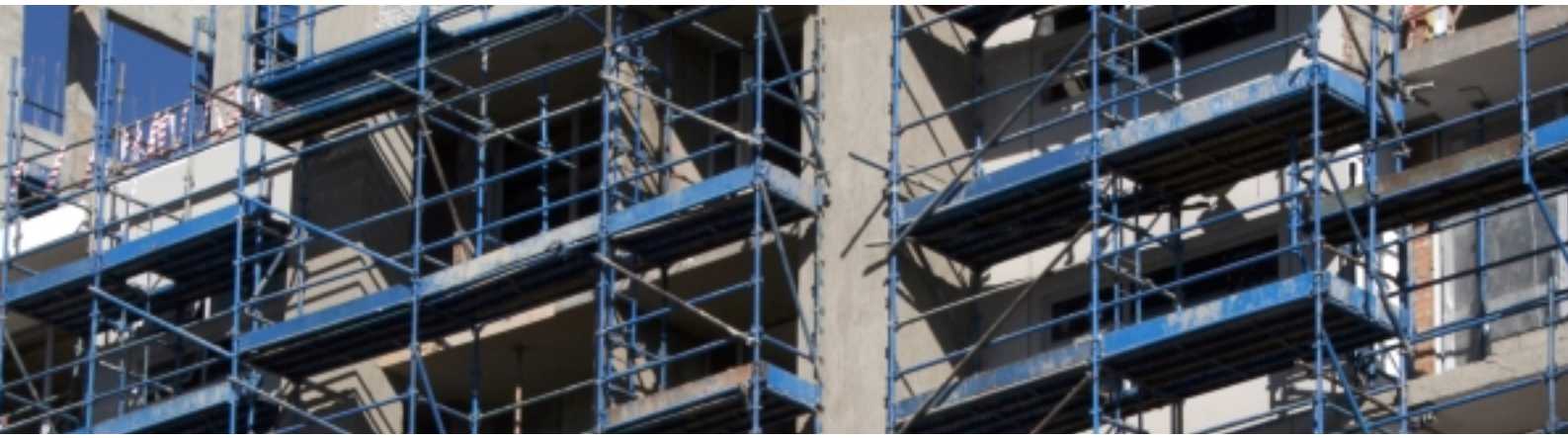


National Infrastructure Maintenance Strategy (NIMS)

Infrastructure Maintenance Budgeting Guideline

cidb
development through partnership

CONTENTS

Deffinitions

ASGISA
Accelerated and Shared Growth Initiative for South Africa

Current day replacement cost
In the context of this document is the amount it will cost to replace an asset with a suitable new asset at present day costs

DWAF
Department of Water Affairs and Forestry

EPWP
Expanded Public Works Programme

IAM
Infrastructure asset management to ensure effective and efficient delivery of services: encompassing the entire asset life cycle including planning, initial construction, ongoing operation, maintenance, refurbishment, maintenance and eventually disposal, and replacement with an appropriate alternative asset. to ensure effective and efficient delivery of services

IDIP
Infrastructure Delivery Improvement Programme

Maintenance
In the context of this document maintenance embraces planning, budgeting and implementation of repair, planned maintenance, rehabilitation and replacement of infrastructure to achieve an optimal level of service provided by the infrastructure.

NIMS
National Infrastructure Maintenance Strategy

Refurbishment
Refurbishment after a period of usage (typically 5 to 10 years) which maintains or extends the remaining useful life of an asset.

Replacement
Replacement of an asset at the end of its useful life

Strategic Infrastructure
Infrastructure which, if it fails, has the largest impact on service delivery and is therefore strategic to maintain in optimum condition

1. Purpose

The purpose of this document is to provide macro budgeting guidelines for maintenance of public sector infrastructure assets in terms of the Government's National Infrastructure Maintenance Strategy and the move towards more effective infrastructure asset management.

These guidelines should only be used for strategic budgeting purposes at national level and not to replace proper infrastructure asset management at the operational level.

2. Context and background - Need for infrastructure asset maintenance

Cabinet has recognized the importance of infrastructure maintenance within Government and the role that effective maintenance will play in support of ASGISA. To this end cabinet has approved the National Infrastructure Maintenance Strategy (NIMS) and the Department of Public Works supported by the Construction Industry Development Board has been tasked with leading the implementation of the programme to deliver on the NIMS strategy.

The vision is that infrastructure shall be adequately maintained and operated, resulting in sustained service delivery, growth and employment creation, thus contributing to the goals of ASGISA. This will be achieved by improved infrastructure asset management planning, budgeting and implementation.

