

**SAICE
Infrastructure
Report Card
for South Africa
2011**



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1 Message from the President

In 2006 the South African Institution of Civil Engineering (SAICE) released the first ever Infrastructure Report Card (IRC) on the state of engineering infrastructure in South Africa. The report highlighted “the observations of the professionals responsible for the planning, construction, operation and maintenance of our nation’s life-support system”. Overall, it gave the nation’s infrastructure a D+ grade.

The 2006 IRC received wide media coverage and resulted in increased dialogue and engagement between civil society and the custodians of economic and social physical assets. Since then, and with the enormous awareness created by the projects surrounding the 2010 FIFA Soccer World Cup in South Africa, the term “infrastructure” has entered everyday speech. It has become a part of the average person’s lexicon, and this is good because infrastructure and public buildings comprise a major part of our nation’s wealth. We all invest in its creation and likewise, we all have a stake in its sustained and increasing value as a public good. Indeed, infrastructure may be regarded as our greatest long-term socio-economic asset and SAICE welcomes the increased acknowledgement of this from the public.

This report is a collective opinion provided by civil engineering professionals at SAICE in the manner of “expert witness”, on the current condition of these assets. SAICE is uniquely placed to do this because its membership is drawn from all sectors of the civil engineering community: all tiers of government, the private sector designers and constructors, suppliers of equipment and materials, and even suppliers of finance. Moreover, it is a learned society and operates as a non-profit organisation.

The Institution views this as its responsibility and duty: to report and engage constructively and without hesitation to the benefit of South African society. Leadership requires that we act not simply as a tool to fulfil society’s demands but also to advise society on the wisdom and sustainability of its requirements so that the prosperity, and indeed survival, of future generations is not further compromised.

I congratulate the convenor of the 2011 IRC, Sam Amod (SAICE President 2006) and the IRC drafting team on the completion of this second Infrastructure Report Card for South Africa.

SAICE 2011 President Seetella Makhetha Pr Eng

2 Message from the IRC Team

This report has been three years and many hundreds of hours in the making. It reflects the labours of the research team at the CSIR and the painstaking drafting, reviewing and grading by the field experts at SAICE. It extends the start we made five years ago and we trust that it improves upon the first IRC.

In that report, skills shortages and lack of maintenance emerged as the two key themes across all sectors. These themes still pertain; however two new important themes have emerged, viz. holistic systems and sustainability. Infrastructure, once created, is unrelenting in its demand for maintenance and this demand will increase the longer it is ignored. From our evaluation, skills constraints notwithstanding, bold leadership and effective management are irreplaceable ingredients for successful and sustainable infrastructure provision.

This SAICE 2011 Infrastructure Report Card covers ten sectors, one more than in 2006. These are further divided into 27 sub-sectors, six more than the previous time. These have been evaluated and graded. Moreover, in this report we are able to show the trend since 2006. We find that nine sub-sectors show improvement, twelve remain unchanged and a further four have deteriorated. The Schools sector and the Fishing Harbours sub-sector are new and therefore do not have trend indicators.

We have awarded an Overall Grade of C-.

The improvement from a grade of D+ in 2006 reflects marginal improvement in the overall condition of our nation's infrastructure over the past five years, influenced by the heavy investment in, especially, national assets: ports, rail, airports and national roads. We must strongly caution, however, against a perception that this is a blanket improvement. On the contrary, the quality and reliability of basic infrastructure serving the majority of our citizens is poor and, in many places, getting worse. Urgent attention is required to stabilise and improve these.

That the grades for some sectors have held up since 2006 is primarily because of the high rate of new construction. Sadly, little maintenance is done and, were it not for these new investments, the trend would be downwards.

Any examination of engineering infrastructure reveals that South Africa has achieved remarkable strides in the past twenty years; it has provided infrastructural services

to millions of citizens at a pace unrivalled in its history. Government deserves recognition for the ongoing progress in this regard, reflected in the difference between the 2006 and current IRC. The 2010 FIFA Soccer World Cup was an excellent example of the unsurpassed quality of South African engineering professionals, who have made this progress possible despite limited resources and against a fixed deadline.

As a developing nation, South Africa's engagement in the global economy is constrained by its infrastructural capabilities. The challenges posed in this document are no less acute because they are chronic, but they can be overcome given the same dedication and ingenuity applied to the challenge of the World Cup. We hope that this report and discussions arising out of it will provide impetus for such action.







Sam Amod Pr Eng
Convenor of the SAICE IRC




SAICE President 2006














Kevin Wall Pr Eng
*Leader of the
CSIR Research Team*
SAICE President 2001







Water 	D-  for Department of Water Affairs infrastructure	<p>There has been further deterioration in the ageing bulk water infrastructure portfolio as a result of insufficient maintenance and neglect of ongoing capital renewal.</p> <p>Persistent, serious salination of key river systems and eutrophication in many dams and rivers continues. These problems increase the cost of water treatment infrastructure and damage the environment. Acid mine drainage is a cause for concern in the vicinity of gold and coal mines.</p> <p>Large dams are developing capacity problems and require urgent refurbishment. Farm dams are deteriorating rapidly because of lack of maintenance, threatening accelerated sedimentation of bulk storage infrastructure.</p> <p>The level of water supply in certain systems has fallen far below the 98% assurance of supply as recommended in the National Water Resources Strategy. Owing to long lead-times required for development of new supply schemes, the situation is likely to become worse before it becomes better.</p> <p>Serious concerns remain about funding for maintenance.</p>
	C+  for major urban areas	<p>Major and ongoing strides in provision of water since 1994, but focus on quantity, not quality, makes water services unsustainable.</p> <p>Water quality is a serious problem, especially outside metros. Seeking Blue Drop status might assist in improving water quality in municipalities.</p> <p>Water wastage (through leaks) is still too high.</p>
	D-  for all other areas	<p>Serious shortage of skilled personnel and officials; governance failures increasing.</p> <p>Increase in protests in urban and rural areas – efforts to force improvement in services.</p>






Sanitation (including wastewater) 	C-  for major urban areas	<p>Serious problems with management of many wastewater (sewage) treatment works. Wastewater leakage and spillage, especially into major rivers, is still too high.</p> <p>Frequent problems with inappropriate and unsustainable design, e.g. on-site sanitation VIPs not designed to be emptied once full. Sanitation backlog is increasing owing to unsustainable infrastructure.</p> <p>Lack of buy-in from users.</p>
	E-  for all other areas	<p>Inadequate operation and maintenance capacity, and shortage of skilled personnel.</p>





