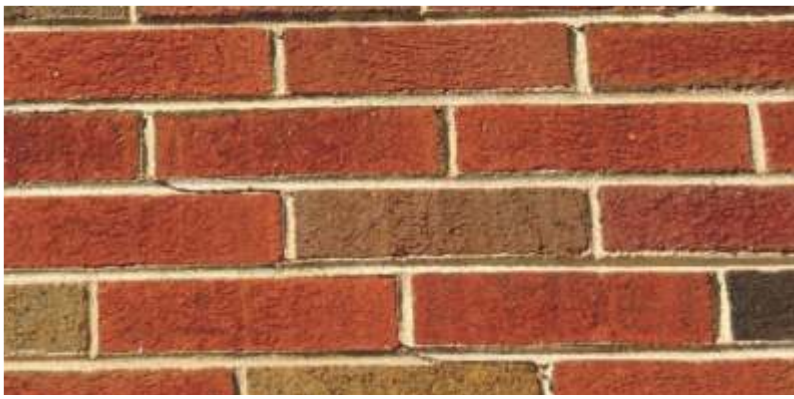

the national infrastructure maintenance strategy

in support of ASGISA and government growth objectives

public works

Department:
Public Works
REPUBLIC OF SOUTH AFRICA

CSIR
our future through science

cidb
development through partnership

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"... looking after both old and new infrastructure is a challenge and an opportunity ..."

"... we have tended not to put maintenance high on the agenda ... not only are we putting it high on the agenda now ... we can launch it as an industry in its own right."

Deputy President Phumzile Mlambo-Ngcuka
November 2005

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definitions and abbreviations

ACSA	Airports Company of South Africa
ASGISA	Accelerated and Shared Growth Initiative for South Africa
BBBEE	Broad-Based Black Economic Empowerment
BEE	Black Economic Empowerment
cidb	Construction Industry Development Board
CMIP	Consolidated Municipal Infrastructure Programme
CSIR	Council for Scientific and Industrial Research
DBSA	Development Bank of Southern Africa
DPE	Department of Public Enterprises
dplg	Department of Provincial and Local Government
DPSA	Department of Public Service and Administration
DoRA	Division of Revenue Act
DoT	Department of Transport
DPW	Department of Public Works
DWAF	Department of Water Affairs and Forestry
EPWP	Expanded Public Works Programme
GAMAP	Generally Accepted Municipal Accounting Practice
GIAMA	Government Immovable Assets Management Act
IDIP	Infrastructure Delivery Improvement Programme
IDP	Integrated Development Plan
IDT	Independent Development Trust
IMESA	Institution of Municipal Engineers of Southern Africa
JIPSA	Joint Initiative on Priority Skills Acquisition
KPI	Key Performance Indicator
Maintenance	Embraces planning, budgeting and implementation of repair of infrastructure, refurbishment and renewal, and provision for replacement of that infrastructure.
MFMA	Municipal Finance Management Act
MIG	Municipal Infrastructure Grant
MTEF	Medium-Term Expenditure Framework
NPA	National Ports Authority
PFMA	Public Finance Management Act
PSA	Public Service Act
RED	Regional Electricity Distributor
SABC	South African Broadcasting Corporation
SALGA	South African Local Government Association
SANRAL	South African National Roads Agency Limited
SAPO	South African Port Operations
SAPS	South African Police Service
SETA	Sector Education and Training Authority
SMME	Small, micro and medium sized enterprise
SOE	State Owned Enterprise
Strategic Plan	Rolling Five Year Strategic Plan that all national and provincial departments are required in terms of the PFMA and PSA to produce each year

preface

Cabinet has recognized the importance of infrastructure maintenance within government and the role that effective maintenance will play in support of ASGISA, and to this end approved the National Infrastructure Maintenance Strategy (NIMS) in August 2006.

The National Infrastructure Maintenance Strategy draws extensively on a framework document developed by the Department of Public Works, the Construction Industry Development Board (cidb) and the Council for Scientific and Industrial Research (CSIR). This document is published here because of its importance.

The Department of Public Works has been tasked with leading the implementation of the programme to deliver on the strategy. The Department and the cidb have been tasked with overall management of the programme, and the cidb will provide a fulltime programme manager to take responsibility for the programme.

1. introduction

1.1 Objective of this document

This document describes the National Infrastructure Maintenance Strategy, a co-ordinated programme of actions to address the issues summarised in the following problem statement.

> **“Delivery” needs to be understood as embracing not just the construction of infrastructure but the operation and maintenance of that infrastructure throughout its intended life.”**

1.2 Problem statement

All three spheres of government, together with the SOEs, manage major portfolios of immovable infrastructure assets. (For the purposes of this report, "public sector" includes state owned enterprises (SOEs) such as Eskom, Transnet and Telkom.) While there is much emphasis on “delivery” of infrastructure, delivery does not end with the commissioning of the infrastructure asset. Once the infrastructure has been commissioned, various activities must be carried out which are necessary to ensure that it continues to perform such as the allocation of necessary budgets and the retention of appropriate staff to maintain the operation of the assets. “Delivery” needs to be universally understood as embracing not just constructing the infrastructure, but the appropriate operation and maintenance thereafter, for the whole design life of the asset.

In this document, "maintenance" is used as a generic term to include planned maintenance, repair, refurbishment and renewal, and provision for replacement of the infrastructure.

In 1994 the democratic government evaluated the imbalance in infrastructure that characterised the nation, and embarked on an ambitious plan to put matters right by addressing the backlog. For example, the government has invested significantly in providing water to 15 million people. Other infrastructure provided at the same time, such as sanitation and road infrastructure, has further improved the quality of life of the people of South Africa. Government is committed to increasing levels of infrastructure investment at national, provincial and municipal government level as a foundation for service delivery, economic growth and social development.

The blueprint for a new South African Economy, the Accelerated and Shared Growth Initiative for South Africa (ASGISA), has identified six "binding constraints", which, if removed or mitigated, would have a considerable effect on accelerating and sharing growth in the short to medium term. One of these is the provision of infrastructure. Clearly, the impact of increased infrastructure investment would be negated should that infrastructure fail to deliver services, and therefore ASGISA recognises the need to simultaneously address backlogs for investment in maintenance and in new infrastructure. This is also recognised in "Government's Programme of Action for 2006" - one of the actions is to complete the plan for maintenance of general public infrastructure.

The fact that government has focussed on new infrastructure to address backlogs from the past is not the problem, and government should not change its focus in this regard. The challenge is to supplement this by also focussing on the maintenance of both new and old infrastructure at the same time as providing the new infrastructure needed to address backlogs.

All spheres of government, as well as state owned enterprises (SOEs), face the challenge of operating and maintaining infrastructure, although to varying extents. Some public sector institutions maintain their infrastructure at a high standard. Budgets are adequate (even if barely so), skilled staff are in place, leadership is committed, and policies support sound infrastructure maintenance practices. Other sectors have lagged behind, but the risks of this are recognised, and in some sectors maintenance needs are being addressed by targeted programmes.

Of wider importance than programmes targeted at individual sectors, the Government Immovable Asset Management Bill is before Parliament, and guidelines for asset management planning are being drafted. The Act will be binding on national, provincial and local government and will guide improved public sector infrastructure asset management.

"Infrastructure maintenance":
For the purposes of this document, the term "infrastructure maintenance" embraces planned maintenance and repair, refurbishment and renewal, and provision for replacement of that infrastructure.

If government spends its maintenance budget on fixing infrastructure only after it has already broken down, then it is effectively throwing away a large proportion of that budget funds that could rather have been used elsewhere to improve the quality of life of its citizens. This is because it is much cheaper to carry out periodic preventative maintenance than to do repairs when infrastructure breaks down.

"The following are the principles of immovable asset management .... [inter alia] in relation to an acquisition, it must be considered whether .... the cost of the immovable asset as well as operational and maintenance cost throughout its life cycle justifies its acquisition in relation to the cost of the service ... [and] when an immovable asset is acquired or disposed of best value for money must be realised."

("Government Immovable Asset Management Bill", clauses 5(1) (c) and (e).)

Despite the good performance in some sectors, there is strong evidence that in other sectors much of the infrastructure, of both pre- and post-1994 vintage, is not being properly maintained. Older infrastructure is often not being refurbished and renewed when it needs to be, and there is inadequate planned preventative maintenance on new infrastructure.

Wastewater treatment works are of particular concern. Other sectors of concern include water treatment works, water and sewer reticulation, and on-site sanitation, some provincial and municipal roads, and some provincial health and education facilities. Ultimately, unless maintenance is improved in these sectors, funds to address the cost of repairs and unplanned replacements (as opposed to planned, preventative measures) will have to be found from capital budgets, which will severely limit the programme for addressing backlogs and expanding service delivery.

Generally, the larger institutions are performing the best with regard to maintenance - for example DWAF water resources, the larger water boards, Airports Company (ACSA), Telkom, Eskom, national roads (SANRAL), Transnet and most of the metropolitan municipalities. On the other hand, some services in some of the rural-based municipalities have already failed.

From an accrual accounting perspective, there is no real saving in reducing maintenance budgets, because the resulting reduction in asset values is greater than the saving in maintenance. Furthermore, there are other significant costs associated with inadequate maintenance and consequent breakdowns, including loss of production which can cause serious economic loss, in some cases health risks, injury or loss of life, and the cost of alternative emergency measures needed during breakdowns.

Given that some public sector institutions are not likely to be able to improve their maintenance policies and practices without strong direction and assistance from national government, a holistic national infrastructure strategy is needed, to ensure that existing and new infrastructure is maintained in good working order.

2.1 A means to an end

Infrastructure is a means to an end. It supports quality of life and the economy if it delivers accessible and reliable services that individuals and institutions need. Access and reliability imply several issues, including that the service must be sustainable if not, the infrastructure (water pipes, for example) may continue to exist, but the service will cease (the water will no longer flow). Clearly, in order to achieve its purpose, infrastructure must be effectively operated and maintained.

