations scoping
2. Predicting and assessing likely impacts

    a. Collaborative selection of sustainability and impact indicators;
    b. Baseline indicator data collection;
    c. Impact significance determination;
    d. Social and economic development opportunities assessment;
    e. Establishing the significance of the predicted changes and determining how the various affected groups and communities will likely respond;
    f. Identifying ways to mitigate negative impacts and capitalize on the positive impacts
3. Developing monitoring and mitigation strategies

    a. For the negative impacts, develop mitigation strategies;
    b. Monitor in case new, unpredictable impacts arise.

4.3. Reassessment of the Economic Viability of the Project without- and with-climate proofing option

The FS's objective is to assess, in greater detail, the technical, financial, and economic viability of climate-proofing projects approved at the PFS stage. CAs may undertake FS or outsource it if deemed appropriate. The FS builds on the information obtained at the PFS stage by examining all aspects of the project's costs and benefits and climate risk exposure and impact in greater detail.

CAs should prepare a final climate-proofed project design based on detailed climate risk assessments, technical studies, engineering drawings, and social and economic impact assessments.

The assessment of projects at the FS stage of the project cycle consists of three steps.

i. The reassessment of a regular Infrastructure investment project's economic viability using primary data and detailed cost estimates.
ii. The reassessment of the economic viability of the preferred climate-proofing option.
iii. Decision making.

Step 1: The Reassessment of the Economic Viability of Regular Infrastructure Investment Project using Primary Data, Detailed Cost Estimates, and Climate Risk Assessment

BOX 10: Illustrative Example – Reassessment of the Economic Viability of a Regular Infrastructure Investment Project

- Based on technical studies and a final design conducted at FS, the 30 km road project is expected to have a capital cost of $25 million and annual O&M costs of $1 million. The project is anticipated to produce benefits of $7 million per annum, which consist of savings in vehicle operating costs (VOC) and travel time (VOT).
- The road will be constructed over a period of 1 year, and its economic life is assumed to be 25 years, with no residual value.
- Based on data from the climate risk assessment, it is estimated that the economic cost associated with the occurrence of a flood is $ 5 million which is composed of;
    a. The cost of rehabilitating the road.
    b. The economic cost associated with the disruption in the road's service (increased VOC and VOT).
- Given the probability of the occurrence of the flood and cost of damage to the road and its associated economic losses, the probability adjusted value of the annual cost of the flood is $ 1 million (i.e., 20% * $5 million).

NPV of a Regular Project "without" climate proofing ($ million)
(Y)
ENPV = 14.22

Note: All values in the table are expressed in real terms discounted using an economic opportunity cost of capital (EOCK) of 12%.

Only projects that exhibit a positive ENPV after reassessment based on updated cost and benefits should be considered for climate-proofing.

Step 2: The Reassessment of the Economic Viability of the Preferred Climate-Proofing Option

BOX 11: Illustrative Example – Reassessment of the Economic Viability of the Preferred Climate Proofing Option

- The preferred climate proofing option identified at the PFS stage is reassessed at FS based on updated climate change models and cost and benefit estimates of climate proofing the project.

Preferred Climate Proofing Option	PV Costs of Climate Proofing the Project ($ million) (A)	PV Benefits of Climate Proofing *without adjustment for residual risk* ($ million) (B)	Anticipated Effectiveness of the Preferred Climate Proofing Option (C)	PV Benefits of Climate Proofing *with adjustment for residual risk* ($ million) (D) = (B) * (C)	NPV of the Preferred Climate Proofing Option ($ million) (E) = (D) – (A)
Option A – raise the height of road segments that are vulnerable to the risk of flooding	**1.50**	**3.92**	**70%**	**2.75**	**1.25**

Note: All values in the table are expressed in real terms discounted using an economic opportunity cost of capital (EOCK) of 12%.

Step 3: Decision making

Once Project A and B have been reassessed at the FS stage using updated cost and benefit data, the decision to implement the project should be based on the criteria outlined in Box 8.