Solid waste management 	C  for waste collection in major urban areas	<p>In general approximately 60% of households receive adequate refuse removal service. In the major urban areas, the percentage is over 80%, while in the rural areas it is as low as 20%.</p> <p>Landfill sites in metros are generally licensed, but not all are well managed.</p> <p>Many other municipalities, especially rural municipalities, have unlicensed landfill sites or licensed sites that are not operated according to acceptable/appropriate standards.</p> <p>Hazardous and health care risk waste disposal is a concern.</p>
	D  for waste collection in other areas	
	C+  for waste disposal in major urban areas	
	D  for waste disposal in other areas	




 Roads	B  for national roads	<p>The national road network is in the good to excellent range with the proportion of roads in poor to very poor condition never exceeding the international benchmark of 10%. SANRAL demonstrates expert knowledge, world-class management and excellent monitoring and maintenance systems.</p> <p>Close to 80% of the network has exceeded its 20-year structural design lifespan. SANRAL's current success in maintaining the national road network will see its responsibilities and network allocation expand further. These will be severe challenges.</p>
	D-  for paved provincial roads	<p>The paved provincial road network has deteriorated significantly over time. Shortages of skilled personnel in provincial departments, inadequate funding and outdated systems, and the lack of routine and periodic maintenance, have contributed to the current condition.</p>
	C-  for paved metropolitan roads	<p>Generally, these roads are in satisfactory condition.</p> <p>Less than 10% (except for Buffalo City) of the paved metropolitan roads are in poor to very poor condition.</p>
	D  for paved district and local municipal roads	<p>Balancing the need for the upgrading of township roads with the necessity to perform routine and periodic maintenance remains a challenge given the limited resources at their disposal.</p> <p>Concerns about the lack of capital expenditure on capacity improvements and signalling upgrades.</p> <p>In general, municipalities lack capacity, skilled resources and funding to efficiently and effectively manage their road networks. Reliable condition data is scarce. Few municipalities make use of pavement management systems to prioritise their needs.</p>
	E  for all provincial, metropolitan and municipal gravel roads	<p>Capacity improvements amount to much less than that required, especially with high urbanisation rates.</p> <p>Based on the limited data available, the paved road network on average, nevertheless appears to be in a fair condition.</p> <p>Maintenance of gravel roads, which constitutes 75% of the total length of the proclaimed South African road network, has been neglected.</p> <p>Condition data is scarce (only available for 24% of the network). Approximately 50% of the provincial gravel roads and 30% of the municipal gravel roads, for which condition data is available, are in a poor to very poor condition.</p>

 Airports	B+  ACSA-owned facilities only	<p>ACSA provides world-class aviation infrastructure at most of its airports. It demonstrates a model of excellent maintenance and operational practice, with first-rate institutional memory. A profitable company, it is strongly driven not only by the need to meet statutory requirements, but also by its own high standards.</p> <p>The delays and inconvenience owing to continuous expansion, reported on in 2006, have largely been overcome, thanks to the substantial completion of the most recent expansion programme, and only relatively minor deficiencies remain, e.g. signage and minor security concerns.</p>
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 Ports	B-  Commercial ports only	<p>Expenditure on upgrading and providing new port infrastructure owned and operated by Transnet has continued at a steady pace since 2006, with a number of large projects already complete, including the new port, Ngqura. Other ports are ageing but well-maintained.</p>
	C Fishing harbours (new sub-sector)	<p>The repair and maintenance programme completed in 2007 drastically improved the condition of the harbours. However, urgent follow-on maintenance is required, particularly for mechanical installations such as slipways, to prevent deterioration.</p>

	B+  for heavy haul freight lines	These lines are in a good condition and are well maintained. Infrastructure expansion will provide capacity for increased volumes. Some operational issues do exist. The additional capital expenditure on these lines has enhanced the state of the network.
	C+  for general freight lines on the core network	The condition of the network has improved slightly. Some bottlenecks exist on specific lines. The focus on the core network will further improve the network condition. Operational performance needs to increase together with higher volumes to take advantage of infrastructure investment. More needs to be done regarding service levels and reliability.
	D  for active branch lines	Just over half of the branch lines have been closed or lifted and active lines are maintained to provide network flexibility or for future expansion. Transnet's focus on the core network means that if active branch lines are not concessioned or earmarked for expansion, further deterioration will occur. (The score has improved from an E to D, with only active branch lines taken into account.)
	C-  for passenger lines (excluding Gautrain)	The capital investment programme is slowly starting to reduce the backlog, but not quickly enough. Operational inefficiencies do exist and passenger volumes are restricted by inadequate and failing rolling stock. Theft and vandalism is another major concern and safety remains a significant issue.

	C+  for Eskom's generating infrastructure	Eskom's generation infrastructure (95% of South Africa's generation capacity) is in a satisfactory condition with a reasonable maintenance regime. It can meet current demand. However, major capital investment for new infrastructure, is needed to meet needs in the next five years. Such investment is being made, but there are a number of risks associated with ageing infrastructure, new project completion and coal supply.
	B-  for Eskom's transmission network	Eskom's high-voltage long-distance transmission infrastructure is in a better than average condition, with a reasonable maintenance regime. It can meet current demand and handle minor incidents across the network. However, major capital investment is required to meet needs in the next five years.
	D  for local distribution	Characterised by inadequate operation and maintenance capacity and shortage of skilled personnel. In many areas, infrastructure is ageing and/or overloaded. Municipal infrastructure in particular is below standard and poorly maintained. There is often a lack of capacity to meet demand and it is not resilient. In the absence of significant investment there may be an impact on the national economy. Eskom's distribution network on average is in a significantly better condition than the municipal distribution network.

	D+  for hospitals	Serious lack of credible and current condition data. Poor financial and procurement management with little dedicated maintenance resources. Serious systemic and capacity failures are typical. Lack of skilled support staff to care for infrastructure. Ageing infrastructure will deteriorate further.
	D  for clinics	Similar to hospitals. Instances of poor building quality and specification. Lack of empowerment at facility level to undertake programmes of infrastructure care.

Public ordinary schools	D+ for public ordinary schools in South Africa (new sector)	<p>In general, maintenance of education infrastructure in South Africa has been limited, resulting in conditions deteriorating across all provinces. However, there is some variation in school infrastructure condition, with urban and ex-Model C schools being generally better maintained than rural schools. Degradation over time means that many schools now need urgent maintenance to ensure environments are suitable for teaching and learning, and to avoid expensive unplanned repairs.</p>
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Overall Grade	C-	<p>The focused investment over the past five years has resulted in more new infrastructure and an improvement in the condition of some existing assets. However, infrastructure at municipal level remains poor and is deteriorating in many places. Further, the resilience of all new and previously existing infrastructure is questionable without a much improved commitment to maintenance.</p>
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4 What do the grades mean?