The four thrusts of the National Infrastructure Maintenance Strategy, implementation of which will lead to the achievement of this vision, are:

i. Strengthening the regulatory framework governing planning and budgeting for infrastructure maintenance.

ii. Assisting institutions with non-financial resources.

iii. Developing the maintenance industry.

iv. Strengthening monitoring, evaluation and reporting, and feeding this into a process of continuous improvement.

This Strategy gives substance to present legislation, e.g. PFMA, MFMA and the Municipal Systems Act, which places an obligation on accounting officers "for the management of the assets of the entity, including the safeguarding and maintenance of those assets". (MFMA 96 (1) (a).)

Many institutions will however not be able to improve their maintenance policies and practices without the strong direction and assistance from national government that will result from implementation of the Strategy.

In this "Infrastructure Maintenance Budgeting Guideline", "maintenance" is used as a generic term embracing planning, budgeting and implementation of repair, planned maintenance, rehabilitation and replacement of infrastructure to achieve an optimal level of service provided by the infrastructure.

The cost of maintenance of an infrastructure asset is determined not just by the size, nature, capacity etc of that infrastructure, but by its fitness for purpose, how well it was designed, materials specified and used, the quality of construction and very importantly, how well it has been operated and maintained in the past. Generally, at least half of the lifetime cost of an infrastructure asset must be borne after it has been commissioned comprising both operating and maintenance costs. In other words, the cost of planning, design and construction of the asset is invariably less than half, sometimes even less than 20%, of the lifetime cost. Decisions are nevertheless frequently taken in order to "save cost" at planning, design or construction stage, despite it often being possible to show that these increase costs of operation, through the life of that asset, that far exceed the initial "saving". It might for example be that the choice of less durable construction materials is the direct cause, later, of having to prematurely refurbish or even replace the infrastructure. Similarly, injudicious design, or poor construction workmanship, if not detected and timeously corrected, will lead to operational problems with resultant significant costs. Furthermore, design and construction that does not take into account practical operation and particularly maintenance issues may result in costly errors.

Life-cycle infrastructure asset management means considering options and strategies, and costs, throughout the life of the asset, from planning to disposal. The objective should to be to look for most effective and efficient service delivery linked to lowest long-term cost (rather than short-term savings) when making decisions.

It should also be noted that maintenance budget norms can only exist in a context of other norms, such as operational skills norms. For example, a competent skilled person could undertake proper maintenance resulting in reduced maintenance costs, whereas an incompetent person could through improper procedures cause damage requiring increased maintenance.

This Guideline focuses on the maintenance budgeting and does not address the operational costs associated with running various types of infrastructure which must be budgeted separately. For example - the cost of chemicals used within a water treatment works is an operational cost distinct from maintenance. Thus, in the financial systems of public organisations distinction should be made in the financial line items between operational costs and maintenance of infrastructure.

3. Strategic Infrastructure Prioritisation

Given the magnitude of the maintenance backlog is in many sectors, it is difficult to know where to start. A fundamental principle of the NIMS strategy is to focus on "strategic infrastructure" i.e. on infrastructure which, if it fails, has the largest impact on service delivery. Once "strategic infrastructure" has been identified, this infrastructure should then be prioritised and available maintenance budget focused on ensuring the ongoing operation of this strategic infrastructure.

Leadership of public sector organisations needs to be accountable for identifying strategic infrastructure and ensuring adequate budget allocation for maintenance thereof.

Examples of strategic infrastructure which should be prioritised include assets such as:

a. Arterial roads which are key transport routes - as these provide the backbone for economic growth and employment;
b. Bulk water storage and bulk water reticulation - as these provide the water supply to regions, municipalities and communities which they serve;
c. Water purification works - as the correct functioning of these have a direct impact on the health of entire communities which they service;
d. Sewage treatment works - as the functioning of these have a direct and serious impact on the health of entire communities and the environment downstream from them;
e. Electricity generation facilities - as these provide the power supply for the entire nation which is the backbone for all development;
f. Major electricity supply lines and transformers - as these provide the power supply for the entire nation;
g. Hospital critical care and emergency facilities - which are needed for critical hospital services;
h. Structural integrity, roofing and weather proofing of schools - as without safe, weatherproof classrooms schools cannot function adequately

Obviously the list goes on of strategic infrastructure. It is important that the various sectors identify the strategic infrastructure within their sphere and focus initially on ensuring that this infrastructure is the focus of adequate maintenance, due to the significant impact which the strategic infrastructure has on service delivery and economic growth.

4. Cautionary note on the use of the guideline

The intention of this Guideline is to provide a start to improving budgeting for infrastructure maintenance but this is **not as a substitute for proper infrastructure asset maintenance (IAM)**, which should be the ultimate goal in supporting service delivery improvements .

There is no simple formula that can be applied across the board with respect to maintenance planning. International best practice confirms this i.e. that it is not adequate to simply apply a simple budgeting rule to maintenance of infrastructure - for example "4% of the replacement cost for public buildings should be set aside annually for maintenance".

This Guideline only provides a guide for indicative minimum budgets which should be applied for national budgeting purposes as a starting point to addressing the maintenance requirements.

It is only by putting in place a comprehensive infrastructure asset management system focusing on effective and efficient service delivery, that adequate infrastructure maintenance can be addressed which takes into account all the contributory factors that influence the life cycle costs of infrastructure such as:

- Current and future demand for services requiring infrastructure to support the delivery of those services;
- Current technology being utilised;
- Current condition of available infrastructure that supports
- Current operating and maintenance costs of the infrastructure;
- Potential remaining useful life of the infrastructure;
- Replacement and disposal strategy for the existing infrastructure.

Furthermore, it is not possible to adequately "average" the maintenance costs of infrastructure as two components of the same infrastructure may have very different operation and maintenance costs and the resultant operational and maintenance costs of poorly designed or poorly maintained infrastructure will be excessive. It is essential to treat each infrastructure asset as a separate element and plan the infrastructure maintenance accordingly. For example:

- A road which is located on poor soil conditions will require much higher maintenance costs than other roads located on good soil conditions and an average budget will therefore not provide for adequate maintenance of the road located on poor soil conditions.
- The ongoing operational and maintenance cost of certain infrastructure can be substantially more than the original capital cost. For example if water and sewage pumps are wrongly specified, the resultant operational costs of electricity usage alone may far exceed the original capital cost of the infrastructure. Furthermore, there is significant evidence that due to inadequate maintenance of pumps, the pumps do not perform optimally and result in significantly increased electricity operational cost which could have been saved if the routine maintenance had been carried out.
- In installations such as water and sewer treatment works and water supply or sewer reticulation which requires pumping, inefficient pumping over the lifespan of the scheme results in inefficient operational costs which may far exceed the capital cost of correctly sized pumps. Maintenance engineers often indicate that they do not have budget to maintain the pump, so they can only fix it when it is totally broken, and when it is broken then they replace it with an oversized pump because they know that they will not get the maintenance budget again to maintain the pump in the future, so it must last 20 years. This approach to over sizing maintenance components results in excessive operational costs over the long term by using the incorrectly sized equipment with resultant very high electricity operational costs many times the cost of adequately sizing pumps and maintaining them.
- Failure within water purification and sewage treatment works has serious implications both in water quality and pollution resulting in serious health hazards.
- Electricity reticulation including substations and transformers which are not maintained or replaced at the correct time, if they fail have significant implications to the economy and community well being within the affected areas.
- Water leakages within reticulation in many municipalities is running at over 50% of water treated, resulting in scarce water resources being wasted and the resultant operational costs of treating the water supply only to have it leak away into the ground.
- If routine maintenance of roads (which should occur every three to seven years dependent on the vehicle loads and traffic volumes) is delayed by just one or two years the resultant lifespan of the road can be reduced by as much as five years.

As illustrated by the above examples, unless the specific infrastructure is identified and a proper asset management system put in place, it will not be possible to determine the actual maintenance cycle and costs for each specific element. Therefore, average maintenance budgets should only be used as a broad guide to kick start the maintenance budgeting processes and should not be used to try and provide a simple budgeting tool, in place of a comprehensive infrastructure asset management focusing on total life cycle costing.

5. Infrastructure Budgeting Guideline

Table 1 below gives indicative budgeting guidelines for various types of infrastructure to be maintained.

As indicated in section 3, it is proposed that the initial focus should be on maintaining infrastructure which is of a strategic nature and the budget requirements for these may differ from that in the table 1 dependant on the current condition of the strategic infrastructure in question.

As indicated in the cautionary note section 4 above, a simplified budgeting formula cannot be used to replace proper infrastructure asset management. The indicative budget figures in table 1 represent ball park orders of magnitude only, for national budgeting purposes.

Maintenance budget estimates within Table 1 should be peer reviewed by the applicable sectors responsible for oversight (for example Department of Water Affairs, Education, Health etc.) in order to confirm that they represent the correct order of magnitude.

The maintenance budget percentages reflected below are estimates of the minimum maintenance budget which should be provided annually in relation to current day replacement cost of the infrastructure, in order to provide a reasonable basis for ongoing service delivery.

The specific technology used within a particular infrastructure may have an significant impact on the maintenance costs and will need to be taken into account when assessing the specific maintenance budget requirements of a particular infrastructure.

In using table 1 it should be noted that the maintenance cycle for each asset is not static each year. Typically the maintenance cycle requires the following components:

1. Normal annual maintenance;
2. Emergency maintenance - for example a burst water pipe as a result of a severe storm;
3. Periodic refurbishment - for example resurfacing of a road every 5 to 7 years to ensure that it will last its design life of twenty years;

The budget estimate within table 1 caters for the above three elements. However, this annual averaging approach in table 1 will need to be refined within each sector to separate out the average annual maintenance budget and the periodic refurbishment.

Over and above the maintenance components set down above, the following components will also need to be taken into account with respect to the total life cycle costing, which are NOT catered for within table 1:

a. Major rehabilitation, in order to extend the life of an asset which is not the same as periodic maintenance;

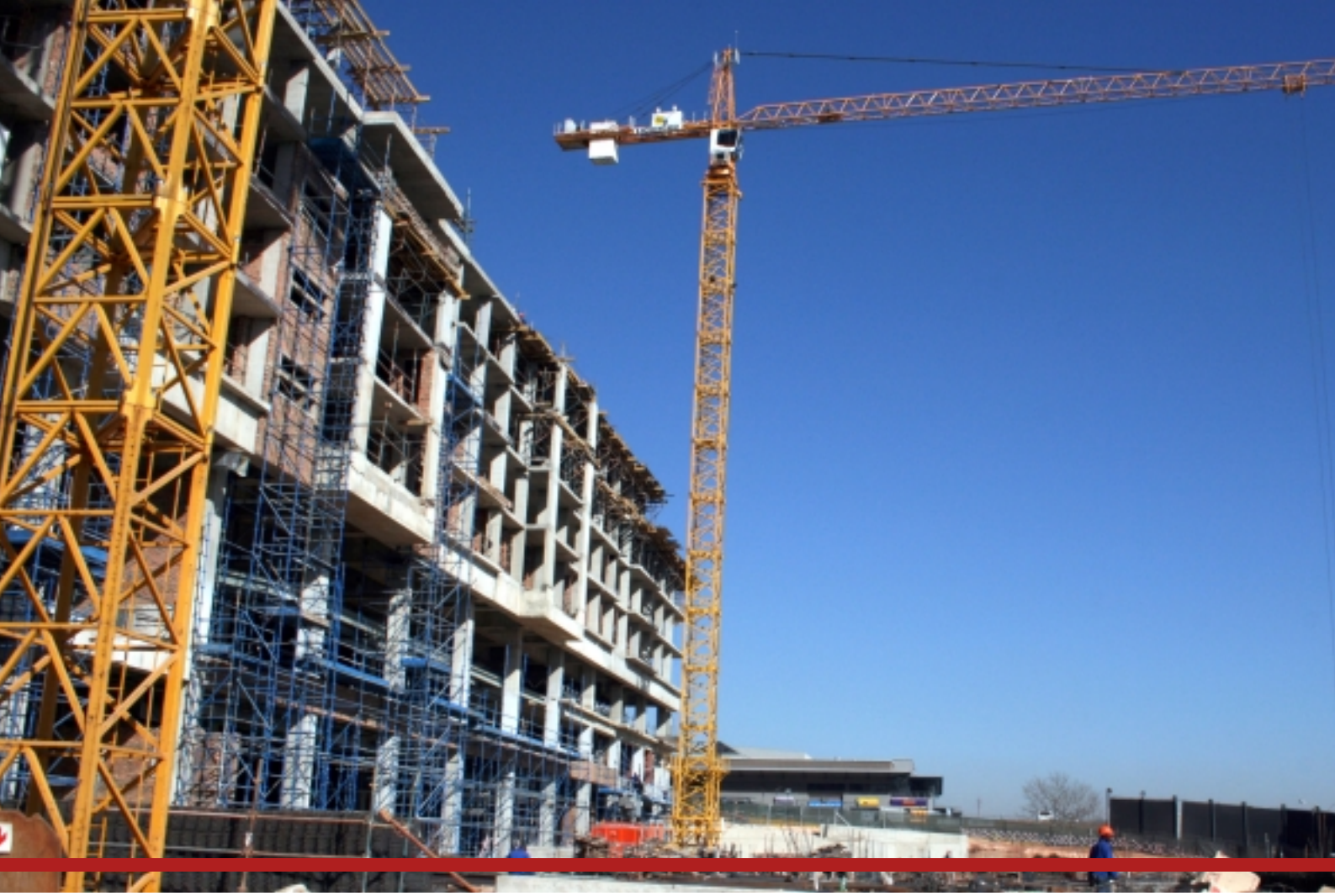
b. Replacement of the asset at the end of its useful life; and

Disposal of the asset which may require demolition and environmental rehabilitation.

It should be noted that the figures set down in Table 1 are indicative only and subject to verification within each sector and by each organisation dependent on a range of issues including age and technology of current infrastructure, current level of usage, future demand etc. The purpose of this table is to provide first order macro budgeting , in order to commence the maintenance budgeting process. As the public sector becomes more adept at infrastructure asset management then appropriate cost norms will be developed within each sector, for different infrastructure components which are of strategic significance (e.g. critical pumps, transformers, link roads, etc.).

Type of infrastructure	Average Annual Maintenance Budget as % of Replacement Cost	Key Assumptions	Replacement or Major Rehabilitation over and above the Annual Maintenance Budget requiring specific capital budget
Bulk water storage	4-8%	Mostly for periodic repair of electrical and mechanical works, storm damage repair, routine maintenance and periodic maintenance	every 30 to 50 years
Water treatment works	4-8%	Mostly for electrical and mechanical equipment	every 20 to 30 years
Water reservoirs	2-3%	Generally low maintenance mostly of telemetry and electrical equipment, storm damage repair, pipe work repair, safety and security, routine maintenance and periodic maintenance	every 20 to 30 years
Water reticulation	4-8%	Mostly for telemetry and pumping equipment, emergency leak repair and ongoing leak repair due to degradation, storm damage repair	every 20 to 30 years
Sewage treatment works	4-8%	Mostly for electrical and mechanical equipment, storm damage and periodic maintenance.	every 20 to 30 years
Sewer reticulation	4-8%	Mostly for pumping equipment, emergency leak repair and ongoing leak repair due to degradation, blockage removal, storm damage repair,	every 20 to 30 years
Roads and storm water	5-10%	Mostly for emergency repair, storm damage repair, and periodic maintenance (resurfacing every 7 to 10 years).	every 20 to 30 years
Electricity reticulation	10-15%	Mostly for emergency repair, storm damage repair, safety and security, routine maintenance and periodic maintenance.	every 20 to 30 years
Public buildings	4-6%	Mostly for emergency repair, storm damage repair, and periodic maintenance (e.g. repainting and cosmetic upgrades every 5 to 10 years).	every 30 to 50 years
Hospitals	5-8%	Mostly for emergency repair, storm damage repair, and periodic maintenance (e.g. repainting every 3 to 5 years, and cosmetic and operational upgrades every 7 to 10 years).	every 20 to 30 years
Schools	4-6%	Mostly for emergency repair, storm damage repair, and periodic maintenance (e.g. repainting every 5 to 7 years,).	every 30 to 50 years
Electricity generation	5-8%	Mostly for electrical and mechanical equipment and dependent on age and technology of works	every 30 to 50 years
Electricity reticulation	10-15%	Mostly for emergency repair, storm damage repair, safety and security, routine maintenance and periodic maintenance (e.g. every 7 to 10 years).	every 20 to 30 years

NOTE: this table must be read in conjunction with the cautionary note in Section 4 of this document



6. Way Forward

This Guideline comprises an input for budgeting of maintenance to the work of the various NIMS task teams as defined within the NIMS strategy and is not an end in itself.

The proposed way forward for the use of this Guideline comprises:

1. Submission into the NIMS Task Teams and various existing planning and coordination forums for review and discussion;

2. Inputs from the various sectors (e.g. Water Affairs, Health, Education, Power Generation, Municipal Services) to verify the macro budgeting norms presented in table 1, as well as the strategic infrastructure within each sector which should be prioritised;

3. Formulation of a guideline for Prioritisation of Strategic Infrastructure;

4. Formulation of strategies for taking forward budgeting for strategic infrastructure within NIMS;

5. Mobilisation of strategic infrastructure identification and prioritisation within NIMS.

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