BOX 12: Illustrative Example of Project Decision Making

NPV of a Regular Project "without" climate proofing ($ million)	NPV of the Preferred Climate Proofing Option ($ million)	NPV of a Regular Project that is Climate Proofed ($ million)
14.22	**1.25**	**15.47**

Note: All values in the table are expressed in real terms discounted using an economic opportunity cost of capital (EOCK) of 12%.

Decision on the Project

As **ENPV Project A > 0** and **ENPV Project B > 0**, the CA should proceed with Project A and B, as climate proofing the project is an economically viable undertaking.

Notes:
a. Project A refers to a regular infrastructure project that does not include a climate-proofing component.
b. Project B refers to the climate-proofing option that will enable the project to withstand climate change impacts to a certain degree.

4.4. Monitoring, Review, Action and Reporting Plan

4.4.1. Monitoring, Review, and Reporting

As stipulated by the National Monitoring and Evaluation (M&E) Policy[10], it is the role of the Line Ministries, local authorities and public entities to develop and implement Monitoring Plans and to disseminate periodic reports. The Line Ministry must specify the frequency of the monitoring and reporting cycle. The PIM Guidelines outline the need for well-designed and realistic key performance indicators (KPIs), as agreed by all key stakeholders. These indicators should clarify the project's intentions and should aid in the assessment of achievements.

MoTID should use Monitoring Plans to keep track of how the project aligns itself with the set objectives and a plan in Monitoring is an oversight of the project's implementation stage. Its purpose is to determine if the outputs, deliveries, and schedules planned have been reached so that action can be taken to correct the deficiencies as quickly as possible.

It is important to develop an M&E plan before beginning any monitoring activities so that there is a clear plan for what questions about the project are to be answered. It will help the program staff decide how they are going to collect data to track KPIs, how monitoring data will be analysed, and how the results of data collection will be disseminated both to the donor and internally among staff members for program improvement. The M&E plan will help make sure that data is being used efficiently to make programs as effective as possible and to be able to report on results at the end of the program.

Steps to develop an M&E Plan include:

1. Identify project goals and objectives

2. Specify KPIs
    - Process indicators to track the progress of the project. They help to answer the question, "Are activities being implemented as planned?"
    - Outcome indicators track how successful the project activities have been at achieving the set objectives. They help to answer the question, "Have project activities made a difference?"

3. Define data collection methods and timeline
    - After creating monitoring indicators, it is time to decide on the methods for gathering data and how often various data will be recorded to track indicators. This should be a conversation between program staff, stakeholders, and donors. These

[10] Government of Zimbabwe. (2015). *National Monitoring and Evaluation Policy.* Harare

methods will have significant implications for what data collection methods will be used and how the results will be reported.

4. Identify M&E roles and responsibilities
    - Line Ministry should identify stakeholders responsible for monitoring outputs delivery. It is important to decide from the early planning stages the responsible parties for collecting the data for each indicator. Data management roles should be decided with input from the key stakeholders so that all parties are on the same page and know which indicators they are assigned.

5. Plan for Report Dissemination
    - The last element of the M&E plan describes how often and to whom data will be disseminated. Line Ministries must spell this out guided by the National M&E Policy

4.4.2. Action

The Monitoring, Review, Action and Reporting Plan should also include a section on the Action Plan. This section should list the steps needed to achieve the project's goals and objectives. It should clarify and break down the resources and timeline for tasks needed to reach those goals. An action plan makes it possible to monitor the project's progress and take each task step-by-step, therefore allowing for efficient project handling. The advantage of doing this is to allow MoTID to execute a structured plan for the end goal that they intend to achieve. Moreover, it provides the team with appropriate foundations, therefore prioritising the amount of time to be spent on each task. This will then prevent any diversions that may occur.

The section should consist of several action steps or changes to be brought about in the community. Each action step or change to be sought should include the following information:

- **What** actions or changes will occur
- **Who** will carry out these changes
- **By when** they will take place, and for how long
- **What** resources (i.e., funds, personnel) are needed to carry out these changes
- **Communication** (who should know what?)