If the appropriate infrastructure services have been provided, and these services are effectively managed, they promote economic growth, equity, sustainable development and job creation. Individuals benefit from the provision of water, sanitation, transport, shelter, energy and telecommunications infrastructure. Communities are less prone to sickness; enjoy better access to facilities, to work opportunities and to markets; and income-earning opportunities arise in service delivery and in construction and maintenance of infrastructure. From an economic development point of view, infrastructure lowers the cost of production and consumption, and makes it easier for participants in the economy to enter into transactions. Increasing the efficiency of infrastructure will thus improve growth performance, service provision and development outcomes. Interruptions or, worse, breakage of services have the opposite effect, often with serious social and economic consequences.

2.2 The cost of not maintaining infrastructure

It is self-evident that failure of infrastructure services has consequences for human development, poverty alleviation and economic growth. The cost of not maintaining infrastructure is no longer affordable to South Africa. In some sectors it is negating the impact of the infrastructure development undertaken to date and planned for the future.

Repairs will inevitably have to be undertaken, at greater expense when total breakdown has occurred. The saying "a stitch in time saves nine" applies. The cost of the repair work will be higher than if the maintenance had been undertaken in time. In addition, the infrastructure may have to be replaced well before the end of its originally intended life. Government would then in effect be paying twice for the construction of that infrastructure - this cannot continue, as it is a cost that strikes at the heart of government's growth objectives.

> **"In seven years time we will be using MIG (Municipal Infrastructure Grant) money to fix what we are building today."**
>
> (provincial official, 2005)

2.3 Infrastructure maintenance: a strategic tool

While the importance of the provision of infrastructure to support socio-economic growth has to date been well recognised within government, the potential of infrastructure maintenance as a powerful tool of economic growth and service delivery needs to come more to the fore.

Infrastructure maintenance must be regarded as a strategic tool to promote improved service delivery, to unlock funding to extend infrastructure to historically disadvantaged communities, and to support the nation's economy. Maintenance of existing infrastructure should not be seen as of secondary importance to the apparently more attractive prospect of new infrastructure.

Appropriate infrastructure maintenance also creates jobs. For example, maintenance needs to be done year after year, and personnel to do this maintenance will therefore always be needed - not just for the limited period of construction, but also for the whole of the designed life of the infrastructure. Furthermore, much maintenance

Investing in infrastructure operation and maintenance offers outstanding opportunities for economic stimulation: jobs are created, capital expenditure goes further, and sustainable delivery can be achieved, while political imperatives and community aspirations can be met.

can only be done, or can best be done, by labour-intensive methods, and it is thus important that government's plans for employment creation and the Expanded Public Works Programme give prominence to maintenance. Finally, there is substantial scope for maintenance contracts to promote SMME development, Broad-Based Black Economic Empowerment (BBBEE), involvement of women and youth, and local employment coupled with appropriate enterprise development.

Based on a conservative estimate of 12 equivalent full time jobs per million Rand (6 direct and a further 6 indirect or induced), it is estimated that a maintenance budget of R20 billion will provide employment to approximately 240 000 people for a year. Where labour-intensive methods are appropriate, for example on civil engineering works, much greater levels of employment are attainable (approximately 50 jobs per million Rand).

Maintaining infrastructure comes at a cost, but this is a prudent investment which will save government significantly in the medium to long term and will promote both economic and human capital development.

2.4 Infrastructure life-cycle investment

The cost of maintenance of an infrastructure asset is very much determined not just by the size, nature, capacity etc of that infrastructure, but by how well it was designed, materials specified and used, the quality of construction, etc. Generally, at least half of the lifetime cost of an infrastructure asset must be borne after it has been commissioned. 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. Or savings on the robustness of foundations later manifest themselves in damage to the infrastructure that has been placed on those foundations.

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. For example, special care needs to be given in the design to those elements of infrastructure that will need to be accessed in order to be repaired or serviced. The more difficult those elements will be to access, the more care must be given to choice of construction material and robustness of design, so as to reduce the frequency of access, and to reduce the probability that the elements will malfunction and have to be accessed.

To conclude: The decision to procure infrastructure must be guided by understanding of the life-cycle costs of that infrastructure. It must take into account not just the relatively brief design and construction period, but the far longer period of operation, and the far greater costs of operation. It must understand that "cheap" design and construction will almost inevitably mean expensive (or unreliable) operation and maintenance. It must also understand that poor workmanship will have the same effect.

Life-cycle 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 lowest long-term cost (rather than short-term savings) when making decisions.

> **"The stock of public sector infrastructure is significant. Current replacement cost of this infrastructure, excluding that owned by the SOEs, exceeds R 1000 billion."**

3.1 Introduction

The stock of infrastructure that is owned by government and its agencies is already major and is increasing at a rapid rate. However the maintenance of this stock varies greatly from sector to sector, and, sometimes, also from institution to institution within a sector. Specific sectors have their own unique challenges. Some examples of these are described in Section 3.2 and in Annexure A. Commonalities and differences between sectors are described and discussed in Section 3.3.

Annexure A overviews sector by sector the state of infrastructure and facilities, the state of their management, and current initiatives to enhance maintenance. It does this in respect of most of the principal strategic sectors, viz roads and stormwater, water, sanitation, rail, airports, harbours, telecommunication, education and health facilities, and government buildings. For convenience of gathering and analysing the information, the sections of Annexure A discuss infrastructure under the headings of the institutions or groups of institutions that own the infrastructure.

This listing does not attempt to cover all of the infrastructure and facilities owned by the public sector (for example Metrorail and SA Rail Commuter Corporation, Eskom, SANRAL, National Parks, the SABC, and the housing in public sector ownership are excluded). However it does represent the majority of the strategic infrastructure owned by the public sector - defining "strategic" as that most pertinent to supporting government's growth and poverty eradication objectives. Although information made available on several of the sectors is sparse, it is nonetheless possible to draw strategic conclusions from the overviews.

In Annexure B are generic remarks by types of infrastructure: what goes wrong if maintenance is substandard, and what is needed in respect of maintenance.

3.2 Analysis

3.2.1 Introduction

The review of the information in Annexure A indicates that all public sector institutions could, in respect of the state of their infrastructure and facilities maintenance, be placed in two broad categories described below and set out in Table 3.2:

- Category A: They have sound asset management plans for their strategic infrastructure (if not for all of their infrastructure), maintenance budgets are adequate (even if they could always do with more funding), capacities and skills are adequate, and their leadership has a strong maintenance ethic. OR: They are largely missing one or more of the elements listed above -- for example they might have the plans and the skills, but maintenance budgets, although substantial, are not adequate. However they recognise this, improvement is taking place, and further improvement is programmed.
- Category B: These are not as strong in each of the elements as the institutions of Category A are. Furthermore, this situation is not improving, and might even be deteriorating. OR: They do not have asset management plans, maintenance budgets are not adequate, they lack capacity, and their leadership does not regard maintenance to be very important.

Section 3.2.2 describes features of institutions in Category A, and highlights some of the factors that justify an institution being placed in Category A. Section 3.2.3 does likewise for Category B institutions.

3.2.2 Category A

<u>Features</u>

Category A institutions generally have a good knowledge of the location and extent of the assets that they own. Knowledge of asset condition is excellent in some institutions, ranging to just adequate in others - knowledge of maintenance performance varies accordingly.

The institutions vary greatly in adequacy of budget and skills. Even the best-resourced express a need for greater maintenance budgets, and have staff vacancies or outsource work that they would prefer to do in-house.

"If road maintenance is delayed, the cost for repairs, rehabilitation etc. increases exponentially. According to SANRAL [South African National Roads Agency Ltd], a delay in road maintenance of 3 to 5 years increases the required repair costs by between 6 and 18 times. Also, because of the subsequent decrease in riding quality, the vehicle operating cost of roads could easily double, with the associated ripple effect on the economy."

("Road infrastructure strategic framework for South Africa", DoT 2002:81-82)

Category	Brief description	Institutions
A	Adequate and/or improving maintenance	SANRAL, national government public buildings, DWAF, ACSA, Eskom, Telkom, Transnet, some provincial roads, some provincial health and education, some municipalities, some water boards
B	Inadequate maintenance and/or deteriorating	Some provincial roads, some provincial health and education, most municipalities, some water boards

Table 3.2:
Public sector institutions by their state of maintenance

The condition of the infrastructure and facilities assets of institutions in this category ranges from good to fair, with a small proportion being poor. Where the condition is poor, the institutions are addressing this or planning to address this in the short term. Institutions' response to trends, where these are known, show acknowledgement by the institutions of the need to not let standards fall. Where trends in condition have been downward, this has been recognised, and backlogs are being addressed with urgency - Transnet (most pertinently, Spoornet) and City Power (Johannesburg) are good examples of this.

Safety considerations play a major role in determining maintenance policies of some institutions - Eskom and ACSA are good examples. In the case of DWAF, maintenance backlogs of significant portions of the water resources infrastructure that it owns are being addressed and substantial resources have been allocated to maintenance and refurbishment.

A few municipalities and water boards are financially stable. These include the metropolitan municipalities, some district and local municipalities closest to the metropolitan areas, and Rand Water and Umgeni Water. The condition of their infrastructure is either already good or is on an upward trend. Some of them are even in a position to be able to assist other areas - for example the involvement of Rand Water in Bushbuckridge for several years.

A minority of the provincial roads authorities are in Category A. These authorities are those that are well aware of location, extent and current condition of the assets, and, thanks to databases that have been maintained for many years, of the trends in condition. They all report a steady slide in condition until the end of the 1990s, since which time they have held (even if tenuously) or even slightly improved the condition of their paved roads systems.

The electricity distribution networks of Eskom and some of the larger municipalities are in a generally good state compared to those of the smaller municipalities. This has provided a strong motivation for the establishment of the regional electricity distributors with a single-focused, well-resourced and financially stable organisation better able to run a network than a small, multipurpose, poorly resourced and financially strapped organisation could.