A	B	C	D	E
WORLD-CLASS	FIT FOR THE FUTURE	SATISFACTORY FOR NOW	AT RISK	UNFIT FOR PURPOSE
Infrastructure is comparable to the best internationally in every respect. It is in excellent condition and well maintained, with capacity to endure pressure from unusual events.	Infrastructure is in good condition and properly maintained. It satisfies current demands and is sufficiently robust to deal with minor incidents.	Infrastructure condition is acceptable although stressed at peak periods. It will need investment in the current Medium-term Expenditure Framework period to avoid serious deficiencies.	Infrastructure is not coping with demand and is poorly maintained. It is likely that the public will be subjected to severe inconvenience and even danger without prompt attention.	Infrastructure has failed or is on the verge of failure, exposing the public to health and safety hazards. Immediate attention is required.

Please note:

- A + or – is sometimes used to indicate a grade which lies at the extremes of the range.*
- The trend in the score since the 2006 IRC is denoted by an arrow: upward, horizontal or downward pointing to indicate improvement, no change or deterioration respectively.*



5 South Africa's infrastructure

5.1 The importance of infrastructure

In the global economy, the state of a nation's physical infrastructure provides one of the best indicators of its likely prosperity. Profitable economic activity requires efficient and functioning systems of transport, energy, water and waste management and social infrastructural services.

There is also a positive relationship between buildings, infrastructure and human well-being. Well-designed and maintained public buildings and infrastructure contribute very significantly to good social relationships, reduced crime and increased productivity. Decrepitude and shabbiness have the opposite effect. In the case of critical social infrastructure, such as public schools, hospitals and clinics, infrastructural quality has been shown to have a proven positive effect on the impact of the service upon its users. In short, good infrastructure improves the quality and length of human life: a fact acknowledged by the medical fraternity.

In recognition of its critical importance, the right to basic services is enshrined in South Africa's Constitution. In 2001, government went further by instituting the Free Basic Services Policy, committing to providing free services to indigent households. Basic services include water (6 kilolitres of water per household per month within 200m of the household), sanitation (a Ventilated Improved Pit (VIP) sanitation facility), solid waste management and electricity (50 kWh per month).

Since 2006, the public profile of deteriorating or dysfunctional infrastructure has increased significantly, leaving some owners highly sensitive to criticism and making data collection for this report more problematic. On the other hand, in the past year the water services sector has received close attention in political circles, the media, and the public domain. The sterling efforts of the Department of Water Affairs (DWA) in undertaking the Blue Drop and Green Drop analysis processes, and releasing the reports to the public, have set a good example to the leaders of other infrastructure sectors and rightly, have been highly praised.

The critical importance of the local government sphere, with its considerable service delivery and infrastructural responsibilities has been recognised by national government, as has the need to overhaul many municipalities.

5.2 Infrastructural legacy

The IRC cannot grade the absence of infrastructure, although addressing this deficiency is an obvious government priority and should remain as such. Since 1994, massive strides have been made in provision of basic services and associated infrastructure, e.g. water, sanitation, energy and transportation. The advances from 2006 alone are significant, as seen in this Report Card.

Nonetheless, until now this provision has too often been made on a flawed basis, through an isolated focus on capital expenditure rather than through life-cycle costing models. Life-cycle costs include capital and operating/maintenance expenditure requirements for projects, providing sustainable infrastructure.

South Africa is a developing country and government has recognised the importance of infrastructure in increasing equality and meeting social and economic needs but this recognition is compromised by neglect of maintenance which results in infrastructural failure and recapitalisation requirements.

At the time of publishing the last IRC, the construction sector was ebullient. After decades of decline, construction and infrastructure provision seemed set for decades of growth, with construction forming the fastest growing sector of the economy. Because construction also generates more jobs per rand spent than almost any other sector of the economy, this investment appeared to satisfy both development needs as well as a driving priority of our developing country: the creation of much needed jobs. Although the South African construction sector was somewhat protected by the mitigation effects of investment for the 2010 FIFA Soccer World Cup, the cyclical nature of the sector imposed itself forcefully in the wake of the global financial crisis that characterised the tail end of the decade.

Although this has now slowed, and funding remains too low for adequate maintenance in many sectors, it is imperative that the culture changes so that we do not build to permit decay. Once again the policy instruments, e.g. Government Immovable Asset Management Act (GIAMA), are in place, and implementation is now required to ensure execution.

6 Matters of critical importance

In the 2006 IRC, two key themes ran as a thread through all the grades. The first was the severe shortage of skills and the impact of this on planning, procurement, design, construction and care of infrastructure. The second was the inadequate funding of maintenance for the existing asset base and the stream of new assets that are continuously completed. It is not surprising that this situation still pertains.

In addition, systems and sustainability have emerged as the two new key themes within the current Report Card. Both of these themes emphasise the need for a holistic approach to infrastructure and its use, not only by the public sector but by all South Africans.

6.1 Skills and competence

South Africa has, by proportion of population, up to twenty times fewer engineers than Australia, America, Western Europe, and even India or China. Furthermore, the racial and gender balance is overwhelmingly white and male. And they are ageing. Increasing the number of engineers is a recognised government priority, but it will need a multifaceted approach starting with urgent attention to mathematics and physical science education at school. Training and mentorship of artisans and young engineering professionals is also essential at all levels, especially in the public sector.

The extreme shortcomings of South African education have been widely discussed and are generally known. As with every other industry in the country, this remains an extreme constraint on the engineering industry. It is worth explicitly noting that this crisis compounds slow delivery of basic services through its effect on the engineering profession that provides this infrastructure.

A comprehensive municipal skills survey was undertaken by SAICE in 2007. Of all 283 municipalities surveyed, 83 had no civil engineers, technologists or technicians on staff. A further 48 employed only one civil technician, and municipalities with civil engineering staff reported 35% vacancies (over 1000 professionals), often owing to budget constraints. Although indications are that salaries for professionals in the public sector have improved noticeably, the skills constraint has still not been addressed. This is further exacerbated by the inefficient deployment of these precious resources and the use of unqualified and inexperienced personnel in positions requiring technical ability.

From evidence, it is clear that much of local government is indeed in distress, and that this state of affairs has become deeply rooted within our system of governance. In assessing the reality of poor municipal performance, cognisance needs to be taken of the unresolved problems identified in previous assessments (despite recognition from national government, and legislation that is often in line with international best practice), and the intergovernmental impact of this failure, both institutionally and for communities. A recurring theme is the inadequate capacity of service providers to fulfil their responsibilities. Delivering and operating



new infrastructure are complex activities but competent skilled persons are in short supply, especially in rural areas. The recent trend towards civil society partnerships with municipalities is beginning to have some positive impact, but the sustainability of this approach is constantly threatened.

6.2 Systems and maintenance

Another technique to improve the delivery capability of a network is to improve the systems and efficiency of application of limited resources. A systems-based approach will enhance the integration of services and maximise the use of scarce human and infrastructural resources. It will also reduce the incidence of failure as constant data collection on condition allows early identification of acute and chronic weak points in the delivery chain. Neglect is also costly in financial terms - for example, roads maintenance that is delayed for one year could cost three to six times more when there is eventually no choice but to do it. A systems-based approach also makes it more difficult for those responsible to avoid doing the necessary work.