4.5. Project Governance Structure Plan

Institutional Analysis reviews the capacity of implementing organisations to contribute to the planned project. Structural mechanisms within the organisation, such as gender policies, gender committees or gender monitoring frameworks indicate a commitment to gender issues. Information to consider includes perceptions and attitudes of staff, skills for gender programming, management support for integrating gender issues and the gender balance in the overall staffing

and decision-making processes. Weaknesses in the organisation may be addressed through formal and informal links with partners.

The description of the main participants, the scheme of their interaction, the distribution of benefits and costs, the project management scheme in the investment and post-investment periods, as well as beneficiaries (specify the number of people and target groups that are likely to benefit from the project). Submission of the project's institutional scheme is guided by the table below:

Table 7 Projects Institutional Scheme

#	Project Participant	Information about the project participant	Functions of the project participant	Responsibility of the project participant
	2	3	4	5
1.	Line Ministry			
2.	Contracting Authority			
3.	Project Assets' Holder			
4.	Project Operator			
5.	…			
6.	Project Participant n			

4.6. Project Implementation Plan

As part of the FS, a proposal that outlines how the project will be implemented should be included. The implementation plan should clearly delineate the scheduled timing of the activities within each phase of the project's implementation plan and should be accompanied by the relevant cost schedules. The successful implementation of the project is subject to the availability of resources required to undertake the project, therefore the implementation plan should ensure that the financial, human and input resources required to execute the project are adequately available. Consideration should be given to contractual structures such as supply contracts and forward and futures contracts to secure key inputs. Additionally, secondary sources of all resources must be identified so as to guard against the inability of primary sources to meet the project's needs. The implementation plan should also outline how the implementation process will be management by assigning responsibilities to the parties most suitable to carry out the given role. Lastly, a proposal must be provided on how the project's progress will be monitored and evaluated. This should

include the KPIs that will be used to measure performance and overall progress against a set of objectives and targets.

4.7. Assessment of Feasibility Study

The assessment of the FS involves checking the robustness and effectiveness of the proposed project according to its ability to meet financial and socio-economic outcomes while adhering to national and sectoral objectives and goals in addressing the identified problem.

The assessment of the FS consists of two phases. The first phase entails an internal assessment of the FS by the Line Ministry. The internal assessment shall attempt to answer three questions:

1. Is the project consistent with National and Sectoral development strategies?
2. Is the proposed solution technically optimized?
3. Do the expected socio-economic benefits of the project exceed its economic costs?

Once the FS has passed the internal screening, it should be submitted to the IMC through the MoFED for the second phase of the screening process. It should be noted that FS submissions are made in July, according to the Public Investment Management and Budgeting Calendar defined in Article 129 of the PIM Guidelines.

The external assessment of the FS by the IMC is a three-step process aimed at assessing the project's alignment with the Government's objectives and priorities. It also entails an evaluation of resource availability to fund the project with consideration of resource allocation to projects from other sectors vying for the same pool of resources. The three steps carried out in assessing the FS are as follows:

i. The first stage is to assess the compliance of the CA with the submission process and other procedural requirements stipulated in the PIM Guidelines and this Manual. CAs are required to submit FSs in compliance with the FS form outlined in the PIM Guidelines (PIM Guidelines, Article 322). In case of missing information, the IMC may postpone the FS pending the submission of complete information.
ii. At the second stage of the assessment, the IMC will assess the project's alignment with the National and Sectoral Strategic Objectives. Projects that are not in line with the National development strategies and sectoral development plans will get postponed. In exceptional cases, CAs may justify projects that are not directly aligned with the strategic development plans. Such cases, for instance, may include projects that are designed to mitigate force majeure situations, such as droughts, floods, earthquakes, Et cetera.

iii. The last stage involves the IMC assessing the technical feasibility of the project, affordability of the project as well as the likelihood of the expected economic benefits of the project exceeding the cost of resources.

The IMC's decisions on FSs shall be issued between August and September. Only projects whose FSs pass both the internal assessment by the CA and the external assessment by the IMC should will be selected for inclusion in the National Budget. FSs approved by the IMC are valid for a period of three (3) years. Once a project's FS expires the project should be reappraised and resubmitted to the IMC for consideration following the internal and external screening processes described above.