Positive drivers

The principal positive drivers of the ability to at least prevent further deterioration, and in many instances to improve infrastructure or facility asset condition, are:

- The political will and leadership in the institutions, that the facilities and infrastructure will be maintained in order to sustain delivery of services;

- initiatives from another sphere that drive or facilitate some of the responsibilities of the institutions (for example the current compilation of a nation-wide schools "register of needs");
- adequate maintenance resources, even if barely so;
- targeted investment (for example the Hospital Revitalisation Grant for the upgrading of hospitals and the building of new ones) and independent monitoring of expenditure;
- overloading of infrastructure is limited through appropriate management (as it is on provincial roads, for example);
- safety considerations have motivated maintenance;
- older facilities were well designed and constructed, and have been well maintained over the years, or have required little maintenance;
- newer facilities have been well designed and constructed;
- the institutions have retained more-or-less adequate skills and experience, and in-house skills are leveraged by hiring skills from outside; and
- ring-fencing and/or commercialisation of service entities (for example the municipal service entities Johannesburg Water and City Power, the provincial roads agency in Limpopo, and the national roads agency SANRAL - or they have even been restructured as listed companies e.g. Telkom).

Also, unlike many of the Category B institutions, those of Category A:

- have been subject to only limited re-demarcation (of responsibilities or physical boundaries), excepting that service divisions have sometimes been ringfenced, with relatively little redeployment of staff across institutional boundaries compared with the changes undergone by Category B institutions;
- were large and well-resourced organisations to start with, so the scale of change of responsibilities and of institutional restructuring hasn't been significant, and institutional memory (among other things) has largely remained intact;
- have retained a number of key staff; and
- have remained relatively financially stable (even though some have required heavy subsidising to stay solvent, but the subsidies have been forthcoming), and are thus able to fund significant infrastructure maintenance programmes.

That some have become more commercially orientated, and even entrepreneurial, has also helped to strengthen and focus them, and make them much more aware of the need for maintenance (and also of the need to upgrade infrastructure, improve service, and extend coverage of service), and therefore willing to fund maintenance. Telkom, ACSA, Johannesburg Water and City Power are good examples here. None of the Category Bs has had this incentive.

Problems of ageing infrastructure and staff

Most of the Category A institutions will in the short to medium term have to face a major twofold problem. That is:

- Infrastructure construction peaked in the 1960s and 1970s, and that infrastructure, having reached the end of its design life, now needs major refurbishment or replacement.
- A large proportion of their trained staff, particularly their technical staff, will be retiring in the next 10 years, taking with them much of the institutions' skill, experience and institutional memories. Data capture can ease (but not eliminate) the loss of the latter. Passing on the skills and experience will be more difficult, given inter alia that there is in most of these institutions a shortage of adequately trained younger staff, and especially of those with 15-25 years experience, the group most able to benefit from the skills and experience transfer, and utilise what they have gained. Also, mentoring programmes are not as they could be, and staff are often too busy to mentor or be mentored.

This twofold problem is of particular concern to DWAF water resources, provincial roads authorities, Transnet, and most of the largest 20 or 30 municipalities.

3.2.3 Category B

Features

Insufficient attention is being paid by the Category B institutions to the maintenance of the services infrastructure for which they are responsible. In addition, many have, due in part to neglect as well as changes in resource allocation and the pressure of increased demand, built up a substantial maintenance backlog. Competing demands on limited budgets (and on staff and other resources) severely constrain the proper maintenance of infrastructure, leading to service interruptions and other shortcomings.

The "large proportion of their trained staff will be retiring" problem, described in Section 3.2.2, is a common problem in Category B. That is, they will be leaving, or they have already left during the last few years (many retired early).

Three major issues significant to water boards and especially municipalities are:

- These two sectors have been subject to radical change since 1994. There have been two rounds of demarcation of municipal boundaries, in 1996 and again in 2000. Each of the rounds has seen major changes in political leadership, staff and systems -- many staff have left, or been assigned new duties or new areas, many new staff have joined, and staff profiles have changed. Responsibility for the administration of and provision of services to very large areas of deprivation has been assigned to unified administrations. Among these administrations that have struggled the most to provide services have been those responsible for geographical areas that had few resources even prior to 1996, and in which there was little existing local foundation upon which to build the new administration. New responsibilities have been assigned to municipalities and water boards. National government funding has enabled the acquisition of new infrastructure on a very large scale. Old funding sources have fallen away, and new ones have come in. It is not surprising therefore that for these reasons alone many municipalities and water boards have struggled to give the necessary attention to maintenance issues.

> **“No comprehensive national data on the condition and age of [electrical distribution] infrastructure exists.”**
> (NER 2004:2)

- Due to the dispersed and decentralised nature of municipalities and water boards, there is no comprehensive dataset on the condition of their infrastructure assets, but the indications are that this infrastructure is generally not in a good state outside the metropolitan and other large urban areas, although there are some exceptions. This is largely due to the widespread inadequacy of institutional capacity, both technical and financial, to operate and maintain the infrastructure - for example, many municipalities have no technical staff above operator level. Many of the municipalities suffer chronic financial problems and this considerably exacerbates this plight. The effects, such as worsening effluent quality from many wastewater treatment works, are cause for great concern. Information on trends in the condition of infrastructure is almost completely lacking outside of a select few of the municipalities and water boards.
- Furthermore, it is clear that an unintended consequence of constructing more infrastructure is in many municipalities resulting in a widening of the gap in infrastructure maintenance, as even new infrastructure requires maintenance. Without concerted assistance, many already stressed municipalities will be unable to maintain increasing amounts of infrastructure.

Summarising features of some of the sectors other than water boards and municipalities:

- The condition of the majority of provincial assets (and recalling that a minority of the provincial roads, health and education institutions lie in Category A) varies from fair to poor. A significant proportion of the health and education facilities, and especially their mechanical and electrical equipment, is in a poor state.
- Particularly lacking are overviews of trends in the state of performance, and maintenance, of

these same facilities. Trends in provincial roads condition are better known, and it is clear that in most instances these trends are downwards. Given budget shortages, conscious decisions have been taken to reduce maintenance to selected roads (invariably the lowest order of roads).

Causes

In Category B institutions, the principal causes (noting that not all causes are applicable to all institutions) of the inability to catch up on maintenance backlogs and to run preventative maintenance programmes are:

- lack of political and senior administrative direction to maintain facilities and infrastructure in order to sustain delivery of services;
- significant institutional change (including re-demarcation, reorganisation, staff changes and loss of key staff);
- emphasis being laid on capital works to construct new facilities, but inadequate measures to maintain these once they are built;
- overloading (most visibly the overloading of vehicles, causing damage to roads; but also in wastewater treatment works, and health and education facilities which are having to cope with numbers of people for which they were not designed);
- inadequate maintenance budgets (either because the institution is in a distressed financial state and thus unable to fund infrastructure maintenance; or, even if the institution is not distressed, infrastructure maintenance not being prioritised in the planning and budgeting process);
- new facilities often not designed to achieve low maintenance, and/or are poorly built;
- inadequate maintenance budgets, because maintenance is not prioritised in planning and budgeting process; and
- inadequate skills (especially technical skills) and experience to plan and implement appropriate maintenance programmes.

The amount of infrastructure for which some of these institutions have in the last dozen years become responsible has increased enormously. However, maintenance budgets, and the numbers and skill of maintenance staff have not increased concomitantly (in some cases, the numbers of skilled staff have reduced).

DBSA staff are expressing concern at the impact of inappropriate infrastructure operation and maintenance on the infrastructure loans provided by DBSA. It is feared that in some instances loan agreements will still be in place, i.e. the loan is not fully repaid, when the asset ceases to perform as it was originally intended. This will impact not only on the service quality delivered, but also on the consequential revenues that had been anticipated in the original financial plan, therefore impacting on the ability of the borrower to repay the loan.

If local government budgets for maintenance are not significantly increased, "this situation may result in lower service level standards, or municipalities having to incur excessive costs to replace/upgrade infrastructure and equipment. ... The importance of preventative maintenance of infrastructure cannot be over-emphasised, as failure in this regard can result in municipalities incurring significant expenditure in future to replace assets not well maintained."

("Report on the analysis of municipal budgets for the 2003/2004 financial year." SALGA 2003:5-6)

3.3 Key contrasts between Category A and Category B

The main differences between Category A and B institutions as described above in 3.3.2 & 3.2.3 are:

- Although nearly all institutions have in recent years been given responsibility for significant amounts of newly constructed infrastructure, the Category B institutions have become responsible proportionately for much more than they had before; and

- Within the Category B institutions, the maintenance budgets and the numbers and skill of their staff, have not increased in step with the increase in responsibility for infrastructure. In some cases, the numbers of skilled staff have reduced, whereas, in the Category A institutions, budgets and staff are more closely keeping up with the increase in the amount of infrastructure.

Other significant differences between Category A institutions and Category B institutions relate to:

- political and senior administrative emphasis on maintenance;
- balance between new construction and existing infrastructure and facilities;
- design and construction quality (which affects the amount of future maintenance required);
- age of infrastructure and maintenance history;
- operation of infrastructure;
- usage of infrastructure (e.g. overloading);
- institutional stability or change;
- overall financial viability;
- external forces requiring that maintenance be attended to (e.g. safety requirements);
- external assistance offered or imposed (e.g. funding and of skills);
- procurement of external assistance; and
- ringfencing of services.

In summary, the Category A institutions maintain their infrastructure well or reasonably well.

Budgets are adequate (even if barely so), skilled staff are in place, leadership is committed, and policies support sound infrastructure maintenance practices. Other institutions have lagged behind, but the risks of this are recognised, and maintenance needs are being addressed by a number of targeted programmes.