An alarming feature is the dearth of data pertaining to infrastructure – and the problem continues to worsen. Reliable, consistent data is a prerequisite for the urgently required shift to routine maintenance. Data permits planning, prioritisation of targets and adequate budgeting for maintenance and extension. An example is SANRAL, which consistently prioritised spending according to data even while its budget was less than required for comprehensive maintenance of all its roads. In order for this data to be collected, capacity strengthening is crucial, especially at municipal level.

The allocation of maintenance funding is, with very few exceptions, simply not sufficient, especially in circumstances where it is expected to also cater for a maintenance regime that has led to neglect. All too frequently the inadequacy of the allocation is compounded by poor management which results in these meagre funds going unspent, e.g. in the health sector. The major airports managed by ACSA are one example of a sector that has consistently maintained its infrastructural assets, avoiding the need for expensive, critical upgrading at a later stage.

Adequate, integrated systems would also improve coordination across different departments of government. Often, departments share responsibility for infrastructure, e.g. the Department of Public Works is responsible for construction of hospitals and clinics, which are managed by the Department of Health. In other cases, diversified responsibility may result in competing priorities or non-sequential project completion because of a lack of coordination across departments. One example of this is the discontinuity between the recently completed Gauteng Freeway Improvement Project and the as yet incomplete public transport initiatives for the province. In this case the competence of one agency is punished by the tardiness of another. In general, there is a need for departments to communicate with one another more effectively through better systems, in order for infrastructure to be more efficiently and cost-effectively managed.

The importance of life-cycle costing has already been mentioned, but cannot be overemphasised. Although departmental-specific policies or legislation often support this idea, this does not translate to implementation, especially in early stages such as procurement.

Innovative, creative procurement is a specialised process essential to sustainable infrastructure, especially in a country beset with skills and financial constraints. We also continue to undertake procurement in a way that ignores life-cycle costing, i.e. the bid with the lowest capital price receives preference, which may mean significantly more expensive maintenance costs. In some cases this is a result of the removal of procurement power from the engineering departments, who are most cognisant of long-term considerations.

6.3 The infrastructure environment

While efficient infrastructure underpins economic and social development, buildings also account for a great portion of energy consumption and carbon dioxide emissions, and construction activity contributes significantly to waste generation. This can be mitigated. South Africans currently ignore sustainability considerations across all social and public/private strata. As a result, there is an extreme absence of awareness regarding the true or user costs of infrastructure and its environmental impact.

The practice of charging true costs to infrastructure users is an eminently fair one, to both human beings (as non-users do not subsidise users) and the general environment (as users pay for their environmental impact). However, provision of free basic services and years of subsidised infrastructure has rendered this concept alien to South Africans. Thus, users do not pay anywhere near the real costs of water treatment and supply, electricity supply or waste management services, and this encourages high levels of wastage and civic disrespect for and neglect of infrastructure. This is a problem because of its detrimental environmental, financial and social impact. Effectively, it encourages avoidable squandering of natural resources and burdens future generations with the costs of our currently subsidised services. Furthermore, this practice discourages users and suppliers from seeking alternative or more economical long-term outcomes regarding natural resource constraints. The danger is that these are gradual effects, without the disastrous urgency accompanying sudden electrical blackouts or water restrictions, and do not summon instant national attention. They are also harder, if not impossible to reverse.

Although government's infrastructure-related deficiencies have been outlined above, all South African citizens are responsible for sustainability, and urgently need to recognise this. Infrastructure is human-made and subject to technological advances multiplying its quantity and quality; however it is built on a foundation of scarce natural resources that are not. We must therefore take ownership of our infrastructure in order to ensure its sustainability, e.g. through water conservation, recycling and recognition of the necessity of "user pays" systems, despite the inconvenience or difficulties associated with this change. This is, in effect, recognition of the importance of demand-side management in all sectors by government, which must be supported by the public through an urgent change in behaviour.





Abbreviations

ACSA	Airports Company South Africa
AMD	Acid Mine Drainage
ARSI	Accelerated Rolling Stock Investment Programme
BDC	Blue Drop Certification
CCTV	Closed Circuit Television
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DHIS	District Health Information System
DoBE	Department of Basic Education
DoH	Department of Health
DoT	Department of Transport
DPE	Department of Public Enterprises
DPW	Department of Public Works
DWA	Department of Water Affairs
FIFA	Federation of International Football Associations
GIAMA	Government Immovable Asset Management Act
ICAO	International Civil Aviation Organization
IPP	Independent Power Producers
IRC	Infrastructure Report Card
ISPS	International Ship and Port Facility Security
LHWP	Lesotho Highlands Water Project
NLTTA	National Land Transport Transition Act
NWMS	National Waste Management Strategy
NWRS	National Water Resources Strategy
PRASA	Passenger Rail Agency of South Africa
REDS	Regional Electricity Distributors
SADC	Southern African Development Communities
SAICE	South African Institution of Civil Engineering
SANRAL	South African National Roads Agency Ltd
SAPO	South African Port Operations
SARCC	South African Rail Commuter Corporation
TFR	Transnet Freight Rail
TNPA	Transnet National Ports Authority
TPT	Transnet Ports Terminal
VIP	Ventilated Improved Pit
WDM	Water Demand Management



7 The sector reports

7.1 Water

Water infrastructure consists of bulk abstraction and conveyance infrastructure as well as local treatment and distribution. The Department of Water Affairs (DWA) is responsible for much of this bulk infrastructure, as well as policy and regulation, while either just municipalities or municipalities and water boards are responsible for local water quality and provision.

There are extreme variations in the condition and performance of the infrastructure in the water sector. Water supply quality for example, is very good in the metropolitan areas, but water quality in many of the more rural areas is frequently unacceptable.

One very positive development since the previous Report Card is the implementation in 2008 of the “Blue Drop and Green Drop” Water Quality Regulation Strategy, a key initiative in monitoring water quality locally. Blue Drop status is awarded to a municipality if it complies with at least 95% of the Blue Drop Certification Programme (BDC) requirements. To date, only 37% of municipalities have asserted that they meet drinking water quality standards.

Much of South Africa’s bulk water infrastructure is reaching the end of its life and will require upgrade or replacement; further, since 2006 a disturbing mismatch between water demand and bulk infrastructure development has come to light, with the result that users in the highly strategic Vaal and Umgeni systems are exposed to unacceptable risk of water restrictions for the next decade. This mismatch was precipitated by comprehensive failure to meet water demand management targets. However, it also points to a failure on the part of DWA to react to this serious problem in time. The long delay in identifying large scale water theft by farmers along the Liebenbergsvlei River and further delays caused by failure to monitor abstractions is also symptomatic of the severe shortage of capacity within the Department.

A serious problem regarding bulk infrastructure is uncontrolled, high levels of pollution, especially in dams. Mingling pollutants near urban areas makes identification and penalisation of the many offenders extremely difficult. Commencement of uncontrolled decanting of acid mine drainage north of the Witwatersrand is indicative of the pollution factor, and the long anticipated decant from the western and central Witwatersrand basins is also imminent. The long delay in investigating and providing appropriate infrastructure has revealed serious management shortfalls. Sedimentation is an acknowledged and ever worsening problem – but farm dams are also known for being poorly designed, built and operated.

Locally, in general, water boards – the institutional tier between national and local government – are better equipped in terms of capacity and finance than municipalities. Infrastructure managed by water boards is thus usually in better condition. Anecdotal evidence suggests that communities value and maintain infrastructure which they partially fund much better than infrastructure provided free by government. While in 1994, only 59% of South Africans had access to basic water services, this has since improved to over 80% of the population. This however still means that six million South Africans lack a reliable source of safe drinking water. Nonetheless, since the 2006 Report Card, approximately 2.2 million South Africans have been provided with basic water services. Free services regrettably,



result in non-payment of the real costs of water (and in some cases, unknown), encouraging wastage and non-accountability.

The focus has been on building of new water infrastructure. Unfortunately this is frequently at the expense of maintenance or improvement of existing infrastructure; hence the sustainability of water services in many areas is in doubt. One of the most debilitating problems in this regard is a severe lack of capacity at local level (unchanged or worse since 2006). Many of the smaller, poorer municipalities require assistance in capacity building to operate as Water Services Authorities and Water Services Providers.

There is urgent need to implement water demand management (WDM) to align demand growth with bulk infrastructure development to minimise the risk of supply shortfall. This would also be highly beneficial to municipalities as it would reduce the pressure for new water supply and sanitation infrastructure. Further, it is a step towards more ethical management of a precious limited resource.

7.1.1 Water resources

South Africa is a water scarce country, with high variability and unpredictability in its annual average rainfall of 500mm, compared to a world average of approximately 860mm. Rainfall is uneven in space and time, with the wettest areas at long distance from both the industrial and urban heartland and from poor rural areas. Further, extreme weather, including droughts and floods, is fairly common. The available water resources are inequitably distributed and sometimes inappropriately used.

Water is thus a precious resource, monitored and regulated by the DWA, which has responsibility for 250 schemes. The replacement value of this resource infrastructure is R139 billion, with an additional R7.3 billion land valuation. Furthermore the state has interest in schemes dependent on water resources originating from other countries, e.g. the Lesotho Highlands Water Project (LHWP).

Bearing in mind these challenges, the foremost issue when it comes to water resources infrastructure must be: how do we best utilise the available water resources? There are several key related questions, including whether we are efficient and sustainable in our water use, and how and where any future water supplies will be obtained. These questions do not appear to be emphasised enough in the Department, nor in the public domain.

A culture of complacency has developed in South Africa regarding water resources and use. The country needs to do much more in terms of instituting appropriate water conservation technology, and a water conservation culture, e.g. usage of grey water for gardens. Projects such as Durban Water Recycling, a private plant commissioned by the eThekweni municipality in 2001, which currently supplies 40 million litres of recycled water daily, should be highlighted.

The water infrastructure – with a weighted average age of 39 years – is subject to ageing effects associated with internal and external stresses and other impacts. Insufficient maintenance and capital renewal have resulted in further deterioration. According to the DWA, there is substantial maintenance non-compliance with regards to the National Water Resources Strategy (NWRS) of September 2009. There is also an urgent need to review the NWRS.

The DWA is struggling with serious capacity and funding problems, which cannot be overstressed. It has estimated that reinvestment of R1.4 billion annually is required to maintain current infrastructure – however, the Department is also suffering from a lack of skilled personnel to implement and supervise maintenance. The problem is compounded by fading institutional memory as individuals retire or are lost to the private sector. Despite long lead-in times for new projects and the above problems, the DWA has been proactive in planning new supply schemes, which is a positive step.



water



7.2 Sanitation

Sanitation services comprise treatment of wastewater and provision of sanitation facilities. These also fall under the mandate of the DWA nationally, and the municipalities and/or water boards locally.

Since 1994, access to sanitation reached over 67% (from an initial 49%) of South African households. An additional 3.3 million people have gained access to basic sanitation facilities since the 2006 Report Card was published. Although these statistics reveal the rapidity of sanitation access, users are often not receiving the full benefit because of high failure rates for two main reasons.

Firstly, most sanitation facilities are not compliant with appropriate technical design standards; hence they are built in a manner susceptible to quick failure and extreme maintenance difficulties. Secondly, there is a consistent lack of communication with users on why and how to use these facilities, compounding maintenance problems. One example of these problems is the fact that many sanitation facilities lack hand washing facilities and/or do not impress the importance of hand washing to users. This simple, avoidable problem threatens all hygiene improvements and restrictions of disease achieved through proper sanitation. It has been suggested that hand washing alone acts as a quasi-vaccine, cutting diarrheal deaths almost in half. Other problems include a lack of privacy and security issues at sanitation facilities, which cause people not to use them.

South Africa has extensive wastewater infrastructure, comprising 850 municipal treatment plants that transport and treat an average of 7 589 megalitres of water daily. However, this infrastructure is in urgent need of maintenance and replacement. Along with inadequate wastewater treatment, there is a lack of wastewater monitoring (not meeting effluent standards or even measuring effluent quality) in many plants; as with water, this varies greatly between locations.

In general, while great strides have been made in basic sanitation provision in South Africa, the infrastructure is in bad condition (for avoidable reasons) without much hope for improvement in the near future. Given the role of sanitation in preventing disease transmission and providing dignity to all, this is a serious health risk and critical problem.



sanitation

Government is also responsible for ensuring compliance with hazardous and health care risk waste disposal rules, which are much stricter than for general or municipal waste; 710 000 tons of hazardous waste (117 500 tons organic) was disposed of in 2007, along with 42 200 tons of health care waste. Skills shortages in municipalities translate into insufficient compliance monitoring and enforcement of these sites. An added concern is that waste is often transported over long distances for disposal, owing to limited licensed hazardous sites with stricter operating and disposal rules.

Power station waste is a historical source of contamination, constituting many more tons than total domestic waste. However, Eskom's new Kusile and Medupi power stations have been designed to best practice standards.

To summarise, the legal framework surrounding solid waste is well developed, but is currently not suitably implemented. The state of solid waste collection has stagnated since 2006, although the poor receive substantial benefits in free basic provision of this service. The state of disposal or treatment facilities has also not advanced, the large metropolitan areas providing a far better level of service as compared to smaller and rural municipalities.



solid waste management



7.4 Roads

South Africa's road network consists of 747 000 km (of which 140 000 km is unproclaimed), and responsibility for this network is shared amongst all three spheres of government. Condition data is available for only 37% of the classified road network; 75% of which is unpaved. Of the classified paved roads, 16 200 km are national roads managed by the South African National Roads Agency Ltd (SANRAL) for the Department of Transport (DoT). Approximately 185 000 km are provincial roads, with 66 000 km under metropolitan management and the rest managed by municipalities. There is extreme variation in the availability of information and condition of roads both between spheres of government and between geographical areas.

SANRAL has more than doubled its inherited network of 7 200 km, much of which was in poor condition when the Agency was created in 1998. Despite this backlog, it has extended the road network and maintained and upgraded existing roads with great consistency. The company deserves praise for its management of national roads, which are classified in the good to excellent range according to Visual Condition index information. Its management practices are in line with World Bank guidelines (no more than 10% of roads under management are in a poor to very poor condition at any time).

Road condition data is available for 82% of provincial roads, but extrapolation suggests that well over half of these roads have exceeded their design life, rendering them highly susceptible to rapid, costly deterioration in many sections. Visual condition information suggests that the overall provincial road network is deteriorating. 74% of this network consists of gravel roads.

For metropolitan roads, condition data is available for 64% of the network: 80% of paved roads, which are in a fairly good condition, and only 12% of gravel roads.

Municipal roads are not well managed, with road condition data available for only 4% of these, and much confusion regarding municipal coordination and responsibility. It appears that paved roads are in a fairly good condition, while gravel roads are poor to very poor. However, the lack of data suggests serious management problems and the possible inability of many municipalities to maintain and extend their road networks, a suggestion corroborated by extreme skills shortages and lack of capacity in most municipalities. A 2007 DoT survey observed that many municipalities lacked the capacity simply to answer the survey questionnaire, implying that they would be similarly incapable regarding roads maintenance and management. Further, of the municipalities that did reply, only 36% indicated some form of a road management system.

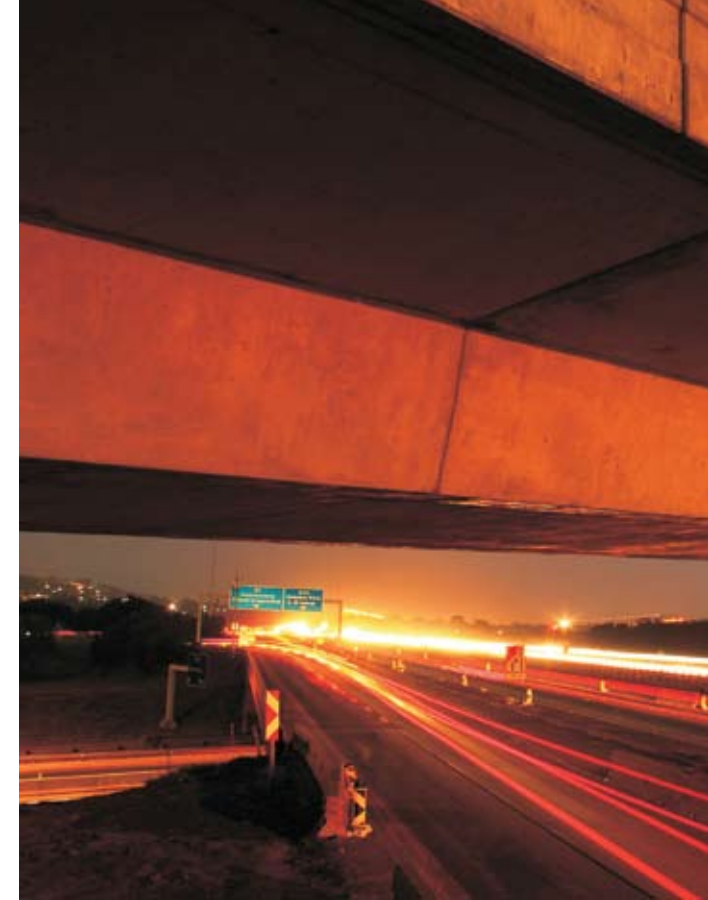
One major consideration is loss of service – a function of capacity and delays. The current lack of capital expenditure on capacity improvements, including additional infrastructural and signal upgrades, is symptomatic of poor service delivery. Authorities (excepting SANRAL) are slow in rolling out new projects. There is a general inability to plan and manage funds appropriately; however the National Land Transport Transition Act (NLTTA) requires the development of integrated transport plans, which must include an infrastructure development component. Further, as per the NLTTA, district and local municipalities must agree on division of planning functions in order for National Treasury to release funds. The absence



of this information (again, excepting SANRAL) is indicative of the lack of technical skills and knowledge plaguing our public sector.

SANRAL asserts that there is currently a R50 billion backlog on strategic (national and provincial) roads, with an associated maintenance budget of R12 billion annually. As noted in South Africa and internationally, road maintenance delayed for five years increases repair costs between 6 and 18 times apart from other direct and indirect costs. Direct costs include a proven positive relationship between road deterioration and vehicle maintenance costs, as well as the cost of time and wasted fuel spent driving on congested or deteriorating roads. Indirect costs include the impact on non-drivers, such as increases in food prices owing to wasted fuel and time spent on congested or deteriorating roads.

Reliable and consistent data on road conditions is a prerequisite for the urgently required shift to routine maintenance. This data permits planning, prioritisation of targets and adequate budgeting for maintenance and extension. An example is SANRAL, which consistently prioritised spending according to data while its budget was less than required for comprehensive maintenance of all its roads. Capacity strengthening, especially at municipal level, is crucial for collection of this data.



roads



7.5 Airports

Major airports are managed by the Airports Company South Africa (ACSA), a profitable company mostly owned by the DoT. Secondary airports are the responsibility of provincial and municipal government or the private sector, and are not assessed here. Almost 90% of the 34 million annual passenger movements occur at three of the nine major airports: Johannesburg (18 million), Cape Town (8 million) and Durban (4 million). Although the recent financial crisis slowed passenger growth during 2008 and 2009, over the previous five years it had averaged almost 10% annually. The current replacement cost of ACSA's infrastructure is over R25 billion, with more than R15 billion invested in capital infrastructure between 2005 and 2010 (including R6.8 billion for Durban's new King Shaka Airport).

ACSA is in many ways a model of excellent maintenance and operational practice. The company has an appropriate, qualified technical staff and operates on the principle of regular maintenance and replacement, prioritising safety and regulated equipment in order to preserve its infrastructure in the most efficient manner. ACSA's strong financial state has allowed the company to implement and sustain highly commendable management principles, a lesson to all managers of infrastructure. It has also been motivated by statutory requirements. This performance appears set to continue, with ACSA allocating R17 billion in the next five years for capital investment.

Prompted by the 2010 FIFA soccer World Cup, many South African airports received a face lift. These included Cape Town International Airport and O.R. Tambo International Airport (Johannesburg). Furthermore, public transport and parking facilities were improved and extended. ACSA's pavement management system (PMS) has been enhanced since 2006, with all pavements at all airports now being supported on the system (runways and taxiways as well as aprons).

ACSA's maintenance programme is guided by statutory requirements of the International Civil Aviation Organisation (ICAO), which prioritises landing systems, and runway/ground lighting. Security and emergency, as well as passenger transport facilities, are the next highest priority, and ACSA has standby power capacity to ensure constant functionality of all these elements. There is excellent equipment monitoring at the three largest airports, and it is foreseen that as the others become more mechanised they too, will be monitored. A further benefit is the ability to compile very accurate equipment histories, and to identify trends. In this respect, ACSA is in line with the best international examples.



airports



7.6 Commercial ports

Transnet is currently responsible for all eight of South Africa's commercial ports (Ngqura, 20 km from Port Elizabeth, has become operational since the previous Report Card). Ports are managed by Transnet National Ports Authority (TNPA) and Transnet Ports Terminal (TPT), previously South African Port Operations (SAPO).

As with Transnet's rail network, maintenance and extension of ports were adversely affected by Transnet's initial inherited debt problems (resolved as of 2008). In 2008, TNPA was responsible for over half of Transnet's profits. The emphasis now is on capital investment and maintenance of existing port infrastructure, and to this end, several projects have been rolled out. Transnet spent R19.4 billion in 2009 on ports alone.

Ports infrastructure extends both above (visible) and below water (mostly invisible), and is both fixed and movable. The fixed infrastructure in the ports includes terminal areas (liquid and chemicals, bulk terminals, general cargo and container terminals, some of which fall under TPT). However, there is also the marine interface, such as quay walls, breakwaters and shore protection, which extend below water. Shipping areas are important, e.g. port "infrastructure" might be regarded to include port entrance channels, fairways and turning basins. Besides keeping channels to the required depth, at some ports there is a need to bypass sand across the entrance channel. A fixed sand bypass scheme has been installed at Ngqura, but sand trap dredging still needs to be carried out at East London, Durban and Richards Bay. A new hopper station, to enhance the sand bypass operation is planned for Durban.

Some of the below-water structures do not receive the recommended regular maintenance, which may be worsened by the possible effects of climate change. Storms during high spring tides have caused considerable damage to coastal structures in the past three years. The breakwaters at the widened Durban port entrance have been significantly rehabilitated, while the older breakwaters at East London and Richards Bay need attention.

With the new international security regulations imposed by the International Ship and Port Facility Security (ISPS) code, much attention and expense have recently gone into upgrading security (lighting, CCTV and fencing) at all commercial ports. Tighter access control of port areas has led to reduced losses through theft. Unfortunately, proportionally less money has been spent on improving port operational aids, which would have improved safety and efficiency. There is also a need to continually improve supporting technologies for marine operations.

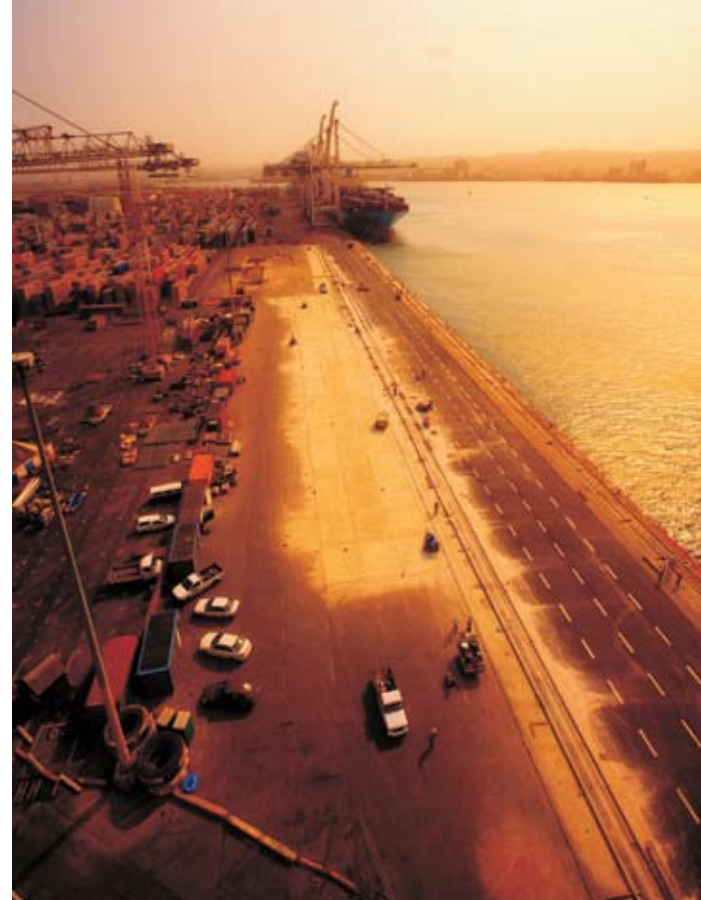
The emphasis in TNPA and TPT has been on improvement of infrastructure, both on capital investment, and on repair and replacement of existing infrastructure. Even though much of the established port infrastructure (excluding Ngqura) is ageing, it is maintained in an operationally serviceable condition. Infrastructure monitoring is good at all ports, and this information is utilised to plan maintenance and to prioritise expenditure. Future expenditure is planned to improve the condition of strategic infrastructure and to expand its capacity. Generally, South Africa's commercial port network is in good condition. It seems that port infrastructure is presently coping with demand and performing well against benchmarks.

7.6.1 Fishing harbours

South Africa's proclaimed 12 fishing harbours, all situated in the Western Cape, were not reported on in the 2006 Report Card. These have all fallen within the mandate of the Department of Public Works (DPW) since 1998. The overall condition of the fishing harbours was dangerously deteriorated by 2001. Fishing vessels were in danger as a result of unsafe marine structures. Electrical connections were often unsafe and illegal. Three of the six slipways at the harbours were inoperative and the remaining three operated without any preventative maintenance. Raw sewage was leaking into the ocean at Hout Bay Harbour.

The 2001-2007 repair and maintenance programme, to the value of R440 million, restored all 12 harbours to an excellent condition. A regular, planned maintenance programme implemented immediately would have consolidated this upgrade of harbour infrastructure.

Unfortunately, this did not occur, thus harbour conditions have deteriorated significantly since 2007 (although not yet to 2001 levels). The infrastructure requires urgent attention – especially mechanical installations, such as slipways and cranes. Failure to implement follow-on maintenance contracts will adversely affect facilities and by implication, the livelihoods of fishing communities that use the harbours, as well as facilities associated with tourism. This is a clear example of the results of a non-life-cycle cost approach to infrastructure in general.



ports



7.7 Rail network

The national rail network is managed by the Department of Public Enterprises (DPE) and the DoT, the former in charge of Transnet and the latter in charge of the state-owned enterprise, the Passenger Rail Agency of South Africa (PRASA), which replaced the South African Rail Commuter Corporation (SARCC) in 2009. The Gautrain Rapid Rail Link is a new asset and the impact of this intra and intercity mass transit system will be assessed in the next Report Card.

The Transnet Freight Rail (TFR) consists of 21 000 km of rail network, running on average 800 trains daily for both domestic and cross-border trade. There is a 12 800 km core network, including 1 500 km of heavy haul rail, and 7 300 km of branch lines.

Although a negative perception persists toward rail, due to past under-performance and historical under-investment, this view might be due for revision because of the investment in upgrading rail infrastructure since the 2006 Report Card. As in 2006, rail infrastructure grading is split into the heavy haul freight lines, the general freight lines, the branch lines, and passenger rail lines.

Significant rail backlogs exist and have existed for many years now; however, Transnet inherited such high debt levels that it was required firstly to engage in a turnaround strategy to achieve profitability. That strategy was successfully completed in 2008, as PRASA began its turnaround. Since then, Transnet has been tackling the backlog with a focus on capital investment. It will invest R80.5 billion in the next five years, building on the R53.5 billion invested since 2005. In fact, Transnet spent as much on rail infrastructure maintenance and expansion in the past two years as in the previous eight. However, the locomotive fleet is on average 30 years old and 35 years old for wagons, which is well above the industry norm of 16 and 20 to 25 years respectively, and is responsible for many operational problems.

The two heavy haul export freight lines (the iron ore line between Sishen and Saldanha and the coal line between Mpumalanga and Richards Bay) are of a high standard and are well maintained, comparable to similar international examples. Transnet is currently upgrading the capacity of both these lines through new locomotive acquisition, infrastructure maintenance, and wagon maintenance.

The short-term focus for general freight lines is with ongoing replacement or refurbishment of the infrastructure in perway, as well as upgrading of rails, signalling, and rolling stock. There is no official monetary figure for the backlog, but the declining state of rolling stock, lack of maintenance, and underinvestment has resulted in Transnet losing market share to roads annually. Even its ambitious investment programme will do little to bring cargo back to rail. The other major challenges are the impact of inadequate electricity supply, theft (costing R22 million in 2009) and vandalism, and the availability of rolling stock.

Branch lines are classified into closed (3 350 km), lifted (874 km), and low and high volume active lines (3 928 km of track). Few of the branch lines closed during recent years are candidates for revival unless virtually rebuilt, owing to extreme theft problems. The traffic moved onto roads from rail is also very difficult to regain.



Transnet provides for branch line concessioning to private operators. The company is currently doing feasibility studies to determine the viability of each concession opportunity and is in discussion with the DoT to finalise a sustainability plan in line with government policy for rural development and rail freight.

Overall branch lines are maintained with the minimum expense and the active lines give Transnet some network flexibility, but in the end the overriding factors will be profitability and future network expansion. The lines that are not concessioned and not needed will most probably be closed.

PRASA includes Metrorail (commuter services), which runs approximately 2.2 million passenger trips daily, Shosholoza Meyl (regional passenger services and tourism) and Intersite (property management). The main objective is to progressively concentrate rail services on transport corridors where rail can perform to its strengths. The Accelerated Rolling Stock Investment Programme (ARSI) and overall strategy is starting to make inroads in an enormous investment backlog, but more needs to be done on an operational level to improve service delivery.

PRASA spent R2.4 billion on the ARSI in 2009, prioritising spending even after input price increases meant the year finished significantly over budget. This illustrates a commendable commitment to passenger service. Nonetheless, a large backlog must still be addressed. PRASA's commitment is reflected in the 9.2% increase in passenger trips between 2008 and 2009, with 646 million trips in total in 2009. Outdated and inadequate equipment is still causing many operational problems, and in general passenger rail is seen as underperforming in the South African context.

Transnet has not quite broken out of its image as an organisation bound by historical methods with a poor ability to find creative solutions and to innovate rapidly – this is reflected in the current overall state of rail networks.



rail



7.8 Electricity

Electricity is generated, transmitted and distributed by Eskom, a state-owned enterprise overseen by the Department of Public Enterprises (DPE) and managed by the Department of Energy. The industry is estimated at R260 billion in terms of asset value. This comprises generation business valued at R188 billion, transmission division valued at R28 billion, and the distribution division at R44 billion.

Eskom is perhaps the best example of the dangers of inadequate staff capacity and neglect of infrastructural maintenance, as seen in the unplanned rolling blackouts (or "load-shedding") that hit South Africa in 2008. Although Eskom has taken action on many of the problems causing blackouts, the distribution sector remains a serious weak point, with the serious skills and funding shortages, highlighted in the 2006 Report Card, remaining in a number of municipalities.

While only 30% of South Africans had electricity access in 1994, 2009 figures indicate that 82.6% of South African households were electrified. These services place a heavy burden on Eskom; however, in addition to expansion of electrification, per capita domestic electricity demand and commercial and industrial demand grew enormously in the past ten years owing to strong economic growth. Eskom was not prepared for this, having in fact mothballed several power stations in the two decades prior, because of excess electricity generation at that time.

Eskom generates 95% of electricity used in South Africa and 45% of electricity used in Africa. (By way of comparison, the whole of Africa generates electricity equivalent to electricity generated in Spain). 13 (all of the base load, or continuously used, stations) of Eskom's 27 power stations are coal fired; one is nuclear and the others are gas/liquid turbine, hydro-electric stations and pumped storage schemes. 93% of South Africa's electricity is coal generated. There is thus far only one wind energy station. A number of Independent Power Producers (IPPs) have also emerged in recent times. Since 2008, Eskom has spent R29.5 billion and installed 3 238 MW of generation capacity.

The Department of Energy's Integrated Resource Plan 1 provides for a reserve margin of 19% to be achieved by 2013. This will depend upon successful implementation of many new generation capacity projects, as well as achieving significant savings through energy efficiency and demand side management programmes. There are multiple risks associated with the new projects. These include Eskom's funding gap and finalising the legislative and administrative environment for IPPs.

Eskom achieved a reserve margin of 16.4% (including imported electricity) in 2010, which is above the international norm of 15%, and is significantly better than the 5.8% recorded in 2008. However, this must be seen in the context of lower electricity demand owing to the global economic downturn. If the economy grows even at a modest 3%, electricity demand will grow at a similar rate. Of the new stations, