

TOOLKIT EDITION 1 2018

CITIES' INFRASTRUCTURE
DELIVERY AND
MANAGEMENT SYSTEM

CIDMS



MODULE 8

Investment appraisal
and planning



national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

clTIES SUPPORT
PROGRAMME



IUDF

INTEGRATED URBAN DEVELOPMENT FRAMEWORK



MODULE PURPOSE

This module provides tools and techniques for project design, infrastructure investment appraisal, project financial planning and the prioritisation of capital projects for inclusion in the capital budget.

WHY

1. Investment proposals are responses to problems or opportunities. In most instances there are several possible alternative solutions in responding to problems and opportunities that include a range of non-asset and asset solutions. Whatever solution is selected, it will most likely come at some cost, whether to the municipality, the community or the environment. It will also draw on a limited pool of available capital, leaving less for other worthy initiatives. Investment appraisal is a means for decision-makers, whether Councillors, National Government, lenders, development agencies or donors to determine whether proposed projects are viable.
2. Traditionally, public sector projects were considered viable when they technically responded to the problem or opportunity to be addressed, and were affordable. Today, public sector projects are considered viable when they deliver net benefits to society. The most attractive projects are those that deliver benefits across a range of sustainability outcomes, and that limit or eliminate negative externalities.
3. An upfront understanding of what society and providers of funds value and dislike can help design attractive, value-for-money capital proposals more likely to succeed. Investment appraisal therefore isn't just a particular point in the process of identification, development and approval of projects, it should be viewed as a means to both plan and select the best possible solution.

OUTPUTS OF MODULE 8:

The adoption of a corporate multi-criteria analysis system to evaluate and rank investment proposals to firstly assess their merits against desired city outcomes, and secondly to rank investment proposals for inclusion in the city's budget. The multi-criteria analysis system should:

1. Reflect the outcome areas defined in the city's asset management policy, and the asset management objectives defined in the city's strategic asset management plan (defined as impacts in the multi-criteria analysis system).
2. Be prepared with full participation of the political leadership, especially with respect to the amalgamation rules applied to the multi-criteria analysis system.
3. Be formally submitted to Council for approval, and documented in the city's strategic asset management plan.

KEY RELEVANT NATIONAL REGULATIONS, POLICIES AND STRATEGIES:

1. Municipal Finance Management Act, No. 56 of 2003
2. Municipal Systems Act, No. 32 of 2000
3. Spatial Planning and Land Use Management Act, No. 16 of 2013

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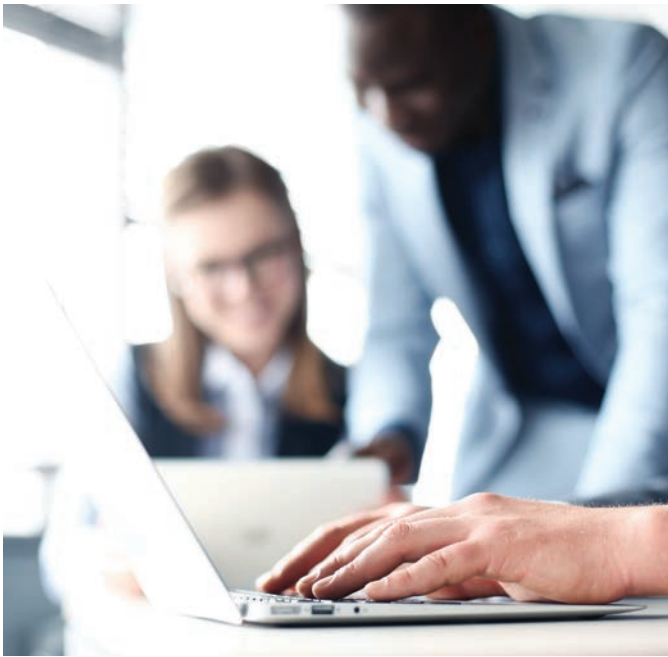


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8.1 INTRODUCTION TO INFRASTRUCTURE INVESTMENT APPRAISAL AND PLANNING

8.1.1 *What is investment appraisal and planning?*

The asset management planning process described in the previous modules generates multiple capital project proposals. These proposals are generated across departments for functions such as potable water, electricity, roads and stormwater, solid waste, public amenities, and for municipal operational facilities such as administrative buildings, depots, stores and yards. The nature of these capital proposals vary from the creation of new infrastructure, to upgrading of existing facilities, to the renewal of infrastructure, or consolidation or reconfiguration of current systems. All of these capital proposals have certain characteristics in common, as follows:



- They need capital outlay or funding to implement. Most require funding ranging from a few hundred thousand to several million Rand, a smaller number of projects will require funding measured in hundreds of millions of Rand, and then there are the mega projects, requiring in excess of a billion Rand. Collectively, the value of all capital project proposals will in a typical city amount to several billion Rand per annum.
- Constructing infrastructure creates long term liabilities. Once infrastructure is commissioned, it must be operated and maintained for its service potential or economic benefit to be enjoyed. In the event that infrastructure is funded through loans, interest costs and capital payments must also be made. These are all recurring operating expenditure that stacks up over time. In many asset portfolios initial capital investment, though large, represents less than 20 per cent of total lifecycle costs. The remainder of lifecycle costs are operating expenditure that municipal customers must fund by paying rates and tariffs.

In practice there are several economic realities to contend with. Funding requests generally exceed available funding. This is because capital is a scarce resource, and human needs are unlimited. This is the economic principle referred to in **Module 1**. In such an event a city will follow a capital rationing strategy, which is when the size of the available capital budget is restricted and all capital project proposals are screened for viability, and the best projects are incorporated into the capital budget until the capital budget limit is reached. The remaining projects are then deferred, redesigned for future consideration, or rejected. This is investment appraisal. Of course, when a city formulates several very attractive and viable projects for which capital is not available through normal means such as grant funding or own sources of funding, it can always obtain funding from the market place. In such an event investment appraisal is still needed to ensure that projects are viable, that there will be attractive returns, and that loans can be serviced from the projected returns.





The economic principle also applies to customers. One project may, when considered on its own merits and in isolation of any other project or commitments, be feasible. But implementing all viable projects may exceed the ability of ratepayers to absorb increases in rates and tariffs, particularly in times of economic downturn. Accordingly investment planning should not only consider a municipality's own financial capabilities, but also that of the citizenry it is dependent on for revenue.

Financial considerations such as capital availability and affordability are important. Cities must always take decisions to ensure ongoing financial viability. But there are other considerations as well, not all of which are financial. Capital investments should always support the mandate of cities, and the strategic objectives and outcomes that a city defines for itself. Some projects may from a financial perspective be very attractive, but may not support the mandate, objectives or desired outcomes of the city. Not all projects are financially feasible in their own right. Municipal roads, for example, require high levels of capital outlay, do not directly generate municipal revenue (though they have the potential to unlock land value and contribute to increased municipal property rates income), and once they are constructed, require significant and sustained expenditure over long periods for maintenance and

periodic renewal. The parameters and mechanics of financial appraisal reject projects that do not generate net revenue. Cities nonetheless have to invest in non-revenue generating assets for a variety of reasons. Accordingly, this module introduces techniques and models to appraise projects against a range of benefits or outcomes (e.g. financial, social, economic and environmental) aligned to city strategic objectives. This latter category of techniques and models include benefit-cost analysis (BCA) and multi-criteria analysis (MCA). Not only do these allow appraisal of a range of projects with dissimilar characteristics and baskets of benefits and disbenefits, they also provide the means to assess, rank and prioritise at a corporate level the project proposals submitted by various line functions and departments.



Investment appraisal and planning, therefore, is about:



Assessing capital project proposals to quantify their benefits and costs, and to determine which projects are both viable and desirable for inclusion in the capital budget;



Planning for how investments are to be funded;



Ensuring that investments made are affordable over the lifespan of assets, to both the municipality and customers.



8.1.2 *Lay-out of this module*

Section 8.2 deals with the identification of problems and opportunities, and the development of infrastructure investment options. It focusses on basics such as what are benefits and costs, how to distribute and discount them, opportunity costs and capital rationing, and what analysis periods to select for investment appraisal.

Section 8.3 provides techniques for infrastructure appraisal, including net present value, benefit-cost analysis and internal rate of return, and for sensitivity analysis. Qualifying (worthy) project proposals are subjected to financial planning in

Section 8.4. **Section 8.5** deals with organisational optimisation, ensuring that projects meet the strategic outcomes desired by Council, and are prioritised accordingly for inclusion in the capital budget.



8.2 IDENTIFY PROBLEMS OR OPPORTUNITIES AND DEVELOP POTENTIAL SOLUTIONS

8.2.1 Sustainability and realisation of city strategic objectives

Cities should adopt sustainable development strategies and their investments should support the achievement of sustainable outcomes. Sustainability has multiple dimensions in the urban infrastructure context, including:

01 ECONOMIC SUSTAINABILITY

Including providing an enabling environment for economic growth through the timely provision of appropriate infrastructure services at reasonable cost, and avoiding infrastructure investment decisions that create periodic city fiscal shocks.

02 SOCIAL SUSTAINABILITY

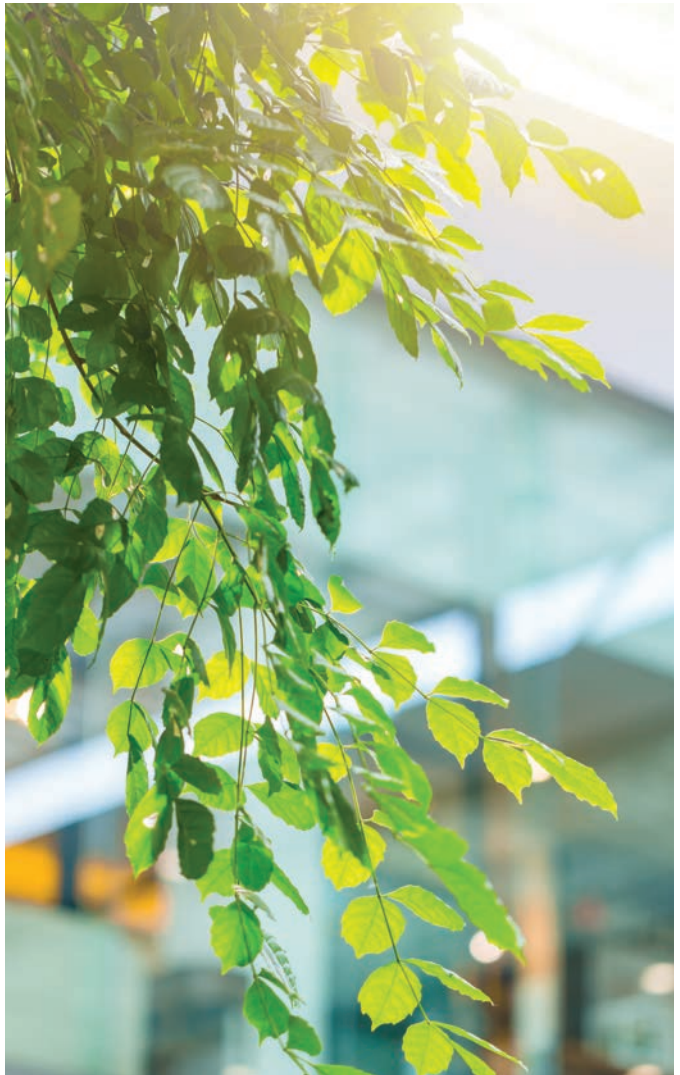
Involves creating sustainable, successful places that promote wellbeing and social inclusion by combining design of the built realm with design of the social world, and providing amenities to support social and cultural life. It also requires systems for citizen engagement, cultural relationships, recognition of community strengths and needs, and transmitting social sustainability awareness.

03 ENVIRONMENTAL SUSTAINABILITY

Requires that development and consumption do not exceed the environment's carrying capacity. This involves limiting city spatial footprints, curbing consumption through non-asset solutions, addressing net demand wherever possible through green infrastructure solutions, and over time to retrofit existing infrastructure to be more resource efficient.

04 FINANCIAL SUSTAINABILITY

Requires investment decision-making that pursues financial viability of the municipality measured in a favourable solvability position and ongoing liquidity.



Accordingly, all capital project proposals should be measured against city strategic objectives. This is done by adopting a corporate multi-criteria analysis system, and evaluating all capital project proposals against this system. Guidance on the design of a multi-criteria analysis system is provided in **Section 8.5**. Note that in investment appraisal terminology, capital project proposals or investment proposals are simply referred to as "projects".

8.2.2 Identification of a problem or opportunity

Any request for capital investment starts with the identification of a problem or opportunity. A problem can be something like:

01 COMPLIANCE REQUIREMENTS

New regulation forces infrastructure system upgrades or reconfiguration. **Examples include:**

- Environmental legislation requires landfill sites to implement and operate technologies to deal with leachate control and process methane emissions. Two of the cities landfill sites do not meet these requirements.
- Following a facility safety audit conducted in terms of new safety regulations, it was determined that the current configuration and manual clearance operations at the inlet chambers of the city's waste water treatment plants present unacceptable safety risks to workers, and that inlet design does not sufficiently address smell pollution.
- An eight storey municipal building accommodates some 246 employees across several corporate units. Following inspection, a certificate was issued stating that the building was unsafe, and the municipality was notified to rectify issues identified during the inspection within a specified time limit or the building would be condemned. These issues included basement flooding with some structural damage, malfunctioning lifts beyond end-of-life expectation, and an insufficient air conditioning system which contributes to chronic employee illness.

02 UNACCEPTABLE RISK EXPOSURE

Such as the following incident:

- A vehicle accident on a rainy night involving loss of life led to litigation against the city. The regional high court found that the accident was triggered by an aquaplaning event, which could have been avoided had the municipality implemented appropriate stormwater infrastructure arrangements. The court awarded damages to the family of R 8.7 million. The city's corporate risk management policy declares any risk above R 5 million to be unacceptable risk exposure that requires intervention.

03 SERVICES BACKLOG OR COMMITMENT TO EXTEND SERVICES

Such as:

- People from outside the municipal area illegally settled on vacant land on the urban periphery. The matter was not addressed when it first happened, as initially there were less than 10 shacks. Over time this informal settlement grew to some 1 700 shacks. The court ruled that the settlers cannot be moved, and services must be provided in situ.



04 ASSET FAILURE

Such as:

- **Capacity:** given current mortality rates, available plot space in the city's cemeteries will be filled in the next 30 months.
- **Condition:** concrete reservoir 7 has been inspected. The assessment team found visual deformation of 50mm on the foundation and visible, persistent cracks in excess of 1 mm wide on the walls.
- **Performance:** a large motor has been rewired on two previous occasions, and the power loss has become such that it can no longer perform to expectations.
- **Cost-of-operations:** a borehole and pump has been providing potable water to a small remote village. It was fitted with a diesel motor but the cost of regular fuel deliveries (including personnel and vehicle costs) has become prohibitive. Although the motor is still in good condition, it has become more cost-effective to supply from a nearby village that has been recently electrified.



Opportunities can generally be classified as follows:

- **Risk reduction:** in the event that the city itself proactively identifies scope for risk reduction (as opposed to the problem where the court found that the city should have provided proper stormwater). An example of this is when the city decides to change design standards for road-side poles to be frangible.
- **Efficiency improvements:** whether they are opportunities for cost reduction (e.g. reduced maintenance expenditure or improved energy efficiency) or opportunities for improvement in operations.
- **Revenue enhancement:** examples of which include smart metering systems and investment in industrial parks.
- **Unique opportunities:** seldom or only periodically present themselves, each of which are distinct in the promise they hold.