Generally, the larger institutions are performing the best - for example DWAF, the larger water boards, ACSA, Telkom, Eskom, SANRAL, Transnet and most of the metropolitan municipalities.

Within the Category B institutions, there is strong evidence that much infrastructure, of both pre- and post-1994 vintage, is not being properly maintained. Older infrastructure is often not being refurbished and renewed when it needs to be, and there is inadequate planned preventative maintenance of new infrastructure.

It is important to identify which infrastructure and facilities sectors constitute the greatest problem in terms of issues such as:

- severity of problem and how frequently it is experienced;
- effects on human health and economic growth;
- lack of effective countermeasures in the event of failure of the service; and
- the risk generally to government's growth objectives.

Wastewater treatment works are problematic, as are water treatment works, water and sewer reticulation, on-site sanitation, some provincial and municipal roads and some provincial health and education facilities.

These sectors must be the main focus of efforts to assist the Category B institutions. If not, funds to address the cost of repairs and unplanned replacements (as opposed to planned, preventative measures) will ultimately have to be found, which would severely limit the programme for addressing backlogs and expanding service delivery.

3.4 Conclusions

It is evident that a holistic national infrastructure maintenance strategy is needed. Whereas Category A public sector institutions are on the path to sustained infrastructure service delivery through maintenance improvement, it does not seem that Category B institutions will (with a few exceptions) be able to improve their maintenance policies and practices without strong direction and assistance from national government.

The next chapter, Chapter 4, describes the National Infrastructure Maintenance Strategy, aimed at promoting sound maintenance of infrastructure and facilities across the whole of the public sector. While it will assist and set parameters for all public sector institutions in general, its primary target is the institutions in Category B.

4. action plan

Improved maintenance of infrastructure is a key element of the realisation of the objectives of ASGISA. By improving infrastructure asset management planning, budgeting and implementation, public infrastructure will be maintained in such a way as to enable sustainable service delivery, increased economic growth, and increased access to services and economic opportunities for the poor.

In addition, maintenance is usually highly labour-intensive, and there are opportunities for contributing to the scaling up of the Expanded Public Works Programme through increased maintenance of infrastructure. Futhermore, since there will be an ongoing need for maintenance, and since most maintenance activities are repetitive, expansion of the maintenance industry will provide increased opportunities for long-term employment. The four thrusts of the National Infrastructure Maintenance Strategy, implementation of which will lead to the achievement of this vision, comprise:

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.

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

As noted in Chapter 3, planning and budgeting for maintenance varies greatly across the public sector. The most effective way to address the needs of those institutions that have not adopted sound infrastructure maintenance policies and practices is to strengthen the performance requirements within the regulatory framework and Treasury guidelines governing the management of immovable assets, the compilation of strategic plans and the annual budgetary process. This will result in improved motivations for additional funding for maintenance, a prerequisite for receiving increased funding.

Some important work is already underway to address these issues. The Department of Public Works has tabled the Government-wide Immovable Asset Management Bill in Parliament. In addition, National Treasury is finalising Asset Management Guidelines. These two initiatives will provide a government-wide policy framework for the management of assets; including:

- planning for new infrastructure (and considering alternatives such as non-asset solutions (eg mobile service centres) and maintaining existing assets better so that they can continue to be used rather than building new assets);
- compiling and updating of asset registers, including the information required to be kept on asset registers (eg description of the asset, condition of the asset, maintenance history, value, utilisation, floor area of buildings, etc);

The Department of Land Affairs is also coordinating a programme involving the other relevant national government departments, provincial governments and municipalities, to ensure that all state immovable assets are vested (with the Deeds Office) in the name of the correct government institution which owns them. This will ensure that there is clarity with regard to which government institution is responsible for the maintenance of each asset.

In addition to these existing initiatives, a further initiative is required to ensure that public bodies increasingly link new capital investments to ongoing operational and maintenance budgets, and increasingly budget for maintenance of existing infrastructure over time. It is also important that funding of infrastructure be changed to a life-cycle funding approach rather than a funding approach which focuses on the initial construction costs only. The focus of improved planning should be for institutions to identify the strategic infrastructure that they are responsible for, i.e. that which is “mission critical” to their service delivery or which if it fails will have disastrous results, and to ensure that this strategic infrastructure is adequately maintained.

Action 1: Review, strengthen and harmonise the strategic planning regulatory framework, so that it includes requirements for planning and

budgeting for maintenance especially of infrastructure of a strategic nature.

Leadership: National Treasury, with dplg and other national infrastructure departments.

Action 2: Create links between the capital budget, the operating budget, and the infrastructure asset management plan of each institution, to ensure that financial provision for maintenance is specifically linked to currently owned strategic infrastructure and to decisions on investment in new capital infrastructure. Create mechanisms to monitor this, and to apply corrective action where necessary. Such mechanisms will include:

- Requiring management of Departments to submit budgets which reflect sufficient provision for maintenance (particularly for strategic infrastructure to be maintained) Treasuries should refer budget submissions which do not make provision for maintenance back to departments to make such provision;
- checking that the financial statements of expenditure, submitted after the end of the financial year, do not without good motivation diverge from the approved budgets for maintenance.

Leadership: National Treasury, with treasuries of all spheres.

Action 3: Treasuries (national and provincial) to plan for increasing global allocations for maintenance over time (assuming that adequate motivations for increased maintenance funding are received from departments), until such time as maintenance funding approaches an optimal level.

Leadership: National Treasury, with treasuries of all spheres.

In terms of the Government-wide Immovable Asset Management Bill (GIAMA), it will become obligatory for public sector institutions to draw up sound multi-year infrastructure asset management plans.

Action 4: Gazette regulations in terms of GIAMA, requiring adequate planning for maintenance (including guidelines for the organisational structures and skilled staff required to manage the planning and implementation of maintenance programmes).

Leadership: DPW, in consultation with National Treasury and dplg.

Many public sector institutions do not have the resources to address all maintenance issues and also deal at the same time with backlogs of new infrastructure provision. They therefore need to identify strategic infrastructure for prioritised maintenance funding - i.e. infrastructure which underpins the core economic and social development of the country, and the failure of which due to a lack of maintenance could have serious economic, social, health, safety or security consequences. Principally, these are wastewater treatment works, water treatment works, bulk water pipelines, health facilities and critical transportation infrastructure. From the situation review (Chapter 3), it is evident that some of this strategic infrastructure is not being maintained properly - many wastewater treatment works and health facilities, for example. Until such time as maintenance budgets are adequate to meet all the maintenance needs, strategic infrastructure must receive priority in the allocation of maintenance budgets.

The corollary of this is that public sector institutions should be encouraged to identify infrastructure that is least utilised or in some or other way can be categorised as of least importance. This infrastructure can consciously be dropped from long-term maintenance programmes, so that funding can be released for the maintenance of other, more important, infrastructure.

Action 5: Incorporate in the regulatory framework described above requirements for

(i) identifying key strategic infrastructure (for example water and wastewater treatment works, key arterial roads, etc.),
(ii) specifically budgeting for the adequate maintenance of this strategic infrastructure, and
(iii) reporting performance.

Leadership: National Treasury with dplg, and national infrastructure departments.

One of the key challenges in increasing funding for

maintenance is the financial viability of some institutions. No programme to improve infrastructure maintenance will succeed in some institutions if their financial viability is not improved. (Several initiatives aimed at improving the finances of targeted municipalities are already underway or planned).

One of the challenges in improving the condition of public buildings lies in finding an appropriate balance between the need to maintain our national heritage embodied in public buildings and the need to comply with government policies and regulations, eg accessibility for disabled people.

> Action 6: Carry out an audit of heritage sites in order to identify work to make them compliant with government policies and regulations, and engage with the South African Heritage Resources Agency (SAHRA) in this regard.
>
> Leadership: DPW, supported by Department of Arts and Culture.

ii. Assisting institutions with non-financial resources

Improving human resources capacity and providing better practice guidelines are measures that will assist institutions to improve maintenance. Supportive interventions that will be introduced include:

- developing norms and standards for maintenance of different types of infrastructure; and
- putting in place appropriate capacity-building, mentoring and direct support programmes.

These supportive interventions will be done in line with the Policy Framework for the Governance and Administration of Public Sector Institutions and the Single Public Service initiative, which are being coordinated by the DPSA.

Maintenance norms and standards will be developed for the various sectors (e.g. roads, water, sanitation, etc.) and good practice guidelines for planning, designing and implementing maintenance programmes will be produced, including guidelines on the skills required to plan and manage maintenance

> “Mbeki …. spoke candidly yesterday about the skills crisis that had in some instances led to a breakdown of service delivery. Mbeki admitted that South Africa did not have enough of the specialists needed to implement government's programme of action.”
>
> (Business Day 2005)

programmes, and guidelines on different implementation models, including private sector participation in maintenance programmes. Based on the maintenance standards, budgeting norms will be developed to facilitate accurate long-term maintenance budget forecasting, taking into account the type, age and condition of infrastructure.

These norms and standards will include maintenance budgeting guidelines, for example, the percentage of infrastructure asset value that should annually be allocated to the maintenance budgets. The norms will differentiate not just between types of infrastructure, but also take into account factors such as size and extent, appropriate materials for various local conditions, age, usage, standard of construction, operator skills levels, current level of maintenance, residual value, etc.

The norms will also take account of reliability, which will be determined by what constitutes "failure", what the consequences of failure are, and mitigation plans. For example, if the "down time" of the asset must not exceed, say, 1% of the time, the maintenance norms need to be a lot more stringent than if the down time can be, say, 10%.

> Action 7: Develop and promote guidelines, norms and standards for the maintenance of infrastructure - covering financial, technical and skills aspects. Extend the Construction Industry Development Board (cidb) "Toolkit for Infrastructure Delivery Management" so that it will support public sector officials to improve the delivery and maintenance of infrastructure.
>
> Leadership: cidb, with the sector departments and National Treasury.

With regard to human resource capacity, one of the

JIPSA initiatives which is under way through the Construction Industry Development Board is an audit of existing technical skills in the construction (and maintenance) industry, together with projections of the skills requirements over the next fifteen years. This initiative is currently developing recommendations for actions to address the projected skills shortages. A similar initiative is required to identify the non-technical skills requirements related to improving the maintenance of infrastructure (eg knowledge of the importance of maintenance and the consequences of neglecting maintenance; skills in budgeting for maintenance, life-cycle planning and budgeting, and supply chain management).

Action 8: Carry out a study of the non-technical human resource capacity requirements for improving infrastructure maintenance, including identifying actions to address the identified skills shortages.
Leadership: cidb, in consultation with relevant departments.

Action 9: Identify the Category B institutions, and build targeted capacity within them, through the Infrastructure Delivery Improvement Programme (IDIP), Project Consolidate and other capacity-building programmes. In particular, provide direct support to assist them (at the very least) to prepare asset management plans including maintenance plans.
Leadership: cidb, with sector departments e.g. DWAF and dplg.

iii. Developing the maintenance industry

Given the skills shortages and equity imbalances in the infrastructure maintenance and construction industry, there is a need for the government to play a role in developing the maintenance industry particularly with regard to skills development, SMME development, and the promotion of Broad-Based Black Economic Empowerment (BBBEE) in the maintenance industry.

Action 10: Build the maintenance sector within the construction industry, recognising its importance with various interventions including:

- Developing models, guidelines and procedures for procurement of maintenance services, particularly ongoing long-term maintenance contracts which will promote SMME development, BBBEE, involvement of women, and local employment coupled with appropriate enterprise development; and
- Building capacity in the industry, through means such as learnerships, mentorships and other forms of skills and contractor development programmes. The EPWP will play an important role in this regard.

Leadership: cidb with Construction SETA and government infrastructure institutions within all three spheres.

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

Monitoring and evaluation processes must be strengthened and implemented - with mechanisms for the feedback to result in the necessary improvements. This will enable performance change to be measured, but, as important, it will draw the attention of the institutions concerned to non-performance. The annual reporting requirements and the forthcoming GIAMA regulations provide the framework for this to take place.

Action 11: Strengthen and implement monitoring and evaluation processes.
Leadership: National Treasury with DPW.

5. conclusions

There are significant differences from one institution to another in capacity, resources and the size of the maintenance problem, and in their maintenance policies and practice. At the one end of the range, the sector review has revealed, there are some public sector institutions that have in place, and more-or-less adequately fund, good infrastructure maintenance policies and practice. At the other end of the range, others are doing very little in the way of maintenance, and service delivery is threatened and in some cases has already failed.

The National Infrastructure Maintenance Strategy will promote sound maintenance of infrastructure and facilities across the whole of the public sector, and set parameters for all public sector institutions to perform against. These measures include strengthening the maintenance regulatory and governance framework, requiring infrastructure asset management planning and linking this to budgets, assisting institutions to develop the required maintenance management capacity, developing the maintenance industry, and monitoring progress and feeding this into a process of continuous improvement.

Many of the Category B institutions are not able to improve their maintenance practice without some level of the assistance and regulation that implementation of the Strategy will provide. Although the Category A institutions are not the target of the Strategy, it is likely that the infrastructure maintenance of many of them will also benefit from some of these measures

This Strategy gives substance to present legislation, e.g. PFMA, MFMA and the Municipal Services 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) - a similar requirement in PFMA is 38 (1) (d)).

Implementation of this Strategy and the key actions identified will, in time, result in an improvement in the state of public infrastructure.

Annexure A: Maintenance reviews, by sector

This annexure provides the detail that is summarised in Chapter 3.

The sectors are listed in the following order:

- provincial roads
- health and education facilities in ownership of provincial government
- public buildings in ownership of national government
- municipalities
- water boards
- water resources infrastructure in ownership of national government
- ACSA
- Transnet and its affiliates (principally Spoornet, National Ports Authority and SA Port Operations)
- Telkom

Each of these is described in the sequence:

- the type of infrastructure in the care of this institution or group of institutions;
- overview of the infrastructure and service delivery;
- current replacement cost, if an estimate is available;
- overview of state of infrastructure and state of maintenance;
- what the causes of this might be;
- current initiatives to enhance maintenance (both what is being promised, and what is being done); and
- a short summary.

All sums for "maintenance" provisions stated in this Annexure are for planned and unplanned maintenance, repair, refurbishment and renewal - but not for the eventual disposal and replacement of the infrastructure assets.

All statistics represent work-in-progress and are therefore preliminary figures only.

Annexure B contains generic remarks by type of infrastructure: what kinds of things go wrong if maintenance is substandard, and what is needed (descriptive, not quantity) in respect of maintenance.

a. Provincial roads

Overview of provincial roads departments' infrastructure and service delivery

The roads departments of provincial governments are responsible for government-owned roads in their provinces that are not the responsibility of SANRAL at the one end of the scale or municipalities at the other end of the scale. Design and construction standard ranges from freeways through to unpaved roads (in 2002, 63 000 km of surfaced roads and 301 000 km of gravel and access roads ("Road infrastructure strategic framework for South Africa", DoT, 2002)). In respect of those sections of "proclaimed main roads" that traverse built-up areas, the provincial roads department could be funding or partially funding municipalities to undertake the maintenance, or they could be doing it themselves.

A current replacement cost of all of the road infrastructure in the ownership of provincial governments has not been thoroughly calculated, but it is estimated to be in the order of R200 billion.

State of infrastructure and state of maintenance

DoT noted that all provincial roads authorities used to do annual "visual condition index" studies, but during the 10 years prior to 2002 "more than half" of them curbed or stopped doing the surveys. This is a "disturbing factor" - "some provinces have very little quality information on which to base managerial performance evaluation and need-identification processes. It seems that this could be one of the primary causes for the poor condition of the provincial road networks in general."

More recent information, obtained directly from provinces, confirms that the generally downward trend in quality information and in the state of roads infrastructure is continuing. There are however some notable exceptions. More than one province still has quality information, and is able to report that its current budget levels are able to "maintain the network in its current condition", although even they are not receiving the budget that they need to significantly reduce maintenance backlogs.

Study of the visual condition information available shows that almost all if not all provinces suffered a steady slide in road condition until the end of the

1990s, since which time some have managed to hold (even if tenuously) or even slightly improve the condition of the paved road network. However what is clear is that, given budget shortages, conscious decisions have been taken to not maintain selected roads, or to maintain them minimally. Hence the available budget has preferentially been given to the strategically more significant roads, while the proportions of the lower order of roads in "poor" or "very poor" condition have climbed.

Many provincial roads departments are not conforming to the requirements of the PFMA and other legislation that they should ensure that adequate provision is made for the long-term maintenance of infrastructure assets.

Clearly, inadequate budgets rather than inadequate skills and experience are at present the main underlying cause of the deterioration.

Current initiatives to enhance maintenance

It is not known if there are current initiatives to enhance maintenance other than those initiatives which individual provincial roads departments are able to plan and implement for themselves.

However, SANRAL has been taking selected strategic roads over from some of the provinces, thereby enabling them to more adequately budget for their now reduced networks. "In most cases, the roads are being reclassified ostensibly because provinces do not have the funds to maintain them." ("Financial and Fiscal Commission: Annual Submission for the Division of Revenue 2006/07." Financial and Fiscal Commission, 2005.)

Summary

In summary, the key factor pertinent to the state of provincial roads infrastructure is the size of the maintenance budget. In some provinces, this is sufficient to prevent further deterioration of the more strategic roads, or even improve them, but in others it is not. Funding for the lower order of roads, and the state of these roads, is in general decline. Overall, the maintenance backlog is increasing.

b. Health and education facilities in ownership of provincial governments

Overview of provincial facilities and service delivery

Provincial governments are responsible for health and education facilities (inclusive of buildings and infrastructure). They are also, among other duties, responsible for provincial roads (discussed in a separate section of Annexure A) and other buildings and infrastructure that are not discussed here (for example housing for selected provincial officials, resorts, and recreation facilities).

The arrangements for budgeting for and implementation of maintenance vary from province to province. In some cases, maintenance budgets are allocated to the Departments of Health and Education, and in other cases the maintenance budgets are allocated to the Department of Public Works. Together with National Treasury, the Department of Public Works and its provincial counterparts are currently working on proposals to establish uniform institutional and budgeting arrangements for health and education facilities. This is being complemented by the Infrastructure Delivery Improvement Programme, which is aimed at improving the planning and implementation of education and health infrastructure.

The CSIR has estimated that the current replacement cost of all provincially-owned health and education facilities is R275 billion. International norms suggest that on average at least 4% of the replacement cost should be spent per annum on maintenance - provided that the facilities are in good condition. This level of expenditure would include provision for planned maintenance (including legislated maintenance, such as on lifts or fire equipment) and unplanned work (such as repairs). However provincial governments generally budget for much less than this.

Where facilities are not in good condition, larger percentages than the 4% minimum need to be spent - for example where, due to lack of preventative maintenance in the past, rehabilitation is now required. Because of

insufficient budgets and for other reasons given below, the maintenance backlog of some provincial departments is escalating.

State of infrastructure and state of maintenance

With a few exceptions, provincial governments have not done formal broad-based audits of the state (i.e. condition) of their health and education facilities. Particularly lacking are overviews of trends in the state and performance, and maintenance, of provincial health and education facilities.

Investigations undertaken by the CSIR on behalf of provincial governments indicate that a lack of maintenance is in many instances hampering health and education service delivery. For example, the condition of much hospital mechanical and electrical equipment has deteriorated, which is leading to unacceptably high rates of equipment failure in service. An especially stark consequence of maintenance not being addressed is a shortening of the lives of the facilities, and hence the need for them to be replaced sooner.

The four principal causes of the ongoing failure of some provincial government departments to catch up on maintenance backlogs and to run a preventative maintenance programme are:

- Emphasis being laid on capital works to construct new facilities, but inadequate measures to maintain these once they are built;
- new facilities often not designed for low maintenance, and also sometimes poorly built;
- inadequate maintenance budgets, because maintenance is not prioritised in the planning and budgeting process; and
- inadequate skills (especially technical skills) and experience to plan and implement appropriate maintenance programmes.

The shortage of skills in the provincial government departments responsible for commissioning and controlling facilities is in many instances manifesting in delays in planning and initiating work, in poor selection of consultants and contractors, and in poor supervision of work. In some provinces, difficulties also arise between the institutions responsible for maintenance (often the provincial Departments of Works) and the client institutions (for example Departments of Health and Education).

Current initiatives to enhance maintenance

Thanks to good programme planning and targeted investment, facilities in some provinces have improved over the last 10 years (for example KwaZulu-Natal and Limpopo), while there is strong evidence to suggest that their condition is sliding in others.

The National Department of Education is driving the compilation of a nation-wide schools "register of needs". While this will contain other information not directly related to maintenance needs, it will include also asset and asset condition registers, and will thus be very useful for assessing and prioritising education facilities maintenance needs. Completion of this register is scheduled for before the end of the 2006/2007 financial year. National guidelines on facilities management, that provincial governments should follow, are also needed.

A nation-wide survey of health facilities needs, much less comprehensive than the schools register of needs will be when it is completed, was undertaken about 10 years ago, and a new survey is long overdue.

National Treasury recently established the "Hospital Revitalisation Fund", a capital grant programme for the upgrading of hospitals and the building of new ones. The revitalisation process does require provinces to include budget provision for hospital facilities maintenance, but the level that has been set is too low. Nevertheless it has succeeded in improving much hospital infrastructure where other programmes have failed - and the reasons for its success are principally that it is a dedicated fund and that it is monitored by National Treasury and the national Department of Health.

Summary

In summary, the maintenance policies and practices of the different departments, and the consequent state of their facilities, cover a wide range. Budgets range from department to department - from adequate, to very inadequate, with the average condition of facilities deteriorating, and the maintenance backlog increasing.

c. Public buildings in ownership of national government

Overview of national government public buildings and service delivery

The large national departments which deliver services directly to the public are responsible for the majority of the buildings owned by the national government (i.e. police stations, prisons, courts and military facilities). These, together with national government-owned office accommodation, constitute the portfolio of public buildings in the ownership of national government. Some office accommodation is also leased. However government is usually responsible for maintenance of the owned portfolio only.

State of infrastructure and state of maintenance

With a few partial exceptions, the Department of Public Works has not yet done formal broad-based audits of the state (i.e. condition) of all of the buildings. Particularly lacking are overviews of trends in the state and performance of the buildings.

Some of the leased accommodation is in a poor condition, and the Department of Public Works needs to improve the management of its leases in order to address this. The improvements required include taking corrective actions against landlords not supplying adequate service levels. Some of the owned office accommodation is also in a poor condition. This should be addressed through improved maintenance planning and the allocation of increased budgets for maintenance on the basis of maintenance plans.

The principal cause of the ongoing failure to catch up on maintenance backlogs and to run a preventative maintenance programme is a lack of adequate funding for maintenance.

Current initiatives to enhance maintenance

The 2005 Government Programme of Action required DPW and DPSA to develop a framework to improve the physical work environment for government. Substantial progress has been made on a number of projects which will collectively form the framework. These include the development of new norms for all forms of accommodation, GIAMA, and a study of the consolidated capital, maintenance and leasing backlogs.

A number of departments have commissioned surveys to enhance information regarding fixed assets - for example Home Affairs and SAPS.

The budgets for the maintenance of all national government-owned buildings have recently been devolved from the national Department of Public Works to the various departments. Departments are required to use their devolved budgets to pay user charges to DPW, based on rental amounts per square metre for different types of building. User charges are currently of the order of one quarter of market-related rentals. However, in consultation with National Treasury, DPW will gradually increase the rental charges over the next ten years, until the rentals are approximately half of market-related rentals (approximately equivalent to market-related rentals less their mark-up for return on capital). This will enable expenditure on maintenance to rise substantially, and the condition of the buildings is expected to improve as a consequence.

In addition, DPW is engaging in a three-year turn-around service delivery improvement programme, with the aim of improving the efficiency, effectiveness, and responsiveness of its operations, including maintenance. Management and supervision of maintenance activities, including maintenance of the prestige portfolio, is being strengthened.

Summary

The main cause of inadequate maintenance of national government buildings has been inadequate budgeting for maintenance. Increasing the user charges will enable maintenance budgets to increase, resulting in improvement to the condition of the buildings.

d. Municipalities

Overview of municipal infrastructure and service delivery

Municipalities are typically responsible for water services (including sanitation), roads and stormwater, solid waste collection and disposal, and, in many but not all cases, the distribution of electricity. They are also responsible for an array of public facilities and amenities, including sports fields, community halls and libraries. They may also be responsible for low-income housing.

The CSIR has estimated that the current replacement cost of all municipal engineering infrastructure and buildings (excluding housing) is at least R300 billion. Given the poor state of much of this, and the repair and refurbishment consequently required in addition to planned maintenance, international norms suggest that approximately 4% of the replacement value should on average be spent per annum on maintenance (excluding for disposal and replacement) - amounting to about R12 billion per annum. However, municipalities are on average budgeting for less than half of this.

State of infrastructure and state of maintenance

There are no formal broad-based audits of the state of municipal infrastructure. Particularly lacking is any overview of trends in the state and performance of local government infrastructure and its maintenance. However research undertaken by the cidb and CSIR reveals serious shortfalls (and in places gross shortfalls) in many municipalities' maintenance policies and practice. The sustained provision of services is in many cases under threat. Specifically, many municipalities are not conforming to the requirements of the MFMA, Municipal Systems Act and other legislation that they should ensure that adequate provision is made for the long-term maintenance of infrastructure assets.

While many of the aspects of infrastructure maintenance are implemented to a high standard in a small number of municipalities, there are great shortfalls in maintenance policies and practice in many other municipalities. The sustained provision of services by a significant proportion of the municipal infrastructure is under threat. Generally, the municipalities in or close to the larger urban centres are coping better, while municipalities that are mostly rural in nature are struggling the most - but there are significant exceptions.

Of concern at municipal level is the state of wastewater treatment, water treatment, water and sewer reticulation, on-site sanitation, electricity reticulation, and arterial roads -- these are the fundamental building blocks for economic growth and healthy communities. Of greatest concern is the state of wastewater treatment.

The two principal causes of the ongoing failure of many municipalities to recover maintenance backlogs, run a preventative maintenance programme and deliver a reliable, sustainable service are:

- inadequate revenue and budgets (either because these municipalities are in a distressed financial state and thus unable to fund infrastructure maintenance; or, even if they are not distressed, infrastructure maintenance is not prioritised in the planning and budgeting process); and
- inadequate skills (especially technical skills) and experience to plan and implement appropriate maintenance programmes.

Unpacking the first of these causes, the following are the greatest contributors to the inadequacy of revenue and budgets:

- the increasing amount of infrastructure (new areas served, improved levels of service, and upgrading of existing service levels) owned by

municipalities (each year, more and more to operate - and to maintain);
- the weak financial state of many municipalities; and, in a few cases,
- the capping of the operating budget.

The unintended consequence of constructing more new infrastructure without addressing maintenance needs is a further widening of the backlogs in infrastructure maintenance. Generally, the poorest municipalities have, proportionate to their ability to look after it, acquired the most new infrastructure. They have the least resources to adequately maintain both this new and existing infrastructure, and need concerted help.

Current initiatives to enhance maintenance

The last couple of years have seen a rising number of initiatives aimed at increasing the maintenance of municipal infrastructure. Some of these are localised - that is, are within a municipality or within a department of a municipality.

Other initiatives cover wider areas. Among these can be mentioned the current formulation process by DWAF of a national water services infrastructure asset management strategy, recent EU-sponsored pilot studies of infrastructure management needs, the condition survey of municipal infrastructure in the Western Cape (currently in pilot stage), and the recently published South African version of the "International Infrastructure Management Manual" (based on an Australasian original). Dplg and National Treasury are also both working on initiatives.

Summary

In summary, the maintenance policies and practice of the different municipalities, and the consequent state of that infrastructure, cover a wide range. On average, municipalities are spending less than half of what they should be spending on maintenance. Maintenance backlogs are increasing rapidly, and the sustained provision of municipal services in some areas is under threat.

e. Water boards

Overview of water board infrastructure and service delivery

Water boards are responsible for bulk water services for their regions, including the abstraction of water (from rivers, dams or groundwater), its treatment and its conveyance in bulk. Municipalities are then usually responsible for its further storage and its distribution, and are also usually responsible for all aspects of sanitation and wastewater. In some cases, however, water boards are involved in some of these municipal-type activities, sometimes under contract to the municipality. In other cases, water boards are responsible for or in some way supportive of community water supply and sanitation in rural areas.

The CSIR has estimated that the current replacement cost of all water board engineering infrastructure and buildings is of the order of R60 billion. Rand Water and Umgeni Water are responsible for 80% of the water supplied by the total of 15 water boards. All the water boards have maintenance backlogs, but those reported by the larger water boards suggest (and this is confirmed by interviews undertaken by CSIR) that their infrastructure has over the years been reasonably well maintained. Furthermore, these larger water boards are fortunate to be able each year to budget amounts for maintenance that are usually not far short of need. Some of the smaller of the water boards, however have accumulated large maintenance backlogs, and are falling further behind each year.

State of infrastructure and state of maintenance

There are no formal broad-based audits of the state of water board infrastructure, and no overviews of trends in the state and performance of this infrastructure.

The larger water boards, and some of the smaller ones, have high standards in respect of many of the aspects of infrastructure maintenance. Some water boards, however, do not, and their sustained provision of the service is under threat.

That some water boards budget adequately for maintenance, and do spend that funding appropriately, is a reflection of the following:

- strong revenue streams; and
- adequate skills (especially technical skills) and experience.

Unpacking the first of these causes, the following appear to be the greatest contributors to the adequacy of revenue and budgets:

- being willing to raise tariffs to cover actual costs, and being successful in raising these tariffs (presumably at least partly because they are one removed from the end users of water); and
- strong credit control.

The following are some of the benefits of adequate skills and funding:

- being adequately resourced, these water boards are able to hire and retain competent staff, and, if they outsource, they are able to competently manage their contractors and get better value for money;
- skills and experience in improving income and reducing cost; including strong credit control;
- skills and experience to plan and implement appropriate maintenance programmes; and
- being conscientious about their statutory responsibilities, for example relating to pressure vessels and water treatment works, and the need to maintain this infrastructure.

Current initiatives to enhance maintenance

Water boards are being included in the current formulation process by DWAF of a national water services infrastructure asset management strategy.

Summary

In summary, the larger water boards are managing to hold maintenance backlogs at a low level. Some of the smaller water boards do, however, face significant and increasing maintenance backlogs.

f. Water resources infrastructure in ownership of national government

Overview of DWAF water resources and bulk supply infrastructure and service delivery

DWAF is responsible for the management of the nation's water resources and the provision of raw water in bulk through water resource infrastructure to various institutions and direct consumers. The DWAF water resources and bulk supply infrastructure comprises dams, weirs, canals, pumpstations, pipelines, siphons and tunnels.

State of infrastructure and state of maintenance

DWAF has reasonably up-to-date records of the location and capacity of assets, and of their maintenance history. However records of condition vary - DWAF has chosen to focus its infrastructure asset management attention on the most strategic elements of infrastructure.

In particular, DWAF has in recent years focused on the management of its dams. The National Water Act (Chapter 12) makes DWAF responsible for ensuring that measures are taken to improve the safety of its dams. However, DWAF is currently unable to comply, because it has not had sufficient funds to adequately address the safety of dams. Many of the dams have reached a state where further postponement of necessary maintenance and refurbishment will result in serious cost escalations as their conditions deteriorate. This is further compounded by the fact that DWAF inherited a large number of ex-homeland dams which were not operated and maintained properly, and which continue to require urgent attention.

One hundred and fifty of DWAF's 350 dams have "significant dam safety shortcomings". Priority rankings have been allocated, and the remediation (i.e. refurbishment) programme will be starting during the current financial year.

DWAF indicates in respect of the rest of its infrastructure, i.e. other than of dams, that it will have to spend "significant amounts to bring it up to an acceptable standard". In particular,

infrastructure built in the 1960s and 1970s is needing major refurbishment, or might even have to be replaced. For example, a canal's design lifetime takes into account that major (refurbishment) work will be required after 25 to 30 years. Given the size of the elements of infrastructure that DWAF owns, failure of any element would have significant impact. Specific examples currently of concern to DWAF include a canal and pump station to Sasol at Secunda, a canal and siphon to a major agricultural scheme in the Free State, and a pipeline to one of the metropolitan municipalities. In all cases, regular maintenance has been undertaken, but certain portions of the infrastructure have reached the end of their useful life and require urgent rehabilitation.

Clearly, inadequate budgets rather than inadequate skills and experience are the underlying cause of the deterioration.

Current initiatives to enhance maintenance

DWAF is doing what it can to address its maintenance needs. It has in some instances sought partners who have a strong interest in ensuring the reliability of water supply to themselves, and have the resources to assist significantly. A good example is the instance mentioned above of the supply to Secunda - the cost of the pump station refurbishment or replacement will be borne by Sasol, with DWAF retaining the responsibility for the canal refurbishment.

Summary

In summary, the key determinant of the state of DWAF water resources and bulk supply infrastructure is the size of the maintenance budget. DWAF has identified its most strategic infrastructure, and is prioritising the maintenance needs of that infrastructure, while doing what it can to address the needs of the remainder.

g. ACSA

Overview of ACSA's infrastructure and service delivery.

Airports Company South Africa (ACSA) owns and operates South Africa's 9 principal airports, including the three major international airports at Johannesburg, Cape Town and Durban. It also has a 35-year concession to operate the airport at Pilanesberg.

The company, created in 1993 by an Act of Parliament, commenced operation in 1995. ACSA was one of the first SOEs to be commercialised. It is owned by the Department of Transport (73%), the Public Investment Corporation (20%), empowerment investors and staff share trusts. The company is profitable.

The company has invested R 3.6 billion in capital infrastructure over the last five years, and has programmed to invest an additional R 15 billion in the next five-year period.

ACSA is at each airport responsible for the property as a whole, and in particular for the runways, terminals and some of the hangars and technical areas (most hangars and technical areas are owned by the airlines). ACSA is not responsible for navigational aids and air traffic control, which are run by Air Traffic Navigation Services (ATNS).

The current (2006) replacement cost of ACSA infrastructure is estimated to exceed R 9.5 billion.

State of infrastructure and state of maintenance

ACSA's infrastructure management policy is (and has been since the formation of the company) driven by the philosophy that the most economical way to retain the value of the infrastructure is to maintain regularly, and to optimise replacement periods. Over and above that, specific elements of infrastructure, being those elements most closely associated with aircraft and passenger safety, receive the highest priority.

Thus instrument landing systems, runway approach lights and runway ground lighting enjoy the highest priority, and are maintained in order to meet the statutory safety and reliability assurance requirements of the International Civil Aviation Organisation. The next highest priority items include security, emergency lighting within

terminals, baggage handling and lifts and air bridges. Statutory requirements rule here also - in particular those of the (South African) Civil Aviation Authority, the (USA) Federal Aviation Authority with respect to security, and those of the Occupational Safety and Health Act.

ACSA also pays close attention to the condition of runways and aprons - the company runs a sophisticated pavement management system, kept up-to-date by weekly visual inspections, recording of all work done, and annual assessments of Remaining Useful Life.

Infrastructure asset management is governed by the "ACSA Maintenance Policy Document", which sets out the life-cycle replacement policy and programmes, and policy and programmes for the review of the status (i.e. wear and tear, and obsolescence) of assets.

All the airports have standby generators, of sufficient capacity to meet the power needs of runway ground lighting, air bridges, baggage handling, security, and emergency lighting within terminals, should the external power source (e.g. Eskom) fail. (But not to meet the needs of, for example, escalators and air-conditioning.)

Budgets for infrastructure management are reported to be very close to the optimum. There is no maintenance backlog to speak of.

ACSA has a more or less adequate technical staff resource at all levels, more than competent enough to manage its infrastructure.

Current initiatives to enhance maintenance

Improvement of current procedures is constantly sought. For example, trials are currently underway of round-the-clock electronic condition monitoring systems for component parts of the baggage handling system and of pumping equipment. Such systems will enable earlier identification of components about to fail (and therefore their timeous replacement, leading to greater reliability of operation of the infrastructure).

Summary

In summary, the key factor pertinent to the state of ACSA's infrastructure has been its strong financial state, and in particular its ability over the years to budget adequately for maintenance and replacement. Statutory requirements for safety and reliability, and the company's own maintenance policy and strong maintenance ethic have also been instrumental.

h. Transnet

Overview of Transnet's infrastructure and service delivery

The core elements of the business of Transnet (since 1989 a SOE, and wholly owned by the Department of Transport) are rail, ports and pipelines. While it has been agreed that the operational function of each of these will be separated from the infrastructure function, this has only been implemented in respect of ports.

Infrastructure and service delivery in respect of the following three entities is described in this section of Annexure A:

- Spoornet (long-distance rail services);
- National Ports Authority (NPA); and
- SA Port Operations (SAPO).

The NPA is responsible for the seven commercial ports, and for their infrastructure, including the harbours and quaysides themselves, harbour buildings, tug and pilot services, dredging and aids to navigation. SAPO is responsible for equipment such as straddle carriers, cranes and conveyor belts, and terminals (such as grain elevators) and their equipment.

State of infrastructure and state of maintenance

The financial state of Transnet has been highly material to the state of its infrastructure. Transnet has been posting substantial losses ever since it ”inherited massive accumulated losses from South African Transport Services at the time of its inception in 1990" ("The DBSA Infrastructure Barometer 2006", page 72). The recent turnaround

strategy, involving amongst other measures restructuring the balance sheet, disposing of non-core assets, renegotiating contracts with key customers, and enhancing the quality of infrastructure, is already making a difference. Transnet returned to profitability in 2004/2005, and also managed to reduce its heavy indebtedness.

There is a new emphasis in Transnet on infrastructure, both on capital investment to grow the business, and on repair and replacement of existing infrastructure. Much of the infrastructure is ageing - for example "locomotives are on average 25 years old, 9 years older than international best practice" (DBSA page 105). Similarly, and in specific reference to Metrorail (the commuter rail service arm, recently transferred from Transnet to the Department of Transport), "while little is known about the condition of track and signalling equipment, it is widely regarded as now beyond its economic life." (DBSA page 106). Some systems (e.g. "train authorisation systems", which authorise movement of trains from one point to another) "have far exceeded their design life and are still functional, although approaching obsolescence." ("Spoornet infrastructure status report", May 2006).

Despite the ageing of much of it, the infrastructure owned by Spoornet is "maintained in an operationally serviceable condition". There is a strict regime of condition monitoring - this information is "utilised by maintenance staff to repair faults and schedule planned maintenance interventions [also] the information is utilised for audit and long-term planning". (Spoornet ibid 2006).

There is evidence that the state of infrastructure has improved in recent years. For example "derailments caused due to the condition of the infrastructure" have decreased.

Rail networks are ranked in priority order. "Core lines are maintained to a high level, whereas non-important and lower tonnage light and lower-density lines are maintained according to safety standards at low axle loading and low speeds." Furthermore, "the current good condition of the core network will be maintained by focusing track material replacement plans on these parts of the network. The level of material replacement will be increased to sustain the condition. Where funds are limited, expenditure on non-core lines will have to be reduced, and speed restrictions will then be imposed to keep them operational until closure from a safety perspective becomes imperative." (Spoornet 2006)

The seven port engineers are obliged to do annual inspections of their infrastructure, and report to NPA. In the most recent such inspection, only one port scored less than "good", and the reasons for its current rating of "adequate" are specifically being addressed. NPA has laid down a maintenance policy, and each port puts together its own maintenance programme, unique to its environment, within the guidelines set out in the policy. ("A report on the infrastructure of the National Ports Authority", April 2006). SAPO has put similar measures in place, driven by the thinking that "the need to maintain the asset is paramount to ... survival." ("Summarised report on the state of plant and equipment maintenance at SA Port Operations terminals", April 2006).

Clearly, inadequate budgets rather than inadequate skills and experience have been the main underlying cause of infrastructure deterioration, ageing and obsolescence, where these are experienced.

Current initiatives to enhance maintenance

The new emphasis within Transnet on infrastructure is mentioned above. The effect of this is shown in recently increased support to a number of existing programmes for maintenance (and upgrading and replacement).

For example, Spoornet has a number of programmes underway to address maintenance backlogs and replace ageing and obsolescent infrastructure. An example is the "Rolling stock maintenance backlog project", a report on which commences with the words: "due to underinvestment in the past the condition of Spoornet's rolling stock assets has deteriorated considerably." Accordingly, this project aims "to restore the condition of Spoornet's rolling stock assets in order to provide required resources and reliability to meet the expansion plan." (Spoornet:

"Rolling stock maintenance backlog project", January 2006). "A major risk is the lack of capacity to do the work timeously. Due to limited budgets, capacity has in some cases been destroyed over the last couple of years."

Summary

In summary, the key factor pertinent to the state of Transnet's infrastructure has been its financial state, and in particular its budgets over the years for maintenance and replacement. Emphasis is now on improving the condition of strategic infrastructure and on expanding its capacity to meet demand. Also the conscious decision has been taken to reduce maintenance of non-core infrastructure, and instead use measures such as capacity and speed restrictions in order to keep operation within safety limits.

i. Telkom

Overview of Telkom's infrastructure and service delivery

Telkom (a former SOE, privatised in 1997, and since listed on the Johannesburg Securities Exchange) is the dominant provider of telecommunications services in South Africa, offering a wide range of services and products, including:

- fixed-line voice communications services, including local, long distance, international and fixed-to-mobile calls in the form of postpaid, prepaid and payphone services;
- fixed-line data communications services, including data connectivity services, such as leased lines and packet-based services, managed data networking services and internet access and related information technology services; and
- mobile services, including voice and data services in the form of contract, prepaid and community service telephones, through Vodacom, a 50%-owned joint venture (the other 50% being owned by Vodafone UK).

Information on the current replacement cost of all Telkom infrastructure "is not available for public disclosure".

State of infrastructure and state of maintenance

The sound financial state of Telkom, and therefore its capacity to allocate adequate resources to infrastructure management, is highly material to the state of its infrastructure. However two additional factors drive the state of its infrastructure and state of maintenance.

The first factor is that the services that Telkom provides are customer-driven, and to some extent subject to competition, or can be substituted for. Customers demand a service that is reliable and continuously available. Telkom is aware that if it does not deliver, its customers will seek alternative options. Telkom is also aware that customers may reduce their use of an unreliable service. Either way, poor service may lead directly to a reduction in revenue to Telkom.

The second factor is the rapid pace of development of information and communications technology. Generally, infrastructure that is not performing is quickly repaired or replaced. This has been the case in the past - for example investment in reducing the number of switching tiers on the voice network as well as migrating from micro-wave transmission technology to optic fiber - these led to improved reliability, as well as increasing the capacity. Telkom has no choice but to keep up with technology change, and its current investments in infrastructure must be planned with an eye to their migration to and enhancement by next generation networks that have increased capacity, enhanced functionality and reduced cost. Interoperability of the older and the new generation technologies must not be compromised. It is for these and other reasons that Telkom follows an evolutionary strategy in the deployment and retirement of infrastructure technologies.

In this section of Annexure A that deals with Telkom, therefore, the status of its infrastructure is presented in terms of (i) technology change and (ii) investment in infrastructure, rather than in the form of statistics as to the state of infrastructure and the state of its maintenance.

To illustrate growth and technology change: In 1996 only 70% of fixed line connections were served by digital exchanges, and there were no broadband services. The following year, Telkom

embarked on an extensive capital investment programme in its fixed-line business. Total investment was R42 billion, of which R28 billion was for network modernization and line rollout in order to comply with license obligations and prepare for competition. Today 99.99% of all fixed line connections are served by digital exchanges.

Telkom is investing R 30 billion over the next five years in order to migrate from the existing networks to an "IP-Centric" (i.e. based on internet protocol) next generation network infrastructure. At the same time it is increasing the broadband penetration of the access network, deploying the relevant access technologies to suit the demand, geography and demographics of the areas to be served.

Investment in maintenance largely depends on the age, capacity and demand placed on the infrastructure as well as the demand for next generation services. This varies from area to area. As Telkom migrates to the next generation network, maintenance investment in existing infrastructure is being managed to ensure that service delivery and service quality are not negatively impacted.

Telkom has a state-of-the-art national network operations centre in Centurion that monitors its core network and coordinates and dispatches core network repair personnel. This operation centre enables Telkom to be proactive in anticipating, localising and isolating problems, such as congestion and cable breaks, so that they can be corrected promptly. The centre houses a real-time visual summary of the status of the entire network. The centre also incorporates an emergency restoration and control facility that manages all network failure restorations. Network service management specialists are able to obtain up-to-the-minute information from this facility, the better to promptly assist customers affected by major network failure.

Current initiatives to enhance maintenance

Telkom is actively positioning its infrastructure for the evolution towards a next generation network, with its greater reliability (and greater capacity). As the migration towards an IP-Centric network accelerates, so do Telkom's investments in new generation technologies. Next-generation SDH, Metro Ethernet, WiMax, broadband access, and edge devices that can aggregate and deliver a number of services, will be deployed together with the operational support systems necessary to facilitate the development and delivery of an IP-Centric network.

Summary

In summary, the key factors pertinent to the state of Telkom's infrastructure have been its strong financial state, its customer orientation (and the presence of competition or substitution), and its selection of technologies in an environment of rapid technological development. The company's own maintenance policy and strong maintenance ethic have also been instrumental.

Annexure B: How substandard maintenance can manifest itself in service delivery

This annexure describes, in respect of some of the services, how substandard maintenance can manifest itself in the deterioration of infrastructure and facilities, with consequences for service delivery.

The first part of the annexure discusses infrastructure and service delivery, and the second part discusses service delivery from buildings and facilities.

- The most common cause of the water from water treatment works not meeting required quality standards is a breakdown of plant and/or the length of time that it takes to have that plant repaired satisfactorily and for it to resume working correctly. The most common causes of plant breakdown typically include inappropriate plant, faulty operating procedures, lack of routine maintenance, and overload.
- The most common problem experienced with water reticulation systems is leakage of water. A variety of factors could contribute to this, including the use of incorrect procedures at the time of laying the pipes, damage due to excavations taking place near to pipes, use of inappropriate pipe materials (and consequent corrosion of the pipes), inappropriate repair procedures, and the ageing of the pipes. Illegal connections exacerbate the situation.
- Municipalities are usually responsible for maintaining the waterborne sanitation piped network, and frequently also the pumping facilities. The most common problems experienced with waterborne sanitation reticulation systems are sanitation spills from overloading of the system and from blockages caused by roots of trees, foreign objects, breakages and deterioration of the network. Routine maintenance of sewers is required to minimise these sewerage spills.
- The most important indicator of wastewater treatment works performance is the quality of the effluent from the works, before it is discharged into the watercourse, or whatever other arrangement is agreed to in terms of the license or other form of authorisation from DWAF for the works to operate. The most common causes of not meeting required standards are very much the same as those for water treatment works, described above.
- The most common causes of the failure of electricity reticulation systems are faulty operating procedures, lack of planned maintenance, damage (e.g. to underground cables) during construction nearby, overloading, and equipment ageing. Cable theft and illegal connections sometimes contribute to failure.
- The most common cause of the failure of roads is neglect neglect of routine maintenance, and neglect to repair damage without delay. Neglect of surface damage or of cracking leads to water penetration of the underlying layers, and consequent erosion of these layers followed by loss of portion of the paved surface (the formation of "potholes"). Overloading of freight vehicles is sometimes a contributor to failure.

The next few paragraphs describe, in respect of some facilities, how substandard maintenance can manifest itself in service delivery.

The effect of under-maintained health and education facilities is felt at several levels. For example, in a hospital, a patient might, because of a combination of factors that includes equipment failure (but also include too little equipment and staff) wait for days to receive a procedure that should take less than a day. For another example, qualified staff, in short enough supply as it is, are thanks to the same combination of factors disincentivised to work in the public sector. For a third example, equipment hasn't completely failed, but it is no longer fully effective - an example is that a steam boiler does work, but the reticulation leaks so much that steam is no longer conveyed to some areas of the hospital.

However the effect of under-maintained hospital and education facilities can also be an immediate risk to the health of staff, learners and patients. The CSIR database documents examples of the following:

- Hospital-acquired infection is a major cause of hospital deaths, increased stay and high costs in the USA and Europe (where it is measured). This is not measured in South Africa, but if it were, there is no doubt it would be at unacceptable levels.
- Fire equipment and systems (including fire and smoke doors) are not maintained (or have even been removed), resulting in massive fire risk.
- Broken balustrades on upper floors at schools, resulting in pupils falling.
- Ceiling and roof collapses at schools.

notes

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