Having identified a problem or opportunity, a clear project objective must be defined and documented – this is the starting point for preparation of the project proposal. The project objective must describe the problem or opportunity to be addressed, and the outcome(s) desired.




Good practice dictates that the project objective(s) demonstrates achievement of the city's strategic objectives. In the event that the project objective(s) does not support any of the city's strategic objectives, then test the project objective against legislative requirements as it applies to the city, and document the relationship. **If the project objective(s) does not support any city strategic objective or legislative requirement, then:**

- It may be an unique case that warrants further careful consideration;
- The matter should be rejected and no further effort invested; or
- The issue should be referred elsewhere. For example, the city's population exceeds the capacity of the existing hospital. However, hospitals are a provincial competence and extending the current hospital or building a new facility is a decision for the provincial administration. The problem should be brought to the attention of the provincial authorities.

8.2.3 Identify potential solutions

Having identified and documented the problem or opportunity as well as the project objective, the next step is to identify possible solutions. Avoid the temptation to simply propose easy solutions or solutions that have always been implemented in the past.



The process of identifying solutions to a problem or opportunity should be an honest attempt to find the best possible solution for the city. It should reflect current best thinking – not preconceived solutions or outcomes.

When formulating solutions, be sure to consider both non-asset and asset solutions, such as:

SOLUTION TYPE	TACTIC	
Non-asset solutions	Reassess service requirements and delivery options	Possible adjustment in levels and/or standards of service
		Outsourcing options
	Demand management	Maintain status quo
		Synchronisation of supply and demand
		Limit or reduce demand
		Substitute demand
		Delay demand
Increase demand		
Asset solutions	Asset level options	Maintain status quo
		More/less maintenance
		Shift maintenance regime (between predictive, preventative and reactive maintenance)
		Renewal: modern equivalent with similar functionality
		Renewal: green retrofitting
		Upgrading
		Combination renewal and upgrading
		Asset decommissioning/disposal – no replacement
		Replacement: different asset with the same functionality and capacity
		Replacement: different asset with more/less functionality and capacity
	Replacement: green infrastructure	
	System or portfolio level options	System expansion
		System reconfiguration
		Regional system integration
		Shift function: e.g. design public parks for stormwater capture and attenuation

TABLE 8.1: Asset and non-asset solutions

Module 5: Future demand provides guidance on future infrastructure trends, demand management and demand responses. When identifying solutions, attempt to identify both asset and non-asset solutions. Asset solutions should also consider both green infrastructure and traditional grey infrastructure.



- Very often the best solution requires adoption of several tactics across the asset and non-asset solution categories, or over the asset lifecycle. Be careful to adopt linear thinking, but also do not unnecessarily over-complicate possible solutions.
- Think beyond purely technical options to solutions that would, if implemented, deliver a range of economic, social, financial and environmental benefits.

8.2.4 Sift potential solutions

Developing robust project proposals or business cases to address a problem or opportunity takes a lot of effort, as does the appraisal of such proposals. Ultimately only one project proposal will be accepted. As a result it is prudent to strike a balance between finding the best possible solution and not spending excessive resources in finding the best solution.

Accordingly, potential solutions should be sifted at this point using some basic criteria. These include the following questions:

1. Will the solution, if implemented, contribute appropriately to the financial, economic, social and environmental sustainability of the city? (Note: solutions that only contribute towards one dimension of sustainability (e.g. financial) are often not fully sustainable, however, the solution itself may hold the potential to contribute towards multiple sustainability outcomes, but simply have not been conceived or articulated as such – in such a case consider redesigning the solution).
2. Does the potential solution pass deal-breakers? Deal-breakers are non-negotiable asset management objectives defined in the City's asset management policy (see Module 2). Non-compliance with any of these objectives or deal-breakers should result in the elimination of a proposed solution, even if the solution is otherwise an attractive one.

DEAL BREAKERS	SCORING FOR COMPLIANCE	
Aligned to city vision and strategic objectives	Yes	No
Comply with legal requirements	Yes	No
Negative economic, financial, social or environmental consequences that can't be reasonably mitigated	Yes	No
Exposes the city to unacceptable levels of risk (see risk tolerance levels in corporate risk policy)	Yes	No

TABLE 8.2: Investment proposal screening list: examples of deal-breakers

Having sifted potential solutions, the shortlist of available options should normally include the following solutions as a minimum:



The current solution or status quo option (base case)



The least cost solution that will still achieve the project objective



The apparent most beneficial solution

These potential solutions must now be developed to a point where rigorous evaluation of their merits are possible.

8.2.5 Process summary: identification of problem or opportunity through to shortlisting of options

The preceding sub-sections described a process starting with the identification of a problem or opportunity, definition of a clear project objective and outcome, and preliminary screening that results in a shortlist of options which must now be analysed in more detail.

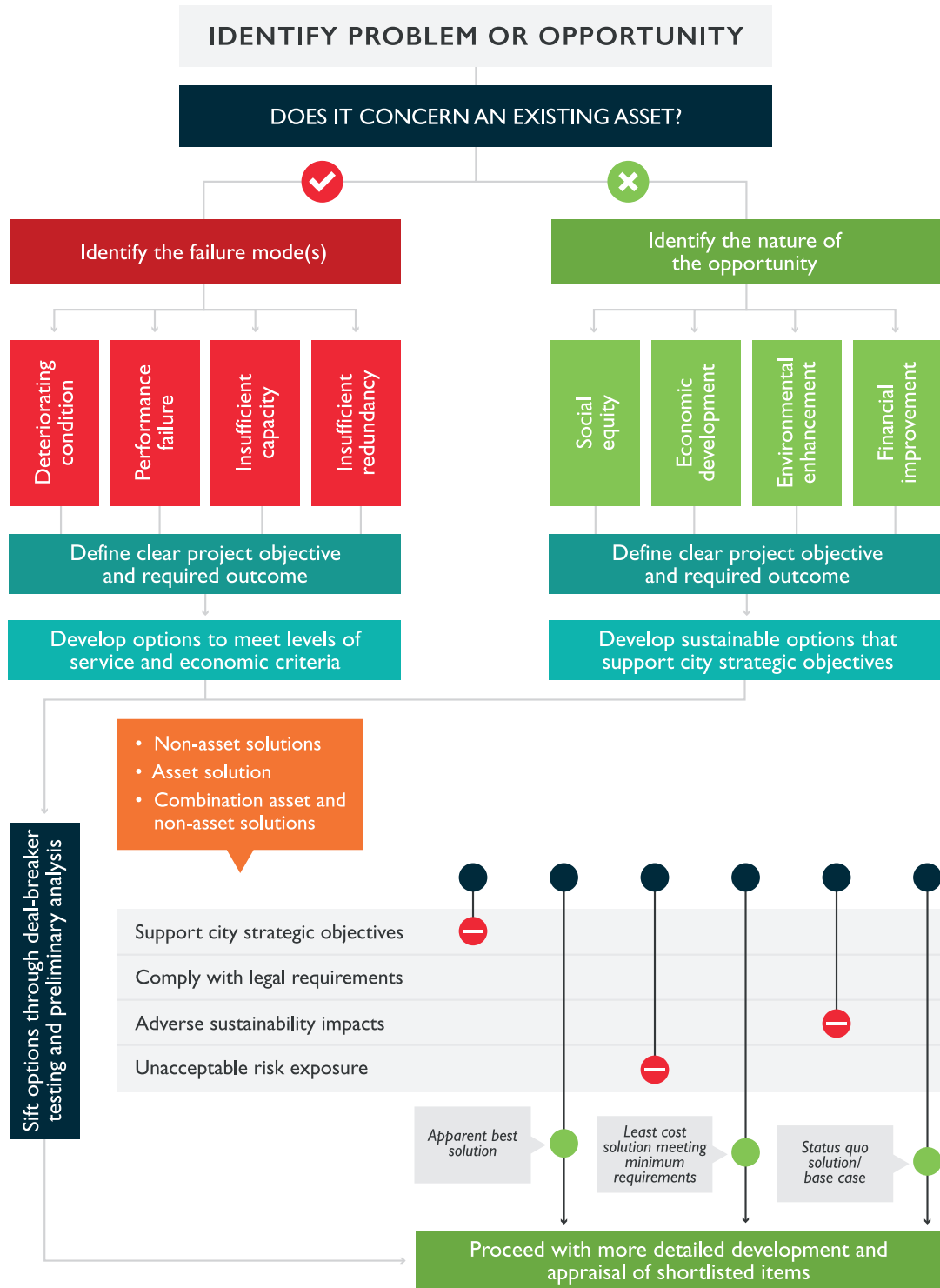


FIGURE 8.1: Process from identification of problem or opportunity through to shortlisting of options



8.2.6 *Determining benefits and costs*

CAPITAL PROJECT PROPOSALS PRESENT BASKETS OF BENEFITS AND COSTS

Each capital project proposal presents a basket of benefits and costs. A viable capital project proposal is one that delivers net benefits, meaning the benefits exceed the costs of the project. But what are benefits and costs? This sounds like a simple question, but it really isn't. Some benefits and costs can be easily measured in financial terms, others not. Consider investment in a road. Direct costs are easy to quantify: they include the costs of design and construction (initial capital outlay), as well as recurring operating and maintenance expenditure. There are generally no direct financial benefits accruing to the municipality, since municipal roads aren't tolled, and no direct revenue is earned. But there are many other non-financial benefits and costs associated with road construction. Direct benefits could include greater movement, reducing congestion and improving the efficiency of the city's economy (e.g. less time in traffic, greater levels of trip reliability and faster delivery times), lower vehicle operating costs and reduced accidents. But how to quantify the benefits of, say, reduced accidents? There are also indirect benefits, which may include unlocking land for economic purposes and enabling increased property rates income. Then there are further costs still, such as possible increases in the levels of air pollution, more noise pollution, and more restrictions on the movement of fauna.



In the event that the road investment proposal is accepted but no mitigation measures are implemented to counter, say, increased air and noise pollution, negative externalities arise. Negative externalities are costs or adverse impacts not included in the cost structure of the organisation producing those adverse impacts. In other words, the organisation gets a free ride, and society at large suffers the consequences. Should the city decide to internalise those costs, the nature of the costs change from indirect costs (e.g. air or noise pollution), to direct costs (e.g. costs to construct noise barriers and selection of appropriate surface pavements).

When infrastructure is constructed for a newly proclaimed township it is generally easy to determine the revenue and expenditure streams relating to the new infrastructure. But what about the replacement of a segment of water pipe in an existing system? Though water is a revenue generating service, the city will not earn any more income after replacing the segment of pipe than it did before. Situations like these require careful thought about the benefits and costs of the proposed project.

Any worthwhile project will however generate benefits. In the case of the replacement of a segment of water pipe, the benefits will include reduced water losses and reduced maintenance expenditure, both of which amount to real savings in operating expenditure, as shown in Box 8.1 below.



BOX 8.1: DETERMINING THE NET BENEFITS OF WATER PIPE REPLACEMENT

A segment of 600mm diameter water pipe that is 200m long has failed (e.g. bursts) on seven occasions over the past twelve months. The cost of replacing a linear meter of 600mm diameter pipe is R 5 000 (brownfields rate), and to replace the whole segment would cost R 1 million. The cost per repair event is R 4 150, amounting to repair expenditure of R 29 050 per annum on that segment of pipe. At face value it appears that it would be less expensive to continue to maintain the pipe. But let's consider the possible benefits of replacing the pipe. Every time the pipe fails, water losses are incurred that lead to increased expenditure. And if the pipe is replaced, maintenance expenditure is reduced, resulting in savings.

The first step is to determine the volume of water carried in different diameter size pipes and water losses for different sizes of pipes, to calculate the likely savings from reduced water losses if the pipe is replaced. The bulk purchase cost per kilolitre is R 7.71, and the water loss per metre of large diameter pipe in poor or very poor condition is 45 kℓ per annum.

Pipe distribution network: Diameter sizes, volumes and water losses

Ø (MM)	MATERIALS TYPE					TOTAL	AVE Ø	VOLUMES		WATER LOSSES % SMALL/ LARGE
	AC	UPVC	HDPE	STEEL	OTHER (MPVC, GRP)			VOLUME IN Kℓ	% BY VOLUME	
<100	928 060	1 728 725	361 525	235 910	3 080	3 257 300	80	16 364 675	3	35
≥ 100 <200	1 788 590	2 674 010	111 050	1 348 215	17 210	5 939 075	150	104 898 912	22	
≥200 <300	309 220	376 695	4 490	235 660	0	926 065	250	45 435 064	10	
≥300 <500	181 515	134 690	1 530	447 345	0	765 080	400	96 094 048	20	65
≥500 <700	39 725	17 225	30	279 255	895	337 130	600	95 272 938	20	
≥700 <900	5 170	3 315	0	120 935	0	129 420	800	65 020 608	14	
≥900	165	6 070	0	58 425	0	64 660	1 000	50 758 100	11	
TOTALS	3 252 445	4 940 730	478 625	2 725 745	21 185	11 418 730		473 844 345	100	

Next, distribute the benefits and costs in a cash flow projection:

Cash flow forecast

YEAR	1	2	3	4	5	6	7	20
Renewal	1 000 000	-	-	-	-	-	-	-
Water losses	68 831	68 831	68 831	68 831	68 831	68 831	68 831	68 831
Repair costs	29 050	29 050	29 050	29 050	29 050	29 050	29 050	29 050
TOTAL ANNUAL SAVINGS	97 881	97 881	97 881	97 881	97 881	97 881	97 881	97 881

Initial indications are that the municipality would save R 97 881 per annum in reduced maintenance expenditure and reduced water losses if it replaced the water pipe segment – these are the project benefits. The project cost is the cost of renewal of the segment of water pipe.



The water pipe replacement example shows that savings in expenditure are treated as benefits: they equate to revenue.

POTENTIAL BENEFITS AND COSTS PER TYPE OF INFRASTRUCTURE PORTFOLIO

Possible benefits per type of infrastructure portfolio are indicated in the table below, on the assumption that the city has adopted a climate resilient infrastructure policy that also entails implementing green infrastructure wherever feasible. Following through on this assumption, a landfill site, for example, would contribute to the city having to purchase less bulk electricity, as the methane produced by the facility would be converted to energy and taken up in the municipal grid. See **Module 5** for more guidance on green infrastructure trends. Also note that benefits are not automatic, projects have to be designed to deliver the types of potential benefits that capital investment in these asset portfolios hold.

BENEFITS CLASSIFIED PER DIMENSION OF SUSTAINABILITY	ACTIVE TRAVEL INFRASTRUCTURE	ENERGY	PARKS	POTABLE WATER	ROADS	SOLID WASTE	STORMWATER	SANITATION	BUILDINGS/ AMENITIES
ECONOMIC									
Accident reduction	●				●		●		
Enhanced tourism opportunities	●		●	●	●			●	●
Flood damage control			●				●		
Improved transportation efficiency	●				●				
Increased business opportunities		●	●	●	●	●		●	●
Job creation	●	●	●	●	●	●	●	●	●
Land value capture/enhanced property value	●	●	●	●	●	●	●	●	●
FINANCIAL									
Bulk purchase cost savings		●		●		●			
Maintenance savings	●	●	●	●	●	●	●	●	●
Operation cost savings	●	●	●	●	●	●	●	●	●
Reduced risk	●	●	●	●	●	●	●	●	●
SOCIAL									
Accessibility	●	●	●	●	●	●	●	●	●
Improved health	●		●	●		●		●	
Improved public safety	●			●			●	●	●
Improved social inclusion	●		●						●
Improved social well-being	●	●	●	●	●	●		●	●
ENVIRONMENTAL									
Flood management/mitigation			●				●		
Improved ecological functioning	●	●	●	●	●	●	●	●	●
Improved energy efficiency	●		●	●		●		●	●
Reduced water consumption		●	●	●	●			●	●

TABLE 8.3: Potential benefits per type of infrastructure portfolio



POTENTIAL COSTS CLASSIFIED PER DIMENSION OF SUSTAINABILITY	ACTIVE TRAVEL INFRASTRUCTURE	ENERGY	PARKS	POTABLE WATER	ROADS	SOLID WASTE	STORMWATER	SANITATION	BUILDINGS/ AMENITIES
ECONOMIC									
Business relocation costs	●	●	●	●	●	●	●	●	●
Increase in accidents					●				●
Reduced tourism opportunities		●			●	●			
Greater flood damage potential	●	●	●	●	●	●		●	●
Reduced transportation efficiency					●				●
Reduced business opportunities		●			●	●		●	
Job shedding	●	●	●	●	●	●	●	●	●
Impaired property value		●		●	●	●		●	
FINANCIAL									
Capital investment costs	●	●	●	●	●	●	●	●	●
Increase in bulk purchase costs		●		●					
Increase in maintenance costs	●	●	●	●	●	●	●	●	●
Increase in operation costs	●	●	●	●	●	●	●	●	●
Increased risk	●	●	●	●	●	●	●	●	●
SOCIAL									
Diminished accessibility			●		●				
Reduced health					●	●		●	
Reduced public safety			●		●				
Reduced social inclusion					●				
Reduced social well-being				●	●	●		●	
ENVIRONMENTAL									
Carbon production		●		●	●	●		●	●
Increased flood potential	●			●	●			●	●
Declining ecological functioning	●	●	●	●	●	●	●	●	●
Land take and habitat loss	●	●	●	●	●	●	●	●	●
Greater levels of energy consumption		●		●	●	●		●	●
Increasing water consumption		●	●	●				●	●

TABLE 8.4: Potential costs per type of infrastructure portfolio

Note that not all costs necessarily apply in each investment case.

CATEGORIES OF BENEFITS AND COSTS

The water pipe example shows that there are both direct and indirect benefits and costs associated with capital project proposals. There are also a range of intangible benefits and costs (e.g. increases or reductions in air or noise pollution).

CLASSIFICATION	DESCRIPTION	BENEFITS	COSTS
Direct benefits and costs	These are incurred by the municipality undertaking the investment.	Increased revenue: <ul style="list-style-type: none"> • Property rates income • Income from service charges • Income from ticket sales • Rental income • Capital appreciation of investment properties 	Investment costs (capital outlay): <ul style="list-style-type: none"> • Disposal of facility to be replaced • Concept and detailed designs • Land acquisition • Costs associated with any consents or approvals required • Construction costs (or costs of acquisition of manufactured items) • Other professional fees relating to the project • Asset handover and commissioning costs
	Direct benefits and costs can be calculated with relative ease using cost accounting techniques or through market research.	Asset life extension	
		Savings in either operating or maintenance expenditure	Additional or incremental operating expenditure: <ul style="list-style-type: none"> • Additional operating expenditure e.g. bulk purchases of water or electricity, more staff and other consumables • Additional maintenance expenditure
		Risk reduction	
Indirect benefits and costs	These are often externalities or spill overs that emerge when the proposed capital project is implemented.	Externalities that benefit the community: <ul style="list-style-type: none"> • Enhanced property values • Improved transport efficiency • Expanded business opportunities • Increased employment opportunities • Higher levels of tourism • Improved public safety • Improved community wealth • Improved social well-being and inclusion 	Externalities that disbenefit the community: <ul style="list-style-type: none"> • Diminished property values • Reduced transport efficiency • Contracted business opportunities • Reduced employment opportunities • Lower levels of tourism • Reduced public safety • Diminished community wealth • Reduced social well-being and inclusion
	Externalities can be positive (benefits) or negative (costs), and are experienced by the citizenry		
Tangible benefits and costs	These are benefits and costs that can be quantified in financial terms	All direct benefits listed above are examples of tangible costs	The mental and health costs associated with noise pollution are examples of intangible costs – provided that there is no recent study quantifying the impacts of noise pollution

TABLE 8.5: Benefits and costs considered in infrastructure investment appraisal

Why do we differentiate between direct and indirect costs? The municipality making the investment must consider the capital investment proposal based on its financial merits to determine the financial viability of the project. A municipality must after all remain financially sustainable. The direct benefits and costs listed above accrue directly to the municipality, and are therefore considered in financial analysis tests performed on projects.

Any investment by a municipality involves the application of public funds, and should result in a positive contribution to the community's total welfare. The indirect benefits and costs listed above measure those changes in community welfare – they do not reflect in the annual financial statements of the city, but they are the reason the municipality exists.



It is also reasonable to ask why to bother with assessing intangibles if we can't easily quantify them in financial terms. The following sub-sections provide guidance on the weighting of all types of benefits and costs whether direct, indirect, tangible or intangible. A multi-criteria analysis system is also presented which takes account of all benefits and costs to both the municipality and the community it serves.



Take care to identify pecuniary benefits and costs for what they really are: they do not constitute gains to either the municipality or the community it serves.

One category of benefits and costs not reflected in **Table 8.5** is pecuniary benefits and costs. These materialise following changes in relative prices as the economy adjusts to the provision of a public service. When this happens, benefits accrue to some but are offset by losses accruing to others. In short, there are winners and losers, and there are no net additional benefits to society. How can this happen? **Consider the following two examples:**

01 GENTRIFICATION

The municipality embarks on an urban renewal project. Some 552 families are moved to other areas to make way for an exciting new mixed-use development incorporating 44 high-end loft style apartments for executives, high street retail facilities, fashionable restaurants, a gym and some office space. Shop owners, mostly local small operators, some of whom have been operating their businesses in the area for decades, are not able to afford the new, higher rents. They are forced to either close their businesses or to relocate to other areas, incurring the costs of relocation and the difficulty of building a new clientele. In this example 44 families benefit, but 552 families are worse off. They have to relocate, their social networks are disrupted, and they likely have to travel greater distances to places of employment, increasing their costs of living. Society as a whole does not benefit. Note though that whilst this example is realistic and reflective of many experiences to date, urban renewal itself is not a bad thing – the urban renewal intervention can be designed in such a manner that net benefits to society is created.

02 A SECOND MUNICIPAL AIRPORT

A municipality has an airport, largely used for limited freight haulage, private operators and parachuting. The facility has space for expansion of both on-site facilities and runways to accommodate larger planes, and currently generates annual net revenue of R 24 million per annum. The city nonetheless decides to construct a new municipal airport some 25 km away, as it intends to develop an aerotropolis precinct at a different location. The cost of constructing the new facility is estimated to be R 641 million, annual revenue some R 51 million, and annual operating and maintenance expenditure around R 22 million (including interest charges and capital repayments). Since the existing facility is itself profitable with a well-established brand, the city intends retaining the existing airport alongside the new facility. This is another example where pecuniary costs come into play. Why? The new facility will generate R 3 million more in net revenue than the existing facility. However, to generate this income it has to capture the clientele of the existing facility. This is because any city will only have so many flight operators and private pilots with their own airplanes – so demand will be limited. One facility benefits at the cost of the other, and since the operating expenditure of both exceed the city's airport revenue potential, society incurs net additional costs.



A multi-criteria rapid environmental and social assessment tool for municipal infrastructure projects is included in Appendix 8.A. This tool will assist cities to improve the design of projects by considering which project alternatives deliver the best basket of benefits and appropriately deal with externalities.

8.2.7 Preparing cash flow forecasts

Investment appraisal is about considering proposals and their future impacts in terms of benefits and costs. The first important point here is the emphasis on future impacts. This means that past investments are considered sunk costs and play no part in the consideration of the investment proposal now being appraised.

01 PREPARING DISCOUNTED CASH FLOW FORECASTS

Future benefits and costs are typically presented in a cash flow forecast that depicts expected revenues (benefits) and expenditure (costs) on an annualised basis over the analysis period. The length of the analysis period should be calibrated to the expected economic life of the project or asset being appraised. The cash flow forecast should be presented in the initial investment proposal. There are some rules to apply when preparing discounted cash flow forecasts. These are:

1. Distribute revenue and expenditure over the analysis period as they are expected to materialise.
2. The exception to rule 1 is that residual or scrap value, which is revenue that the city expects to earn from the sale of the asset at end-of-life, is included in year 1 of the forecast, or if the project involves multi-year construction, in the year in which the asset is expected to be ready for use.
3. Ignore depreciation. Depreciation is a means to allocate capital costs over the life of the project. This is however not necessary, as capital costs are already included in the form of investment costs or original capital outlay.
4. Do not provide for general inflation. Financial appraisal employs discounted cash flow analysis that adjusts future cash flows to present values. However, if the price of a specific expenditure item such as structured steel, concrete or diesel is expected to increase relative to general prices, then adjustment should be made for this, but only in relation to the general price level. Any such an assumption should be noted in the analysis.
5. When first preparing the cash flow forecast as part of the project proposal, ignore financing costs. At this stage the proposer does not yet know how the project will be funded, and the discount rate already takes account of the weighted average cost of capital – these terms are discussed in following sub sections.

“ Financial appraisal employs discounted cash flow analysis that adjusts future cash flows to present values.”

02 DISCOUNTED CASH FLOW ANALYSIS

Investments in infrastructure normally represent long term impacts, with benefits and costs accruing over years, often decades. Discounted cash flow (DCF) analysis is a means of discounting future benefits and costs to present value (PV) using the following formula:

$$PV = \frac{\text{EXPENDITURE IN YEAR N}}{(1 + \text{DISCOUNT RATE})^{(N)}}$$



BOX 8.2: CALCULATING PRESENT VALUE



Recall the segment of 600mm diameter water pipe that is 200m long. Let's assume that we know the number of pipe failures, but the municipal costing system is not sophisticated enough to allow us to determine the cost per pipe repair event. We also do not have sufficient data to reasonably cost the impacts of water losses incurred during pipe bursts. We do however know that the pipe segment needs replacing at some point. The MTEF has largely been fixed, and the CFO indicated that the inclusion of the pipe segment project in the budget will require that another water project must be removed from the budget.

Is there any benefit in delaying the project to replace the segment of pipe at a later stage? Replacing the segment of pipe today would cost R 1 million. The MTEF is a three-year instrument, so the earliest the project can commence if we delay the project is four years. The discount rate is 8%. The present value of the capital expenditure to replace the segment of pipe in four years' time is then:

$$\begin{aligned} PV &= R\ 1\ 000\ 000 / (1+0.08)^4 \\ &= R\ 735\ 030 \end{aligned}$$

Deferring the water pipe capital expenditure will result in a saving of:

$$R\ 1\ 000\ 000 - R\ 735\ 030 = R\ 264\ 970$$



03 DISCOUNT RATE

The discount rate converts flows of benefits and costs over time (present and future money values) into a net present value. This is done to:



Establish whether a project is worthy. A worthwhile project will have a positive net present value.



Compare projects with unequal lives, a situation that often occurs in the municipal space.



DCF analysis can also be used to select the optimum timing of investment projects, especially when there is unused capacity in earlier years.

The discount rate equates to the opportunity cost of capital. Public money is limited, as is capital that can be sourced from the market to finance public projects, whilst the needs of the city are unlimited. Therefore money invested in one project means an opportunity missed to invest in another project, or, more simply, the opportunity cost of a choice is what you give up to get it.

OPPORTUNITY COST IS DEFINED AS:

The cost of cash flows that could have been earned in the best alternative investment opportunity.

The discount rate is also referred to discounting rate, the capital hurdle rate or the social discount rate (the latter when applied in the public sector).

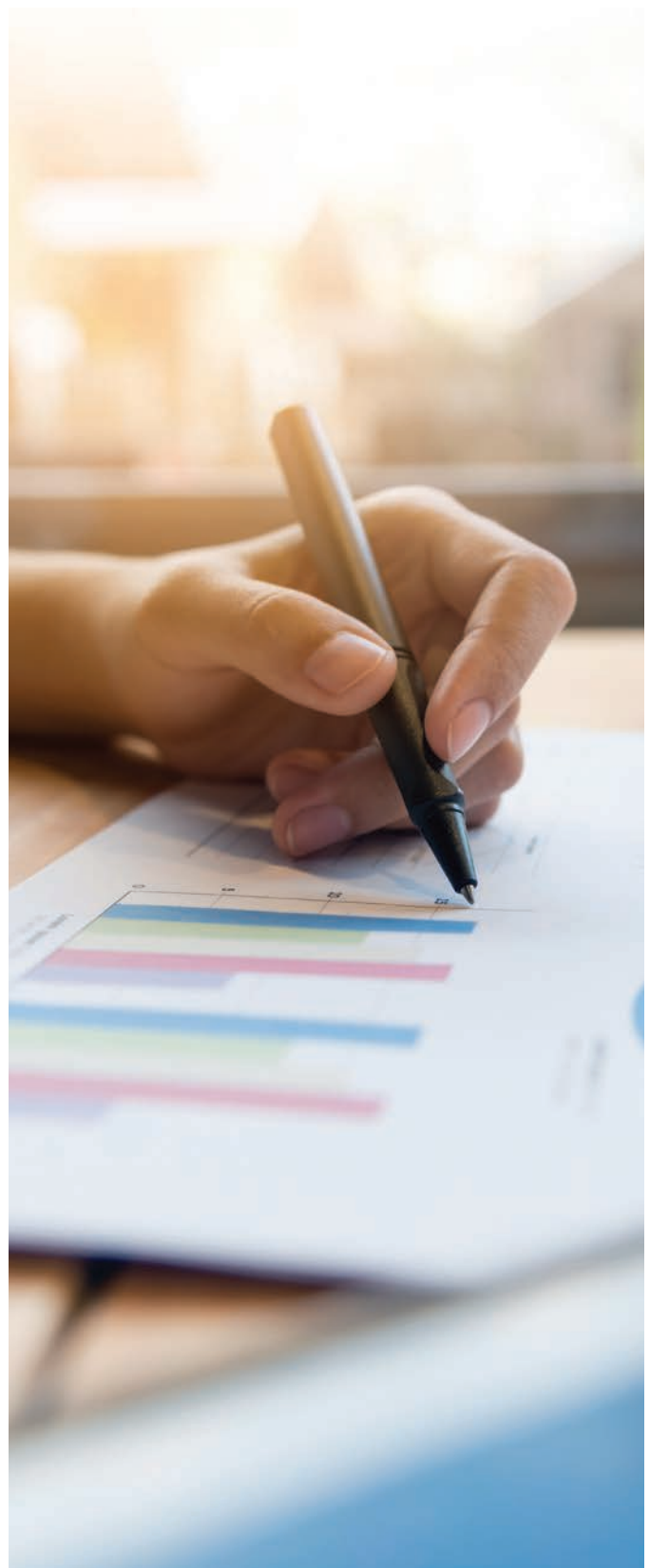




The following are key rules and considerations in the establishment and application of the discount rate:

1. The discount rate is set annually by the Chief Finance Officer, and then applied in all investment appraisal analyses.
2. The implication of (1) above is that all project proposals are subjected to the same discount rate, as the issue of the opportunity cost of capital applies to the organisation as a whole.
3. It is sometimes believed that it is not necessary to apply discounted cash flow analysis to grant-funded investments. This belief is incorrect, for the following reasons:
 - Grant funding represents public money that should be used wisely and to best effect.
 - Grant funding itself is limited, hence opportunity costs still apply.
 - Capital grants fund initial investment costs. That investment gives rise to future benefits and costs that are generally not grant-funded, and that requires careful analysis of the present value of those future impacts to determine whether it is a good investment.
4. The discount rate is normally the weighted average cost of capital (WACC) for the organisation as a whole.
5. When determining the discount rate, consider the following:
 - It should normally absorb all available capital on projects where the benefits exceed project costs.
 - In times of capital scarcity, the discount rate should be raised, all other considerations being equal. The discount rate should therefore also be lowered in times of abundance of capital. The discount rate must however always be a positive factor (higher than 0%).
 - When raising the discount rate in times of capital scarcity, be careful that the discount factor does not prejudice against optimal lifecycle solutions. Under these conditions the discount rate can lead to selection of lower capital investment costs and higher maintenance cost solutions.
6. Notwithstanding (1) and (2) above, there are specific circumstances under which a different discount rate would be applied, typically when a project with a risk profile higher than the norm is being evaluated.

“ The discount rate is set annually by the Chief Finance Officer, and then applied in all investment appraisal analyses.”



04 INVESTMENT ANALYSIS PERIOD

The choice of the investment analysis period is an important one. If the period selected is too short, it is highly unlikely that capital projects will generate sufficient benefits to be financially viable. Selecting excessively long periods are not the answer either. The longer the analysis period, the more the discount rate reduces future benefits and costs, as shown in the table below.

DISCOUNT RATE = 8%				
YEAR	ANNUAL REVENUE/EXPENDITURE	PRESENT VALUE	% VALUE IN CURRENT TERMS	
0	R 1 000 000,00	R 1 000 000,00	100%	
1	R 1 000 000,00	R 925 925,93	93%	
5	R 1 000 000,00	R 680 583,20	68%	
10	R 1 000 000,00	R 463 193,49	46%	
15	R 1 000 000,00	R 315 241,70	32%	
20	R 1 000 000,00	R 214 548,21	21%	
25	R 1 000 000,00	R 146 017,90	15%	
30	R 1 000 000,00	R 99 377,33	10%	
35	R 1 000 000,00	R 67 634,54	7%	
40	R 1 000 000,00	R 46 030,93	5%	
45	R 1 000 000,00	R 31 327,88	3%	
50	R 1 000 000,00	R 21 321,23	2%	

Here are general rules and considerations in selecting an appropriate investment analysis period:

1. One year (12 months) is the base unit of analysis in the analysis period. Expenditure that results in benefits accruing in a period shorter than one year is operating expenditure.
2. The analysis period should generally correspond with the economic life of the asset being considered. If a road surface has an economic life of 15 years, then the analysis period should also be 15 years.
3. Some assets, such as dam walls, have extremely long economic lives. In some instances their lives can be measured in hundreds of years. In other words, the asset life, seen from the perspective of our generation, is for all practical purposes infinite. In such a case, the correct approach is to only forecast benefits and costs to the point where the project breaks even (benefits equal costs), or to the point where future cash flows assume an unchanging pattern.
4. Notwithstanding (3) above, in practice it is more prudent to limit the investment appraisal period to 30 years in the event that the asset will have a longer lifespan. This is partly because future cash flows beyond the 30-year boundary are discounted to very small amounts and their impacts will in the distant future have little effect, and partly because the distant future is highly uncertain.

TABLE 8.6: Calculation of PV at 8% discount rate



But there is another reason still. Each successive generation is wealthier than the one before it, and enjoys a progressively higher standard of living. Even relatively poor people today enjoy benefits that kings in past generations could not conceive of, such as instant communication, the ability to travel great distances in short spaces of time, and all the benefits that electricity offers. An investment that can't yield positive benefits within the next 30 years means that the current generation is investing on behalf of future generations, who will have greater capacity to make investments. Is it worthwhile and just to invest mostly for the benefit of future generations, when there are so many unserved needs in the current generation?

BOX 8.3: MORE ON LONG INVESTMENT ANALYSIS PERIODS



Is it worthwhile and just to invest mostly for the benefit of future generations, when there are so many unserved needs in the current generation?

The answer would generally be no. At the heart of it, this is a discussion about sustainability. And sustainability demands that each generation is entitled to meet its own needs without comprising the ability of future generations to do the same. So when there is a large proportion of poor people in the current generation, their needs are the priority, provided that addressing those needs does not impede the ability of future generations to address their own needs.

There are however definite exceptions. It would, for example, be irresponsible to design and construct large civil structures such as high dam walls and heavy vehicular traffic bridges to have short lifespans. Not only would such designs likely be unsafe and unfit for use, they are also not sustainable.



8.3 INVESTMENT APPRAISAL

Having prepared a shortlist of investment options to address a problem or opportunity and having furthermore prepared cash flow forecasts of benefits and costs, it is now time to subject these proposals to investment appraisal to determine the financial merits thereof. Three methods are generally considered appropriate for use in appraising public sector infrastructure investments, these being:

<h1>NPV</h1> <p>Net present value</p>	<h1>IRR</h1> <p>Internal rate of return</p>	<h1>BCR</h1> <p>Benefit-cost ratio</p>
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Financial practitioners refer to these methods as capital budgeting or investment appraisal techniques.



8.3.1 Net present value (NPV)

NPV is the difference between the present value of benefits and the present value of costs, as follows:

NPV = PV OF NET BENEFITS – PV OF INVESTMENT COSTS

The expected cash flow of the project in period t is denoted by C_t , the present value of the investment (capital outlay) by C_0 (this has a negative sign), and the discount rate as r , as follows:

$$\begin{aligned}
 NPV &= C_0 + \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_N}{(1+r)^N} \\
 &= \sum_{t=0}^N \frac{C_t}{(1+r)^t}
 \end{aligned}$$

A positive NPV indicates that projected benefits exceed expected costs (both in present Rands), and the investment proposal is therefore financially feasible. A negative NPV indicates that the investment project will lead to a net loss to the city. In practice NPV calculations would normally be done using Excel spreadsheets. The first step is to discount all future cash flows to determine present values, and then to solve for NPV by calculating the difference between benefits and costs.



BOX 8.4: DETERMINING NET PRESENT VALUE

We have already calculated the cash flow for our 600mm diameter water pipe replacement project, as follows:

Cash flow forecast – not discounted yet

YEAR	1	2	3	4	5	6	7	20
Renewal cost	1 000 000	-	-	-	-	-	-	-
Water losses	68 831	68 831	68 831	68 831	68 831	68 831	68 831	68 831
Repair costs	29 050	29 050	29 050	29 050	29 050	29 050	29 050	29 050
TOTAL ANNUAL SAVINGS	97 881	97 881	97 881	97 881	97 881	97 881	97 881	97 881

The next step is to discount cash flows. The discount rate given by the CFO is 8%.

Discounted cash flow forecast

YEAR	1	2	3	4	5	6	7	20
Renewal cost	925 926	-	-	-	-	-	-	-
Water losses	63 733	59 012	54 641	50 593	46 845	43 375	40 162	14 768
Repair costs	26 898	24 906	23 061	21 353	19 771	18 306	16 950	6 233
TOTAL ANNUAL SAVINGS	90 631	83 917	77 701	71 946	66 616	61 682	57 113	21 000

Test this yourself in Excel by calculating the discounted water losses in year 2 (cells marked in grey):

$$= 68\,831 / (1 + 0,08)^2$$

$$= 59\,012$$

To obtain the NPV of this project, subtract the sum of all discounted annual savings over the analysis period (R 961 013) from the discounted renewal cost (R 925 926). The project NPV in this instance is R 35 087. This is a worthwhile project.

Calculate the project NPV

YEAR	BENEFITS/COSTS
NPV of costs (capital outlay to renew pipe)	925 926
NPV of benefits (savings in water losses and maintenance expenditure)	961 013
Project NPV (net benefit/loss)	35 087





8.3.2 Internal rate of return (IRR)

IRR is the discount rate that makes the NPV of all cash flows in a project equal to zero. This is the technically correct definition, and it sounds odd. Put differently, IRR is the specific discount rate which would make the discounted income (present value) equal to the cost of the project. More simply still, it is the rate at which the investment breaks even. The resulting rate (IRR) is then the rate of return on the investment. IRR is also known as the economic rate of return (ERR).

Discount rate where: **PV OF NET BENEFITS = PV OF INVESTMENT COSTS**

IRR can't be calculated directly, it is done iteratively till a NPV of zero is found, or alternatively using a financial calculator or financial software. When calculated for a financially feasible project, two results will be achieved. The first is a NPV of zero, as noted, and the second is a rate or percentage. This rate is the IRR.

IRR also requires some additional notes on interpretation. Many practitioners using the IRR function in Excel believe they have a viable project when achieving a positive IRR (say something like 5%). This is not how IRR works. Using IRR, the project will only be feasible when the IRR is higher than the cost of capital.



BOX 8.5: CALCULATING IRR

We have already calculated the cash flow for our 600mm diameter water pipe replacement project, as follows:

Calculate the project NPV

YEAR	1	2	3	4	5	6	7	20
Renewal cost	1 000 000	-	-	-	-	-	-	-
Water losses	68 831	68 831	68 831	68 831	68 831	68 831	68 831	68 831
Repair costs	29 050	29 050	29 050	29 050	29 050	29 050	29 050	29 050
TOTAL ANNUAL SAVINGS	97 881	97 881	97 881	97 881	97 881	97 881	97 881	97 881

The result is 8.58%, marginally better than the discount rate (cost of capital) set at 8%. This project can be accepted.



BOX 8.6: CALCULATING BCR

As was the case with calculating the NPV for the 600mm diameter water pipe replacement project, we need discounted cash flows and present values for both net benefits and investment costs:

Discounted cash flow forecast

YEAR	1	2	3	4	5	6	7	20
Renewal cost	925 926	-	-	-	-	-	-	-
Water losses	63 733	59 012	54 641	50 593	46 845	43 375	40 162	14 768
Repair costs	26 898	24 906	23 061	21 353	19 771	18 306	16 950	6 233
TOTAL ANNUAL SAVINGS	90 631	83 917	77 701	71 946	66 616	61 682	57 113	21 000

Discounted cash flow forecast

YEAR	BENEFITS/COSTS
NPV of costs (capital outlay to renew pipe)	925 926
NPV of benefits (savings in water losses and maintenance expenditure)	961 013
BCR	1.04

The result of 1.04 (961 013 / 925 926) is positive (greater than 1) and the project can be implemented.



8.3.3 Benefit cost ratio (BCR)

BCR measures the extent to which the discounted net benefits exceed the discounted investment costs. This ratio is independent of the size of the project being considered. BCR is calculated as follows:

$$\text{BCR} = (\text{PV OF NET BENEFITS}) / (\text{PV OF INVESTMENT COSTS})$$

A ratio of one means that the benefits equal costs, hence there is no net benefit to be had from implementing the project. A ratio of less than one indicates net costs after implementing the project, meaning that the project is not feasible. A ratio greater than one indicates a viable project.

8.3.4 When to use which metric

NPV, IRR and BCR can all be easily calculated from the same cash flow forecasts in Excel, and as a general rule infrastructure planners and analysts are advised to set up their spreadsheets to calculate for all three metrics. However, applied over a range of projects with different characteristics, these metrics may yield different and sometimes confusing results. The following tables provide guidance on when to use which metric, and when not to.

METHOD	EXPRESSION	MEASURES...	ACCEPT INVESTMENT PROPOSAL WHEN...
NPV	NPV = PV of net benefits – PV of investment costs	The value or magnitude of an investment	NPV > R 1
IRR	Discount rate where: PV of net benefits = PV of investment costs	The efficiency or yield of an investment	> than the cost of capital
BCR	BCR = (PV of net benefits) / (PV of investment costs)	The overall value of an investment proposal	BCR > 1

In most instances all three methods can be used to evaluate a single project or investment proposal. It is generally accepted that NPV is theoretically the superior method over IRR, though IRR is more widely used in the private sector as it provides a rate that can be compared with other market rates. NPV, as the best indicator of value created by a project, is a great metric to use when either appraising a single project, or multiple projects with similar investment costs. In practice, though, a city will each year consider hundreds to over a thousand project proposals of varying sizes. These projects will range in value from less than R 1 million, to over R 100 million. In these instances IRR and BCR are better suited to compare and rank projects, and NPV less so. This is because one project with a smaller initial investment may have a smaller NPV than that of another project with a larger investment, but the benefit per Rand may be higher for the first, smaller project. In other words, NPV does not measure the size of the project.

TABLE 8.7: Summary of capital budgeting techniques




SITUATION	NPV	IRR	BCR
Evaluation of the merits of a single project	✓	✓	✓
Evaluation of mutually exclusive projects	?	?	✓
Evaluation of projects with different lifespans	✓	✗	✓
Evaluation of projects that differ significantly in scale	✗	✓	✓

TABLE 8.8: When to use which method, and not to

Care however needs to be taken when using IRR as the decision criterion for projects with a large initial capital outlay, long lifespans and low levels of surpluses (net benefits), all of which are characteristics associated with most infrastructure projects. IRR tends to reject such projects, instead preferring projects with more immediate or higher net benefits.

When two projects are mutually exclusive, then a city intends to only proceed with one of these projects, such as the choice between developing a new cemetery or constructing a crematorium. When evaluating mutually exclusive projects NPV and IRR sometimes give conflicting results. What to do then? If it is because the projects under consideration have very different lifespans or differences in the timing of cash flows, then rather rely on NPV. If it is a case that the projects are of significantly different scale, then rather give credence to IRR.

“ When evaluating mutually exclusive projects NPV and IRR sometimes give conflicting results.”



NPV and IRR can produce conflicting results when the following differences occur: scale or size of the project, project duration and the timing of cash flows. Be sure to understand why, and when to give preference to which metric.

8.3.5 Further analysis: sensitivity and scenario analyses, and simulation

01 SENSITIVITY ANALYSIS

The project cash flow forecasts prepared and subjected to investment appraisal are expectations of the magnitude and distribution of future benefits and costs. As such it is a view of an expected future scenario, based on certain key assumptions represented by key variables. A key variable is an assumption or value that, if it changes in reality, can affect the outcome of the project to the extent that it can become more beneficial or can cause the city to incur net losses. It is therefore both accepted and prudent practice to test the sensitivity of key project variables.

Sensitivity analysis evaluates the effect of changes in a key variable on the project outcomes. It does so by examining one variable at a time, though multiple key variables may be examined consecutively. Sensitivity analysis therefore involves asking “what if” questions. As a process, it involves changing the value of a key variable (both up and down), modelling the impact of the change, and assessing the impact on the project outcomes.

BOX 8.7: SENSITIVITY ANALYSIS ILLUSTRATED



Let's again return to our project proposal to replace the section of 600mm diameter water pipe, and perform sensitivity analysis on the proposal.

STEP 1:

Identify the key variables to be tested for sensitivity

KEY VARIABLE	VALUE
Replacement cost per linear metre of 600mm diameter pipe	R 5 000.00
Bulk purchase cost of water	R 7.71kℓ
Cost per repair event	R 4 150.00
Nr of burst per annum	7



STEP 2:

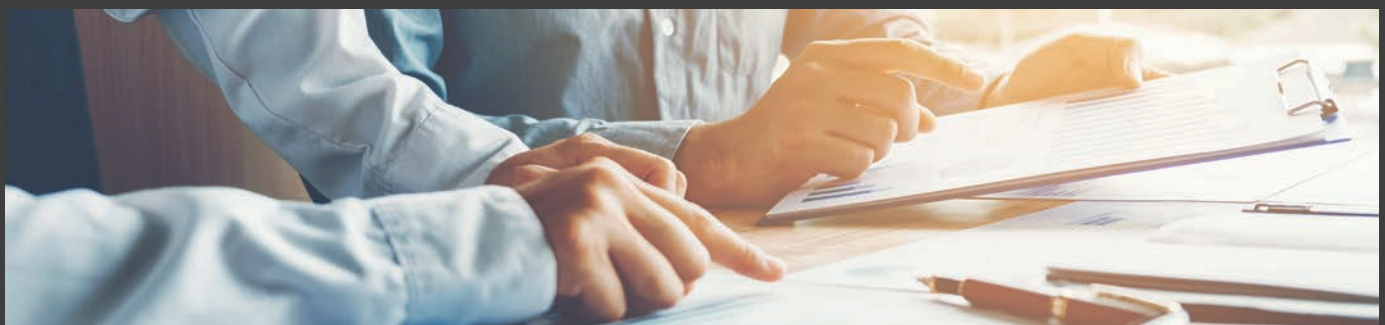
Develop "what if" questions for each variable, and in successive order test the sensitivity of each variable by modelling the outcomes of the "what if" questions

	WHAT IF...?	TOTAL PROJECT SAVINGS	PROJECT NPV	PROJECT IRR	PROJECT BCR
Sensitivity analysis 1: Change in bulk purchase costs	Base case: cost per repair event of R 4 150	R 961 013	R 35 087	8,58%	1.04
	Maintenance costs decreased by 5%?	R 946 752	R 20 826	8,34%	1,02
	Maintenance costs increased by 5%?	R 975 274	R 49 348	8,81%	1,05

	WHAT IF...?	TOTAL PROJECT SAVINGS	PROJECT NPV	PROJECT IRR	PROJECT BCR
Sensitivity analysis 4: change in number of pipe bursts per annum	7 bursts/annum	R 961 013	R 35 087	8,58%	1.04
	5 bursts/annum	R 879 522	-R 46 403	7,23%	0,95
	6 bursts/annum	R 920 268	-R 5 658	7,91%	0,99
	8 bursts/annum	R 1 001 758	R 75 832	9,24%	1,08
	9 bursts/annum	R 1 042 504	R 116 578	9,90%	1,13

STEP 3:

Assess outcomes of sensitivity analysis and, if necessary, redesign or reject the project proposal





02 SCENARIO ANALYSIS

Scenario analysis is about developing a range of scenarios on a continuum, typically as follows:

- Best case scenario – this is the most positive future state or most desirable project outcome
- Middle-of-road or probable scenario – this is the likely future state or project outcome
- Worst case scenario – this is the future negative or undesirable state possible, to be avoided

Other scenarios can be added, depending on factors such as the complexity of the problem or opportunity and the level of control that the city has in shaping future outcomes. One such other scenario typically added to the range of scenarios tested is that of an optimum scenario, typically somewhere between the best case scenario and the middle of the road scenario.

03 SIMULATION

Simulation is nothing but advanced sensitivity analysis. It involves simultaneously changing the values of several or all key variables, and modelling the impacts thereof.



8.4 FINANCIAL PLANNING



Investment appraisal techniques (NPV, IRR and BCR) determine whether investment proposals are likely to yield net benefits and to select amongst a shortlist of potential options those proposals that will generate the most net benefits for the city (the municipality and the community it serves). A more comprehensive financial analysis is still required to determine whether the project will be financially feasible, how it will impact on both the municipality (financial position and performance – terms that are discussed in later sub-sections) and on ratepayers (tariff implications), how the project will be funded, and specific budget requirements.

8.4.1 Elements included in the financial analysis

Financial analysis can be done per project, across an entire asset portfolio or for the city as a whole. The financial plan for an asset portfolio will be included in the asset management plan for that portfolio, and the financial plan for the city as a whole in the city's strategic asset management plan.

The following elements should be included in the financial plan, regardless of whether for a project/asset, asset portfolio or for the city as a whole.

- Total capital requirement (investment cost)
- Capital lay-out required per annum
- Sources of capital
- Operating expenditure per annum – this also includes annual capital redemption and interest payments as well as provision for depreciation
- Revenue expectations per annum
- Annual surplus/loss
- Tariff impacts



“ The financial plan for an asset portfolio will be included in the asset management plan...”

The financial analysis and plan should build on the cash flow projection initially prepared, there is no need to duplicate effort. For purposes of investment appraisal all benefits and costs were considered, to the municipality and the community it serves. The financial analysis only considers financial impacts on the municipality, meaning the expenditure it will incur that will lead to actual cash outflows, and the revenue it is expected to earn that will result in cash inflows. Other benefits accruing to the community or society in general are not considered in this phase, and must be stripped out from the initial cash flow forecast.



When developing cash flow forecasts for financial analysis purposes, build on the work done in preparing the initial discounted cash flow forecasts. But do not override the initial file. Instead save a different version of the same file for purposes of comparison. Much can be learned from comparing the initial cash flow forecast with the financial analysis cash flow, which helps to refine future similar efforts, and to develop a feel for the intricacies involved in the process.

8.4.2 Funding arrangements

When undertaking financial planning for either a project or for an asset portfolio, consider how capital investment will be financed. This is important for a number of reasons, including:

- The manner in which the project is financed can determine its financial viability. This should not ordinarily be the case, as all projects must pass the capital hurdle rate. It is however possible that the project under consideration has a high risk profile, and that financiers will require a higher rate of return (reflected in a higher interest rate) than the city's capital hurdle rate. Provided that the project has a low revenue yield, the required higher rate of return may cause the project not to be financially viable.
- Suppliers of capital, whether government, development financiers or other suppliers, may impose conditionalities. These conditionalities may affect the design and net benefits' package of the project, from the manner in which project objectives and stated outcomes are defined, to the revenue and cost structures and cash flows to be generated by the project.

Capital financing is a complex discipline in its own right. It is not the intention of this toolkit to provide authoritative or complete advice on how to deal with this subject. **This section is limited to providing a basic understanding and some key pointers on project finance. Here are some pointers – presented in no particular order:**

1. Consider all available sources of financing, not just grant funding. For example, also think about developer contributions, issuing municipal bonds or entering into a public-private partnership. In general there are the following categories of financiers:
 - Tax payers in the form of cash financing
 - Lenders to government (e.g. commercial banks) in the form of loans or guarantees
 - Development agencies (e.g. the World Bank or the DBSA) in the form of concessionary finance (soft loans), loan guarantees or grants (conditional and unconditional)
 - Developer contributions in the form of either cash contributions or developer funded and constructed assets
 - Private investors in the form of either loans or equity investment
 - Donors in the form of capital grants
2. Loans can be taken up for individual projects, or for a portfolio of projects.
3. The most appropriate source of funding will depend on factors such as the regulatory framework, ability of the project to generate revenue, the project risk profile, and who ultimately pays. Who pays in part depends on government's or the municipality's approach where discretion exists, and in part on the regulatory framework. The approach to who pays generally relies on either the benefit principle (end users pay) or the ability-to-pay principle (financed by tax payers). In short, there are ultimately four possibilities on who pays:
 - End users
 - Tax payers
 - Donors
 - Some combination of the above
4. When tax payers (in the municipal context these are rate payers) or end users are expected to pay, it is good practice to test for both willingness to pay and affordability.
5. Also consider whether the project can be redesigned or repackaged to improve access to attractive funding, such as funding for green initiatives or green job creation.
6. In general, non-income generating projects and assets should be financed from grants or internal sources. Loans and bonds, that are interest-bearing, should generally only be used to fund income generating project and assets.
7. Long life assets should be funded from long term loans or other financial instruments when grant funding is not available. Loan periods should be matched to the life of the asset to be created. This ensures inter-generational equity and continued solvency.

“ Planning for municipal infrastructure services and municipal revenue is normally done on the basis of households.”



8.4.3 Prepare or adjust cash flow forecast

The cash flow forecast now prepared only considers cash inflows and cash outflows from the municipality. **The objectives of this exercise are to:**

- Determine the municipality's cash flow position at the end of each year of the life of the project, to assess the financial performance and liquidity of the project.
- Assess the impact on municipal charges and tariffs, and therefore the impact on the municipality's customers.
- Determine the accumulated cash position of the project throughout its life.

Elements for inclusion in the financial forecast were noted in **Section 8.4.1**, and an example of such a forecast is included in Box 8.8. Note that the financial forecast includes funding arrangements as well as depreciation. Also note that tariff impacts are specifically considered, as are both the annual and cumulative cash flow impacts on the city's finances.

In this example, provision has been made for annual increases, and this has been clearly stated in the project financial appraisal.



8.4.4 Conduct sensitivity analysis and analyse results

As was the case with the discounted cash flow analysis, it is good practice to conduct sensitivity analysis on the annual financial cash flow forecast. **Typical variables tested for sensitivity include:**

1. Change in number of customers.
2. Where loans are taken up, changes in interest rates, where these are not fixed.
3. In revenue-generating projects, the cash flow impacts at various debtor payment levels.
4. In revenue projects with large upfront investment costs where capacity is created for full built-out, test for the impact of changes in the rate of uptake of capacity on cash flow.



BOX 8.8: EXAMPLE OF A PROJECT FINANCIAL APPRAISAL

For a water reticulation network for a new township of 3 500 households

PROJECT: ESTABLISHMENT OF WATER RETICULATION NETWORK FOR A NEW MIXED-INCOME TOWNSHIP OF 3 500 HOUSING UNITS

Nr of residents	3 500,00
Capital outlay per customer	47 302 500,00
Assumed network life	30,00
Funding	10 192 000,00
Developer contributions	37 110 500,00
Municipality takes up a loan	
Discount rate	9%
Other opex %	2%
Loan period	30,00
Interest rate	0,09
Deposit	-
Base year tariff	11,57
Rate in crease	6%
Bulk purchase costs: base year	7,71
Surplus target	0,15
R/kl	
NPVR	1 227,05
R	
kl	480,00

Fin year	Nr of residents	Revenue: new connections	Revenue: water sales	Annual revenue	Interest	Capital payment	Capital & interest	Bulk purchase costs	Other OPEX	Net annual revenue position	NPVR	Depreciation	Tariff impacts	Cumulative cash flow	Tariff	Bulk purchase rate
2015/16	1 750	2 147 338	9 715 373	11 862 710	3 339 945	272 256	3 612 201	6 476 400	1 96 327	1 850 038	1 697 283	788 375	908 908	908 908	11,57	7,71
2016/17	1 200	1 472 460	17 359 983	18 832 443	3 315 442	296 759	3 612 201	11 572 402	297 757	3 646 843	3 069 475	1 328 975	-2 649 408	2 649 408	12,26	8,17
2017/18	550	674 878	21 832 386	22 507 263	3 288 734	323 467	3 612 201	14 553 766	356 850	4 307 914	3 326 500	1 576 750	-4 399 158	4 399 158	13,00	8,66
2018/19	-	-	23 142 329	23 142 329	3 259 622	352 579	3 612 201	15 426 692	373 732	4 081 983	2 891 780	1 576 750	-5 714 187	5 714 187	13,78	9,18
2019/20	-	-	24 530 869	24 530 869	3 227 890	384 311	3 612 201	16 352 612	391 610	4 558 758	2 962 880	1 576 750	-7 100 317	7 100 317	14,60	9,73
2020/21	-	-	26 002 721	26 002 721	3 193 302	418 899	3 612 201	17 333 768	410 541	5 065 110	3 020 159	1 576 750	-8 543 727	8 543 727	15,48	10,32
2021/22	-	-	27 562 884	27 562 884	3 155 601	456 600	3 612 201	18 373 794	430 588	5 602 901	3 064 979	1 576 750	-10 031 955	10 031 955	16,41	10,94
2022/23	-	-	29 216 657	29 216 657	3 114 507	497 694	3 612 201	19 476 222	451 815	6 174 114	3 098 580	1 576 750	-11 553 785	11 553 785	17,37	11,59
2023/24	-	-	30 969 657	30 969 657	3 069 890	542 486	3 612 201	20 644 795	474 290	6 780 857	3 122 095	1 576 750	-13 099 130	13 099 130	18,43	12,29
2024/25	-	-	32 827 836	32 827 836	3 029 890	591 310	3 612 201	21 883 483	498 087	7 426 375	3 136 559	1 576 750	-14 658 939	14 658 939	19,54	13,03
2025/26	-	-	34 797 506	34 797 506	2 967 672	644 528	3 612 201	23 196 492	523 283	8 110 059	3 142 914	1 576 750	-16 225 103	16 225 103	20,71	13,81
2026/27	-	-	36 885 357	36 885 357	2 909 665	702 536	3 612 201	24 588 282	549 959	8 837 451	3 142 021	1 576 750	-17 790 374	17 790 374	21,96	14,64
2027/28	-	-	39 098 478	39 098 478	2 845 437	765 764	3 612 201	26 063 578	578 200	9 610 263	3 134 662	1 576 750	-19 348 286	19 348 286	23,27	15,51
2028/29	-	-	41 444 387	41 444 387	2 777 518	834 683	3 612 201	27 627 393	608 098	10 431 377	3 121 553	1 576 750	-20 893 089	20 893 089	24,67	16,44
2029/30	-	-	43 931 050	43 931 050	2 702 397	909 804	3 612 201	29 285 037	639 749	11 303 868	3 103 342	1 576 750	-22 419 681	22 419 681	26,15	17,43
2030/31	-	-	46 566 913	46 566 913	2 620 514	991 686	3 612 201	31 042 139	673 253	12 231 007	3 080 621	1 576 750	-23 923 551	23 923 551	27,72	18,48
2031/32	-	-	49 360 928	49 360 928	2 531 262	1 080 938	3 612 201	32 904 667	708 719	13 216 280	3 053 928	1 576 750	-25 400 729	25 400 729	29,38	19,59
2032/33	-	-	52 322 583	52 322 583	2 433 978	1 178 223	3 612 201	34 876 947	746 259	14 263 400	3 023 751	1 576 750	-26 847 731	26 847 731	31,14	20,76
2033/34	-	-	55 461 111	55 461 111	2 327 938	1 284 263	3 612 201	36 971 684	785 992	15 376 324	2 990 536	1 576 750	-28 261 517	28 261 517	33,01	22,01
2034/35	-	-	58 789 655	58 789 655	2 212 354	1 399 846	3 612 201	39 189 985	828 047	16 559 269	2 954 685	1 576 750	-29 639 452	29 639 452	34,99	23,33
2035/36	-	-	62 317 034	62 317 034	2 086 368	1 525 833	3 612 201	41 541 384	872 555	17 816 727	2 916 564	1 576 750	-30 979 265	30 979 265	37,09	24,73
2036/37	-	-	66 056 056	66 056 056	1 949 043	1 663 158	3 612 201	44 033 867	919 658	19 153 487	2 876 503	1 576 750	-32 279 019	32 279 019	39,32	26,21
2037/38	-	-	70 019 419	70 019 419	1 799 359	1 812 842	3 612 201	46 673 899	969 505	20 574 656	2 834 805	1 576 750	-33 537 074	33 537 074	41,68	27,78
2038/39	-	-	74 220 585	74 220 585	1 636 203	1 975 997	3 612 201	49 476 453	1 022 253	22 085 675	2 791 738	1 576 750	-34 752 062	34 752 062	44,18	29,45
2039/40	-	-	78 673 820	78 673 820	1 458 363	2 153 837	3 612 201	52 445 041	1 078 068	23 692 348	2 747 550	1 576 750	-35 922 862	35 922 862	46,83	31,22
2040/41	-	-	83 394 249	83 394 249	1 264 518	2 347 683	3 612 201	55 591 743	1 137 125	25 400 863	2 702 462	1 576 750	-37 048 574	37 048 574	49,64	33,09
2041/42	-	-	88 397 904	88 397 904	1 053 227	2 558 974	3 612 201	58 927 248	1 199 609	27 217 820	2 656 672	1 576 750	-38 128 495	38 128 495	52,62	35,08
2042/43	-	-	93 701 778	93 701 778	822 919	2 789 282	3 612 201	62 462 883	1 265 716	29 150 261	2 610 361	1 576 750	-39 162 106	39 162 106	55,77	37,18
2043/44	-	-	99 323 885	99 323 885	571 884	3 040 317	3 612 201	66 210 655	1 335 651	31 205 695	2 563 689	1 576 750	-40 149 045	40 149 045	59,12	39,41
2044/45	-	-	105 283 318	105 283 318	298 255	3 313 946	3 612 201	70 183 295	1 409 631	33 392 137	2 516 803	1 576 750	-41 089 099	41 089 099	62,67	41,78
TOTAL	3 500	4 294 675	1 523 207 539	1 527 502 214	71 255 520	37 110 500	108 366 020	1 015 390 908	21 732 929	419 122 857	87 355 449	46 266 350				

8.5 ORGANISATIONAL OPTIMISATION



By this point all departments will have developed multiple viable project proposals for inclusion in the municipality's capital budget. Whilst there is scope for most cities to both increase levels of capital spending and accelerate infrastructure, the basic economic problem remains universal. There will always be more needs to satisfy than there are resources with which to satisfy those needs. In practice this means that there is an absolute capital budget ceiling in any given financial period, and there will be more budget requests than there is available capital funding. This requires capital rationing through a process of cross-asset organisation optimisation: budget needs are prioritised and the ones with the greatest benefit for the organisation as a whole are included in the capital budget, and the remaining project proposals are deferred, redesigned or rejected in the event that they fail to prove worthy.

8.5.1 Corporate-level prioritisation using a multi-criteria analysis framework

Ultimately all capital project proposals compete for inclusion in the city's capital budget. A multi-criteria analysis (MCA) framework contains defined outcome areas and key performance indicators of importance to the city as a whole, against which all projects are scored on a consistent basis. Each project is assessed against the MCA framework, accorded a score and ranked in order of highest to lowest score. The value of projects with the highest scores are then selected which fit the available capital budget, and the remainder of projects are then deferred, reconfigured or rejected.



The benefits of a structured MCA system for a city include the following:

1. Selection of capital proposals in accordance with strategic objectives, outcomes and values desired by the city.
2. Robust consideration of projects and their impacts, both positive and negative, whether they accrue to the municipality as an organisation or the city at large.
3. Projects that deliver multiple benefits are more likely to pass selection, ensuring maximum value for money.
4. Projects are evaluated and selected on a consistent basis, and the impacts of personal bias and personal interest are limited.
5. The ability to evaluate different types of investment activities (e.g. service expansion, infrastructure upgrades or renewal) across multiple asset portfolios (e.g. roads, water, electricity distribution or public amenities).

BOX 8.9: EXAMPLE MULTI-CRITERIA ANALYSIS SYSTEM

Project description	CAPEX requirement	Project NPV	Function segment	Fund segment	Project segment	Regional segment	Level of discretion	Spatial efficiency	Economic development and prosperity	Environment sustainability	Financial health and sustainability	Social upliftment and inclusion	Forging an unifying city identity	Organisational effectiveness and efficiency	MCA score	MCA ranking	Budget decision
Project 1	4 780 000	478 000	Water distribution	USDG	New	Region D	3	3	1	0	1	3	0	0	1,5	6	Proceed
Project 2	2 900 100	145 005	Water distribution	Internal funds	Renewal	CBD	4	5	5	0	1	1	0	2	2,4	3	Proceed
Project 3	44 100 000	13 230 000	Electricity	Loan	New	Region B	2	3	3	1	2	3	0	7	2,65	1	Proceed
Project 4	24 995 000	-14 090 000	Roads	ICDG	Upgrading	Corridor 01	4	4	4	-1	-5	4	0	0	1,35	7	Proceed
Project 5	8 223 000	657 840	Water distribution	Loan	Upgrading	CBD	3	5	5	0	1	2	0	2	2,45	2	Proceed
Project 6	3 312 000	-2 200 100	Stormwater	USDG	New	Region C	2	2	1	1	-2	3	0	0	0,9	10	Reject
Project 7	7 455 000	-2 350 000	Roads	Internal funds	Renewal	Region B	3	2	0	0	-2	2	0	2	0,8	11	Reject
Project 8	19 000 000	380 000	Sanitation	USDG	New	Region A	3	1	0	0	1	3	0	0	1,05	9	Defer
Project 9	9 000 100	2 520 028	Electricity	ICDG	Renewal	CBD	4	5	5	0	1	1	0	2	2,4	3	Proceed
Project 10	2 567 700	128 385	Parks	MIG	New	Region A	2	2	0	2	1	2	1	1	1,35	7	Proceed
Project 11	2 300 000	122 100	Parks	Internal funds	Upgrading	Region C	3	2	1	4	1	3	2	1	2,05	5	Proceed
Project 12	3 800 000	-1 980 000	Stormwater	USDG	New	Region D	3	1	0	0	-2	1	0	0	0,3	12	Reject
	132 432 900	-2 958 742															

R 98 865 900

Value of approved projects

R 3 191 358

R 100 000 000

Capital budget limit

Net value to be generated from implementation of capital budget



Box 8.9 provides an example of a MCA system. In this example we have a municipality with the capacity to implement a capital budget of R 100 million. Various departments submitted capital budget proposals, but there are two problems. The value of all capital budget proposals exceed the capital budget limit by R 32 432 900. The second problem is that implementing these projects as one package will place the municipality in a worse position than it found itself in prior to adoption of these proposals, since their combined NPV stands at a negative R 2 958 742. Decision makers now need to identify the most worthy projects for inclusion in the capital budget, whilst ensuring that the financial performance of the municipality is preserved

(maintaining a positive NPV of the total capital budget to be implemented). The capital budget committee met and evaluated all capital budget proposals against pre-defined outcome areas of importance to the municipality, using its MCA system. These outcome areas range from spatial efficiency through to organisational effectiveness and efficiency. Each project was scored and ranked based on its MCA score, and the projects with the highest scores were included in the available capital budget of R 100 million. Using the MCA system, a capital budget was developed that will deliver a NPV benefit of about R 3.2 million.

8.5.2 Elements of a MCA system

A well-constructed MCA system consists of the following elements:

- Defined outcome areas of importance to the city
- Key performance indicators per desired outcome area.
- Project ranking criteria reflecting project impacts, arranged on a scale that ranges from (left) high cost to low cost, to neutral, to low benefit, to high benefit (right).
- Amalgamation rules, which is the rule set that determines the weighing accorded to individual outcome areas and performance indicators.

These elements, and how to construct an MCA system, are discussed in the following sub-sections. The process of constructing an MCA system is summarised as follows:

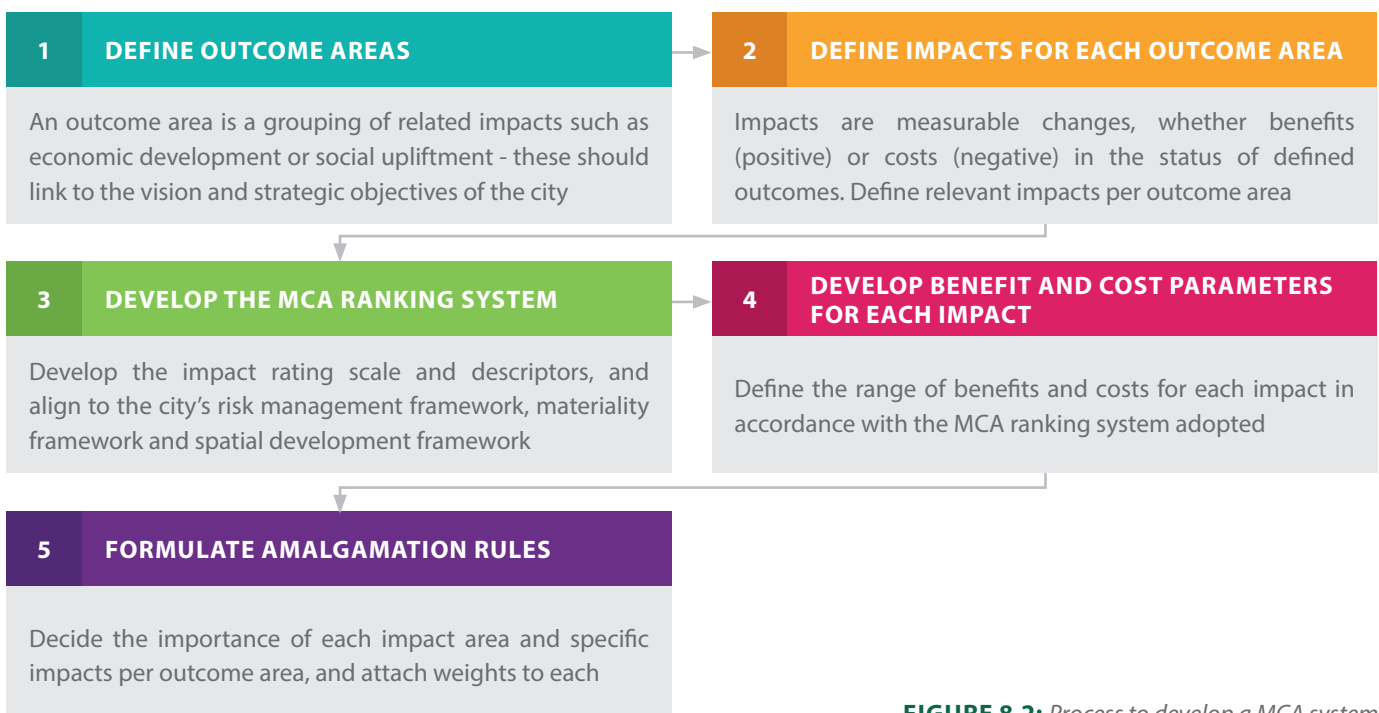


FIGURE 8.2: Process to develop a MCA system

8.5.3 Define outcome areas

01 SUSTAINABILITY OUTCOMES

Outcome areas of importance will ideally have been articulated in the city's long term growth and development strategy, whether in the form of strategic objectives or outcomes. These strategic objectives or outcomes will ideally include all dimensions of sustainability, including social, economic, environmental, cultural and financial perspectives. Social, economic, environmental and cultural outcomes are typically those benefits that the municipality wish to deliver to its community (the city at large), or adverse impacts that the municipality wish to protect its citizenry from. Financial outcomes are impacts on the municipality as an organisation.

02 BUSINESS AND OPERATIONAL CONSIDERATIONS

There are however other impact areas outside of the various dimensions of sustainability. **These can be classified as impacts relating to business and operational concerns, and include considerations such as:**

1. Level of project commitment. A city does not always have full discretion in deciding whether to undertake projects. Some projects must be implemented to meet legal requirements, and noncompliance can lead to imprisonment of the accounting officer, a fine, withholding of grant funding or other forms of sanction, such as public protest or disinvestment. There are various levels of project commitment, ranging from political commitments expressed in say the approved IDP, to contractual commitments, to regulatory compliance. When evaluating and scoring project proposals, any existing project commitments to be honoured must be taken into account.
2. Improved productivity and cost efficiencies. This outcome area is focused on ensuring that municipal staff are capacitated and productive, and that assets and processes are cost-effective and efficient. This outcome area focuses on the municipality as an organisation.
3. Health and safety. The city has a legal obligation to provide a safe and healthy working environment to its employees and contractors, as well as members of the public with right of access to municipal facilities. This outcome area measures these health and safety impacts, and is largely focused on the municipality as an organisation.

03 SPATIAL EFFICIENCY

All South African cities are in process of spatial transformation, aiming for more compact footprints as well as functional and social integration (see Module 1). Some projects may have strong merits when considered in isolation, but may or may not support the spatial efficiency objective. A proper metropolitan municipal MCA system should include a spatial efficiency outcome that penalises project proposals which do not support this objective, and reward those that do.



04 FOUNDATION OUTCOME AREAS

Based on the above, the following outcome areas are recommended for inclusion in a city's MCA system:



OUTCOME AREA	DESCRIPTION	MEASURES...	
		COMMUNITY IMPACTS	ORGANISATIONAL IMPACTS
Level of project discretion	Considers the flexibility the municipality has in deciding to implement the project	●	○
Spatial efficiency	Assesses whether the project contributes to the city's strategic spatial transformation agenda	●	
Economic development	Measures whether projects contribute towards a growing, competitive economy that attracts fixed capital investment and deliver business opportunities and jobs	●	
Environmental sustainability	Protection and enhancement of the natural environment to deliver multiple, sustained benefits to society	●	
Financial health and sustainability	Measures whether a project will add financial value to the municipality as an organisation		○
Social upliftment	This outcome areas focuses on service delivery impacts and opportunities for community upliftment initiatives such as economic skills development	●	
Forging a unified city identity whilst celebrating diversity	Focuses on social integration across all demographics as well as the protection and strengthening of culture	●	
Organisational effectiveness and efficiency	Ensuring that projects employ best-fit technology and are resource efficient		○
A safe, capable and empowered workforce	Focuses on attracting and retaining human capital, whilst specifically ensuring a safe and healthy working environment		○

TABLE 8.9: Proposed foundational outcome areas

05 OTHER OUTCOMES

A city may define outcome areas in its MCA system in any way it wishes and may add additional outcome areas, but implementing the following advice will ensure best benefit and greatest usability:

1. There should be a clear link between the strategic objectives of the city and the MCA system, thus ensuring that capital projects are selected which achieve the city's objectives.
2. Outcome areas should be defined in the city's corporate asset management policy and strategy.
3. Try not to adopt too many outcome areas, only those ones that are critical for the city as a whole. Adding more outcome areas may reduce the weight of outcomes to the point where little priority is given to specific outcome areas.



8.5.4 Define impacts for each outcome area

Key performance indicators are measures indicating the extent to which the project under consideration contributes towards each outcome area. Put in different words, they indicate the extent to which the project creates benefits in each outcome area. But where there is benefit, there is usually also a cost, so the indicator selected usually also has a negative dimension.

There are often a great many indicators that can be used per outcome area. When selecting indicators, be careful again not to overburden the MCA system. Remember that the MCA must evaluate all types of capital projects across all functional elements (services such as water distribution), and that a city

can evaluate many hundreds of projects for inclusion in the capital budget. It is therefore necessary to select the right type of performance indicator. To understand this, read the discussion in Box 8.10 on performance indicators for the outcome areas of environmental sustainability.



BOX 8.10: SELECTING PERFORMANCE INDICATORS



FOR THE ENVIRONMENTAL SUSTAINABILITY OUTCOME AREA

There are various focus areas for performance or impact in environmental sustainability. One can broadly consider impacts on the extent of natural assets, the ability of the natural environment to provide ecosystem services, or changes in risk status (e.g. change in problem species status or veld fire risks). Let's for a moment delve into ecosystem services. These are the goods and services which nature bestows upon us. Ecosystem services in turn can be grouped into four distinct categories, each with a set of benefits and performance indicators, as follows:

REGULATING SERVICES:

- Flood regulation
- Purification of water and air
- Carbon sequestration and climate regulation
- Waste decomposition and detoxification
- Pest and disease control

PROVISIONING SERVICES:

- Energy e.g. biomass fuels
- Food
- Medicinal materials
- Minerals
- Ornamental resources including handicraft, jewellery and souvenirs
- Raw materials e.g. wood
- Water

CULTURAL SERVICES:

- Cultural, such as the inspiration nature provides for the arts
- Recreational experiences including ecotourism, outdoor sports and leisure activities
- Science and education including use of school trips to learn about nature
- Spiritual and historical including the use of nature for religious or heritage value

SUPPORTING SERVICES:

- Primary production
- Nutrient recycling
- Soil formation



Now clearly the list of potential impacts has become very long indeed. And we have only considered one category of impact in just one of several outcome areas. This is why we need to limit the number of performance indicators.

We can overcome this problem by collapsing, where appropriate, several indicators into one. Instead of having 19 different indicators for ecosystem services, we include one in the environmental sustainability outcome area that reads as follows: "Availability and quality of ecosystem services".

OUTCOME AREA	SPECIFIC IMPACTS	MEASURES THE FOLLOWING IMPACTS (BENEFITS AND COSTS)
Level of project discretion	Level of commitment to implement the project	Compliance with commitments (policy commitments, regulatory compliance etc.)
Spatial efficiency	Compact city footprint	Average gross residential density/ha, redevelopment of greyfields and land use intensification
	Greater transport connectivity and more effective and efficient movement	Commuting time, use of public transportation and % of household income spent on transport costs
Economic development	Fixed capital investment	The level of fixed capital investment/disinvestment enabled by the project, expressed in R' million
	Business opportunities	Positive indicators include % increase in serviced Gross Leasable Area (GLA) and sqm of serviced informal trading space created. Negative indicators include % of local businesses having to relocate or % of business opportunities lost due to construction activity which limits customer and business interaction
	Land value capture	% increase/decrease in the land value of property zoned for economic purposes (business, commercial and industrial)
	Employment creation	Number of annual equivalent jobs created or lost
Environmental sustainability	Carbon mitigation	Measures the carbon impact of the project on a range of negative impact (net carbon generator) to positive impact (net carbon store)
	Availability and quality of ecosystem services	Assesses the project's impact on the ability of the natural environment to deliver ecological services
	Protection of fauna and flora	Measures the impact on fauna and flora by considering the increase/loss of quality, protected natural space
Financial health and sustainability	Overall value of investment proposal	Measures the discounted BCR of the investment proposal
	Investment efficiency	Measures the IRR of the project
	Value of the investment	Measures the NPV of the project
Social upliftment	Service delivery impact	Measures the number of residential customers receiving municipal services following implementation of the project
	Inclusionary housing	Positive indicators measure the number of households benefiting from an increasing set of options for housing in sustainable human settings. Negative indicators measure the number of households forcibly resettled for reasons other than illegal settlement
	Community health	Measures the severity by which the project creates (negative impact) or mitigates against (positive impact) health and safety impacts. Impacts range from minor health impacts through to fatalities
	Community empowerment	Measures the number of people who obtain new skills as a result of the project being implemented
Forging a unified city identity whilst celebrating diversity	Protection of cultural heritage	Measures the project's impact on the cultural heritage and wealth of a city. Positive impacts range from protection and restoration of community assets, through to the creation of cultural wealth that attracts national interest and bolsters the tourism potential of the city. Negative impacts range from limited impairment of cultural wealth through to loss of cultural wealth of national importance
	Creation of inclusionary public spaces and meeting places	The emphasis here is on creating public spaces that are multifunctional and, more importantly still, which encourages social integration



OUTCOME AREA	SPECIFIC IMPACTS	MEASURES THE FOLLOWING IMPACTS (BENEFITS AND COSTS)
Organisational effectiveness and efficiency	Opportunity to improve productivity and cost efficiencies	Measures efficiency gains or losses in R' million
	Promote health and safety	Measures the severity by which the project creates (negative impact) or mitigates against (positive impact) health and safety impacts. Impacts range from minor health impacts through to fatalities.
	Retain employees through an attractive environment	Focuses on hygiene factors and staff morale
	Resource efficiency	Resource efficiency in this context refers to the efficient use (or not) of scarce natural resources with specific reference to land, water and energy

TABLE 8.10: Specific impacts per outcome area



8.5.5 Develop the MCA ranking system

Project impacts can vary greatly. Project A may deliver 300 annual equivalent jobs, whilst project B delivers less than 10. There are also multiple instances where two projects deliver different baskets of benefits, such as the following:

PROJECTS BEING CONSIDERED	PROJECT BENEFITS
Project A: Mixed income eco-housing development	Delivers a once-off employment dividend of 85 annual equivalent jobs during construction, and thereafter 4 annual equivalent jobs for the lifecycle of the eco-housing estate
	Provides mixed-income housing to 48 households in a sustainable green setting
	Enables inter-regional open space connectivity and serves as a net carbon trap
	Development employs green technology that in comparison with typical household benchmarks saves 28% on water consumption and 35% on coal-based energy
Project B: Provision of infrastructure to enable the construction of a new factory	Enables fixed capital investment by a large industrial concern in the order of R 230 million
	Delivers 37 annual equivalent jobs over the next twenty years
	Expected annual contribution of R 495 million to the city's GVA, with further spin-offs across the economic value chain expected
	Project NPV of R 9.9 million

TABLE 8.11: Projects delivering different baskets of benefits



So if we could only choose one project, which would we select? The choice may not seem too difficult. But how would we choose the best 700 projects of, say, 1 200 capital project proposals submitted?

Any robust MCA system requires a ranking for the following reasons:

		
To weight the benefits and costs of the range of impacts of a particular project proposal	To appropriately consider the risks and materiality of each project proposal, in line with the city's corporate risk framework, materiality limits and risk appetite	To compare the benefits of projects against each other, and to rank projects for inclusion in the capital budget



A mature city MCA ranking system will allow for the ranking of both benefits and costs, and will make provision for the severity or intensity of impact, the indicative spatial scale of impact, as well as the indicative financial loss/gain, as follows:

COST – BENEFIT RANGE	IMPACT QUALITATIVE DESCRIPTION (1)	IMPACT RATING	TYPICAL SPATIAL SCALE OF IMPACT (2)	FINANCIAL GAIN/LOSS (R' MILLION) (3)
Costs	Major – extreme negative impact	-5	Regional to city-wide impact	> 30
	Moderate negative impact	-3.5	Township-wide impact	20 – 30
	Insignificant – minor negative impact	-2	Suburb or district level	0 – 19
Neutral	No impact	0	No spatial impact	0
Benefits	Insignificant positive impact	1	Neighbourhood/village	0 – 19
	Minor positive impact	2	Suburb or district level	20 – 39
	Moderate positive impact	3	Township or trunk public transport facility	40 – 59
	Major positive impact	4	Integration zone, major arterial road or region	60 – 120
	Extreme positive impact	5	CBD, primary nodes, corridors or special economic zones	>120

Notes:

1. Align the impact scale (2nd column) to that used in the city's corporate risk management framework.
2. Align the spatial scale (4th column) with the spatial hierarchy adopted in the city's spatial development framework.
3. Align the financial loss/gain scale (5th column) with the materiality framework of the city.

TABLE 8.12: MCA ranking system

Also note that the impacts of costs are proportionally penalised to a greater extent than those of benefits, e.g. a moderate negative impact scores a minus 3.5 whilst a moderate positive impact scores a 3. This is to protect both the municipality and the community against adverse impacts. For this same reason, there are only three levels of cost impacts as opposed to five levels of benefit impacts.

8.5.6 Develop benefit and cost parameters for each impact

The next step involves the development of benefit and cost parameters for each impact. This is a two-step process. The first involves selecting an impact, say “Fixed capital investment” within the outcome range “Economic development” (see **Table 8.10**). The second step involves defining benefit and cost parameters for that specific impact in accordance with the ranges provided in the MCA ranking system (see **Table 8.12**).

An example of benefit and cost parameters for impacts in the “Economic development” outcome area is shown in **Table 8.13**.

MCA RANKING SYSTEM			SELECTED ECONOMIC IMPACTS			
IMPACT QUALITATIVE DESCRIPTION	IMPACT RATING	TYPICAL SPATIAL SCALE OF IMPACT	FINANCIAL GAIN/LOSS (R' MILLION)	FIXED CAPITAL INVESTMENT	LAND VALUE CAPTURE	EMPLOYMENT CREATION
Major – extreme negative impact	-5	Regional to citywide impact	> 30	Discourages or causes disinvestment of fixed capital of R 30 million or more	Estimated decrease in market value of properties zoned for economic use of 20% or more	Loss of employment opportunities of more than 300 jobs
Moderate negative impact	-3.5	Township-wide impact	20 – 30	Discourages or causes disinvestment of fixed capital of between R 20 million - R 29 million	Estimated 11 - 19% decrease in market value of properties zoned for economic use	Loss of employment opportunities of between 101 - 300 jobs
Insignificant – minor negative impact	-2	Suburb or district level	0 – 19	Discourages or causes disinvestment of fixed capital of upto R 19 million	Estimated 1 - 10% decrease in market value of properties zoned for economic use	Loss of employment opportunities of between 1 - 100 jobs
No impact	0	No spatial impact	0	No impact	No impact	No impact
Insignificant positive impact	1	Neighbourhood/ village	0 – 19	Enables fixed capital investment of between R 1 - R 19 million	Estimated 1 - 5% increase in market value of properties zoned for economic use	Creation of between 1 - 50 annual equivalent jobs
Minor positive impact	2	Suburb or district level	20 – 39	Enables fixed capital investment of between R 20 million - R 39 million	Estimated 6 - 10% increase in market value of properties zoned for economic use	Creation of between 51 - 100 annual equivalent jobs
Moderate positive impact	3	Township or trunk public transport facility	40 – 59	Enables fixed capital investment of between R 40 million - R 59 million	Estimated 11 - 15% increase in market value of properties zoned for economic use	Creation of between 101 - 200 annual equivalent jobs
Major positive impact	4	Integration zone, major arterial road or region	60 – 120	Enables fixed capital investment of between R 60 million - R 119 million	Estimated 15 - 20% increase in market value of properties zoned for economic use	Creation of between 201 - 300 annual equivalent jobs
Extreme positive impact	5	CBD, primary nodes, corridors or special economic zones	>120	Enables fixed capital investment of R 120 million or more	Estimated increase in market value of properties zoned for economic use of over 20%	Creation of more than 300 annual equivalent jobs

TABLE 8.13: Examples of benefit and cost parameters for selective economic development impacts



8.5.7 Formulate amalgamation rules

Amalgamation rules are the set of rules applied to the results of an investment study when different sets of result are combined in a multi-criteria analysis. There are two layers of rules. The first is at the level of outcome areas, and the second is at the level of specific impacts. The first layer of rules define the importance of each outcome area relative to other outcome areas, by according a weight to each outcome area. Consider **Table 8.14**: each outcome area is accorded a weight, in this case a percentage. Spatial efficiency has been given a weight of 15%, and environment sustainability a weight of 10%. Both outcome areas are considered important to the municipality, which is why both have been included in the MCA system, but spatial efficiency is considered the more important outcome area.

The second layer of rules couple weights to all specific impacts within each outcome area. For consistency's sake, each impact is accorded a maximum percentage, and the weights of all impacts in a particular outcome area sum to 100%.

OUTCOME AREA		SPECIFIC IMPACTS PER OUTCOME AREA	
DESCRIPTION	WEIGHT	DESCRIPTION	WEIGHT
Level of project discretion	15%	Level of commitment to implement the project	100%
Spatial efficiency	15%	Compact city footprint	50%
		Greater transport connectivity and more effective and efficient movement system	50%
Economic development	15%	Fixed capital investment	30%
		Business opportunities	30%
		Land value capture	10%
		Employment creation	30%
Environmental sustainability	10%	Carbon mitigation	20%
		Availability and quality of ecosystem services	50%
		Protection of fauna and flora	30%
Financial health and sustainability	15%	Overall value of investment proposal	34%
		Investment efficiency	33%
		Value of the investment	33%
Social upliftment	15%	Service delivery impact	40%
		Inclusionary housing	40%
		Community health	15%
		Community empowerment	5%
Forging a unified city identity whilst celebrating diversity	5%	Protection of cultural heritage	30%
		Creation of inclusionary public spaces and meeting places	70%
Organisational effectiveness and efficiency	10%	Opportunity to improve productivity and cost efficiencies	30%
		Promote health and safety	30%
		Retain employees through an attractive environment	10%
		Resource efficiency	30%

TABLE 8.14: Amalgamation rules

The weights indicated in Table 8.14 are purely for demonstration purposes. Each city should decide the weighting for each outcome area and each impact, in line with its perceived importance to the city. In deciding weightings for outcome areas and impacts, consider the following:

1. Cities have a developmental mandate. Service delivery lies at the core of this mandate. Accordingly weights accorded to the “Social upliftment” outcome area and impacts related to it, such as service delivery, should reflect this constitutional imperative – meaning a higher weight should be given to the outcome area “Social upliftment”.
2. Funding is required to finance or subsidise social upliftment. This requires that the city must be in good financial health, maintained through revenues earned from a strong city economy. Therefore a robust, growing city economy is essential for enabling the city to service the needs of the poor, and for the economy to create employment to alleviate poverty and so reducing the need for the city to provide poverty support. Therefore the outcome areas “Economic development” and “Financial health and sustainability” should also be given higher weightings.

Amalgamation rules should be established with full participation of the political leadership, and once agreed, should be submitted to Council for approval.



8.6 APPROVAL OF MCA SYSTEM



The MCA system, inclusive of its amalgamation rules, should be approved by way of Council resolution, and documented in the city's strategic asset management plan.

8.7 CONCLUSION

Investment proposals are responses to problems or opportunities. In most instances there are several possible alternative solutions in responding to problems and opportunities which include a range of non-asset and asset solutions.

Whatever solution is selected, it will most likely come at some cost, whether to the municipality, the community or the environment. It will also draw on a limited pool of available capital, leaving less for other worthy initiatives. Investment appraisal is a means for decision-makers, whether Councillors, National Government, lenders, development agencies or donors to determine whether proposed projects are viable. Traditionally, public sector projects were considered viable when they technically responded to the problem or opportunity to be addressed, and were affordable. Today, public sector projects are considered viable when they deliver net benefits to society. The most attractive projects are those that deliver benefits across a range of sustainability outcomes, and that limit or eliminate negative externalities.

An upfront understanding of what society and providers of funds value and dislike can help design attractive, value-for-money capital proposals more likely to succeed. Investment appraisal therefore isn't a particular point in the process of identification, development and approval of projects, it should be viewed as a means to both plan and select the best possible solution.

This module provides tools and techniques for project design, infrastructure investment appraisal, project financial planning and the prioritisation of capital projects for inclusion in the capital budget. It presents a firm foundation for infrastructure investment and financial planning. The user of this toolkit's attention is however drawn to the fact that there are multiple types of specialised investment cases that are not dealt with in this module, though these are likely to be included in future versions of this toolkit.



ANNEXURES



ANNEXURE 8A: City-level multi-criteria analysis framework



MODULE 8 Investment appraisal and planning

OUTCOME AREA		IMPACT LEVELS:		COST RANGE		
				MAJOR - EXTREME NEGATIVE IMPACT	MODERATE NEGATIVE IMPACT	INSIGNIFICANT - MINOR NEGATIVE IMPACT
		TYPICAL SPATIAL SCALE OF IMPACT:		REGIONAL TO CITY-WIDE SPATIAL IMPACT	TOWNSHIP-WIDE IMPACT	SPATIAL IMPACT LIMITED AT DISTRICT OR SUBURB LEVEL
		FINANCIAL LOSS/GAIN (R' MIL) (ACROSS); KEY PERFORMANCE INDICATORS (DOWN):		30 >	20 - 30	0 - 19
Level of discretion to implement project	15%	Decision flexibility: Legal, political, contractual or project factors		N/A	N/A	N/A
Spatial efficiency	15%	Compact city footprint	50%	Development outside the current approved urban edge, driving sprawl	Development within the urban edge, but not in proximity to a major corridor, public transport route or bulk municipal infrastructure	Residential development within the urban not contributing towards increased gross dwelling units/ha
		Greater transport connectivity and more effective and efficient movement	50%	Increased commuting time in/or spatial segment or more than 15% reduction in use of public transportation or increase of more than 15% of household income spent on transport costs	Increased commuting time in/or spatial segment or 10% - 15% reduction in use of public transportation or increase of between 10% - 15% of household income spent on transport costs	Increased commuting time in/or spatial segment or 1% - 10% reduction in use of public transportation or increase of between 1% - 10% of household income spent on transport costs
Economic development	15%	Fixed capital investment	30%	Discourages fixed capital investment of more than R 30 million	Discourages fixed capital investment of between R 20 million and R 30 million	Discourages fixed capital investment of upto R 19 million
		Business opportunities	30%	Expropriation or gentrification forcing more than 10% of local businesses to relocate elsewhere or Loss of business opportunities of more than 10% due to construction activity for 6 months or more	Expropriation or gentrification forcing 6% - 10% of local businesses to relocate elsewhere or Loss of business opportunities of between 6% - 10% due to construction activity for upto 6 months	Expropriation or gentrification forcing upto 5% of local businesses to relocate elsewhere or Loss of business opportunities upto 5% due to construction activity for upto 6 months
		Land value capture	10%	Estimated decrease in market value of properties zoned for economic use of over 20%	Estimated 11 - 20% decrease in market value of properties zoned for economic use	Estimated 1 - 10% decrease in market value of properties zoned for economic use
		Employment creation	30%	Loss of employment opportunities of more than 300 jobs	Loss of employment opportunities of between 101 - 300 jobs	Loss of employment opportunities of between 1 - 100 jobs
Environmental sustainability	10%	Carbon mitigation	20%	Net generator of carbon	N/A	Project design employs current carbon-based technologies together with limited carbon-offset measures (e.g. on site tree planting)
		Availability and quality of ecosystem services	50%	Irreparable degradation of the natural environmental to the extent that it is no longerable to provide ecosystem services, or large scale reduction in access to ecosystem services. City liable for environmental penalties and remedial costs, and will likely face public outcry	Moderate loss in the quality of an ecosystem service or in the spatial availability of that service	Minor loss in the quality of an ecosystem service or in the spatial availability of that service
		Protection of fauna and flora	30%	Loss of protected or problem species, coupled with negative media exposure and public outcry	N/A	Limited habitat loss not affecting status of protected species
Financial health and sustainability	15%	Overall value of investment proposal	34%	Negative discounted BCR greater than minus 1	Negative discounted BCR in the range of minus 0.5 - 1	Negative discounted BCR in the range of minus 0.1 - 0.5
		Investment efficiency	33%	Project does not deliver any financial yield	IRR positive, but more than 3% below cost of capital	IRR in the range of 3% below cost of capital
		Value of the investment	33%	NPV greater than minus R 5 million	NPV in the range of minus R 1 million - R 5 million	NPV in the range of minus R 1 - R 1 million
Social upliftment and inclusion	15%	Service delivery impact	40%	N/A	N/A	N/A
		Inclusionary housing	40%	Project to result in forced resettlement of more than 300 families for reasons not related to initial illegal settlement	Project to result in forced resettlement of between 101 - 300 families for reasons not related to initial illegal settlement	Project to result in forced resettlement of between 1 - 100 families for reasons not related to initial illegal settlement
		Community health	15%	Project creates unattended risks of serious injury or fatalities for the community	Project creates chronic health impacts for the community	Project creates adverse but non-threatening health impacts that impedes quality of life
		Community empowerment	5%	N/A	N/A	N/A
Forging of a unifying city identity whilst celebrating diversity	5%	Protection of cultural heritage	30%	Project leads to severe degradation or loss of cultural assets or cultural wealth of national importance, resulting in mass public outcry, negative national media coverage, possible litigation and loss of tourism potential	Project leads to significant loss of cultural assets or cultural wealth, resulting in opposition from lobby groups and negative local media coverage	Project leads to limited degradation of existing cultural assets or cultural wealth, not opposed by the broad community
		Creation of inclusionary public spaces and meeting places	70%	Project delivers unimproved public space that poses serious security risks, particularly to women, the elderly and children or Project consumes more than 1 hectare of improved public space without providing alternative public space	N/A	Project delivers unimproved public space that poses minor security risks, particularly to women, the elderly and children or Project consumes upto 1 hectare of improved public space without providing alternative public space
Organisational effectiveness and efficiency	10%	Opportunity to improve productivity and cost efficiencies	30%	Implementation of project to result in productivity or cost efficiency losses of more than R 10 million compared to the current situation or market average cost	Implementation of project to result in productivity or cost efficiency losses of between minus R 5 million - R 10 million compared to the current situation or market average cost	Implementation of project to result in productivity or cost efficiency losses of upto minus R 5 million compared to the current situation or market average cost
		Promote health and safety	30%	Ranging from fatality or multiple major injuries through to multiple fatalities	N/A	Minor injuries or health impacts of temporary and reversible nature, with no lasting impact on employee well-being or operational effectiveness
		Retain employees through an attractive environment	10%	Staff arranges protests, slow go actions or go on strike. Unacceptably high rates of staff turnover in the professional and management echelons due to unsatisfactory physical work environment	Significant decline in staff morale, with staff openly displaying negative work sentiments at more than one location	Marginal decline in staff morale, limited to a particular location, may be evidenced through higher than normal sick leave or consistent low rates of productivity
		Resource efficiency	30%	Project uses scarce resources in an unsustainable way	Project results in significant losses in resource efficiency	Project results in marginal losses in resource efficiency

NEUTRAL	BENEFIT RANGE				
NO POSITIVE OR NEGATIVE IMPACT	INSIGNIFICANT	MINOR	MODERATE	MAJOR	EXTREME
0	1	2	3	4	5
NO SPATIAL IMPACT	NEIGHBOURHOOD/VILLAGE	DISTRICT/SUBURB	TOWNSHIP OR TRUNK PUBLIC TRANSPORT FACILITY	INTEGRATION ZONE, MAJOR ARTERIAL ROAD OR REGION	CDB, PRIMARY NODES, CORRIDORS OR SPECIAL ECONOMIC ZONES
0	0 - 19	20 - 39	40 - 59	60 - 120	>120
No requirement to implement the project	Project is discretionary	Project is required to coordinate with or support a higher priority committed project	Project is committed by policy of Council or in the municipality's strategic plan, or is required to achieve non-statutory accreditation	Project is committed for either contractual reasons or project staging requirements	Project must proceed to meet statutory requirements
Redevelopment, upgrading or renewal in existing built space (no increase in spatial footprint, density or intensification in land use)	Development causes or contributes towards increase of upto 5% of current average gross residential density/ha, or redevelopment of greyfields and/or Development that causes land use intensification for more than 8 hrs/day	Development causes or contributes towards increase of between 5% - 10% of current average gross residential density/ha, or redevelopment of greyfields and/or Development that causes land use intensification for more than 8 hrs/day	Development causes or contributes towards increase of between 10% - 15% of current average gross residential density/ha, or redevelopment of greyfields and/or Development that causes land use intensification for more than 8 hrs/day	Development causes or contributes towards increase of between 15% - 20% of current average gross residential density/ha, or redevelopment of greyfields and/or Development that causes land use intensification for more than 12 hrs/day	Development causes or contributes towards increase of over 20% of current average gross residential density/ha, or redevelopment of greyfields and/or Development that causes land use intensification for more than 12 hrs/day
No impact	Reduced commuting time in/or spatial segment or 1% - 5% increase in use of public transportation or reduction of between 1% - 5% of household income spent on transport costs	Reduced commuting time in/or spatial segment or 6% - 10% increase in use of public transportation or reduction of between 6% - 10% of household income spent on transport costs	Reduced commuting time in/or spatial segment or 10% - 15% increase in use of public transportation or reduction of between 10% - 15% of household income spent on transport costs	Reduced commuting time in/or spatial segment or more than 15% increase in use of public transportation or reduction of more than 15% of household income spent on transport costs	Project necessary to achieve city-wide public transport integration
No impact	Enables fixed capital investment of between R 1 - R 19 million	Enables fixed capital investment of between R 20 million - R 39 million	Enables fixed capital investment of between R 40 million - R 59 million	Enables fixed capital investment of between R 60 million - R 120 million	Enables fixed capital investment of more than R 120 million
No impact	Either: Increase in serviced GLA of 1-5% of spatial scale or Increase in serviced informal trading space of between 1 - 50m2	Either: Increase in serviced GLA of 1-5% of spatial scale or: Increase in serviced informal trading space of between 51 - 150m3	Either: Increase in serviced GLA of 1-5% of spatial scale or: Increase in serviced informal trading space of more than 150m4	Either: Increase in serviced GLA of 1-5% of spatial scale or: Increase in serviced informal trading space of between 1 - 50m5	Either: Increase in serviced GLA of 1-5% of spatial scale or: Increase in serviced informal trading space of between 1 - 50m6
No impact	Estimated 1 - 5% increase in market value of properties zoned for economic use	Estimated 6 - 10% increase in market value of properties zoned for economic use	Estimated 11 - 15% increase in market value of properties zoned for economic use	Estimated 15 - 20% increase in market value of properties zoned for economic use	Estimated increase in market value of properties zoned for economic use of over 20%
No impact	Creation of between 1 - 50 annual equivalent jobs	Creation of between 51 - 100 annual equivalent jobs	Creation of between 101 - 200 annual equivalent jobs	Creation of between 201 - 300 annual equivalent jobs	Creation of more than 300 annual equivalent jobs
Carbon neutral/ no carbon production	Project design ensures full sequestration of the carbon it generates	N/A	N/A	N/A	Project delivers a carbon store greater than the carbon it produces
No change in the ability of the natural environment to deliver ecological services	Limited local restoration or enhancement of the ability of the natural environment to deliver one or more ecosystem services	Restoration or enhancement of the ability of the natural environment to deliver one or more ecosystem services with district-wide benefits	Restoration or enhancement of the ability of the natural environment to deliver one or more ecosystem services with township-wide benefits	Restoration or enhancement of the ability of the natural environment to deliver one or more ecosystem services with regional benefits	Project enhances the ability of the natural environment to deliver multiple ecosystem services e.g. provisioning, supporting, regulating and cultural services at a city-wide scale
No impact on fauna and flora	Project provides quality natural space of at least 500m2	Project provides quality natural space of at least 1 hectare	Project provides quality natural space of at least 1.5 hectares, or contributes towards connecting natural corridors within the township	Project provides natural green space of regional significance and contributes towards the establishment of green corridors within that region, or to other regions	Project enhances the quantity or richness of species or enables the creation of a city-wide linked open space system
Discounted BCR of 1	Discounted BCR in the range of 1.1 - 1.5	Discounted BCR in the range of 1.6 - 2.5	Discounted BCR in the range of 2.6 - 3.5	Discounted BCR in the range of 3.6 - 4	Discounted BCR greater than 4
IRR equals cost of capital	IRR in the range of 1% - 3% above hurdle rate	IRR in the range of 3.1% - 5% above the hurdle rate	IRR in the range of 5.1% - 7% above the hurdle rate	IRR in the range of 7.1% - 10% above the hurdle rate	IRR greater than 10.1% above the hurdle rate
NPV equals 0	NPV in the range of R 1 - R 19 million	NPV in the range of R 20 million - R 39 million	NPV in the range of R 40 million - R 59 million	NPV in the range of R 60 million - R 120 million	NPV greater than R 120 million
No impact	Project delivers municipal services to less than 1 000 customer units	Project delivers municipal services to 1 001 - 5 000 customer units	Project delivers municipal services to 5 001 - 10 000 customer units	Project delivers municipal services to 10 001 - 20 000 customer units	Project delivers municipal services to more than 20 000 customer units
No impact	Single product housing delivery project catering for a single market segment, without provision for the conditions associated with sustainable human settlement	Project delivers a limited range of housing products, without provision for the conditions associated with sustainable human settlement	Project delivers a range of housing products for households with varying lifestyle needs and affordability, with no attention paid to creating the conditions for sustainable human settlement	Project delivers a range of housing products for households with varying lifestyle needs and affordability, with limited attention paid to creating the conditions for sustainable human settlement	Project delivers a range of housing products for households with varying lifestyle needs and affordability in a sustainable human settlement
No impact	Project mitigates against non-threatening health impacts that impedes quality of life at neighbourhood scale	Project mitigates against non-threatening health impacts that impedes quality of life at district/ suburb scale	Project mitigates against chronic health impacts	Project mitigates against the risks of injury by members of the public	Project mitigates against the risks of fatality by members of the public
No impact	Project creates opportunities for skills development of between 1 - 50 community members	Project creates opportunities for skills development of between 51 - 100 community members	Project creates opportunities for skills development of between 101 - 200 community members	Project creates opportunities for skills development of between 201 - 300 community members	Project creates opportunities for skills development of more than 300 community members
No impact	Protection or restoration of existing cultural assets e.g. historic grave sites of local cultural value	Protection or restoration of existing cultural assets e.g. historic grave sites of city-wide cultural value	Protection or restoration of existing cultural assets e.g. historic grave sites of cultural value broader than the city limits	Project creates or enhances the cultural wealth of the city sufficiently to attract provinc-wide interest and media coverage, and cultural tourists outside the city limits	Project creates or enhances the cultural wealth of the city sufficiently to attract national interest and media coverage, and cultural tourists outside the city limits
No impact	Project creates neighbourhood space for enjoyment by local residents	Project creates public space of suitable quality and utility that people travel across a district to make use of it	Project creates inclusionary public space of suitable quality, utility and capacity for the benefits of all people in a suburb	Project creates public space for regional enjoyment by people of different walks of life, offering multiple functionality, capacity and design for social inclusivity	Project delivers celebrated public space for multi-cultural enjoyment by people of all dispositions (class, race, gender and age), of a nature that enhances the urban character and strengthens the city's tourism potential
No impact	Implementation of project to result in productivity increases or cost efficiencies of R 1 - R 10 million	Implementation of project to result in productivity increases or cost efficiencies of R 11 - R 20 million	Implementation of project to result in productivity increases or cost efficiencies of R 21 - R 40 million	Implementation of project to result in productivity increases or cost efficiencies of R 41 - R 60 million	Implementation of project to result in productivity increases or cost efficiencies of more than R 60 million
No impact	Improvement limited to reduction of minor incidences. Will not improve operational effectiveness, but will demonstrate commitment to employee wellbeing	Improvement in health & safety conditions lead to an improvement in lost time due to injury-related sick leave and/or other financial claims	Improvement in health & safety conditions sufficiently robust to reasonably limit life-threatening events, disability or other irreversible injuries	Supports best practice in preventing/limiting widespread or repetitive major health & safety incidences of a type that includes limited fatalities or multiple major injuries	Enhancement of health & safety conditions in line with legal requirements with potential to prevent or limit extreme or large scale health & safety incidences
No impact	Marginal improvement in staff morale, or meeting of basic workplace hygiene requirements	A noticeable improvement towards a conducive work environment or employment conditions, with improved staff morale expected in a particular location	A noticeable improvement towards a conducive work environment or employment conditions, with improved staff morale expected in more than one location	A noticeable improvement towards a conducive work environment or employment conditions, with improved staff morale expected in most or all locations	Create or support workplace or employment conditions required by law and accepted industry practice benefiting most staff
No impact	Project delivers marginal improvements in resource efficiency	Project delivers significant improvements in resource efficiency	Project delivers major improvements in resource efficiency	Project employs novel new technologies promising high levels of resource efficiency gains	Project employs recognised best-in-class resource efficiency technology or operations

CITIES' **INFRASTRUCTURE**
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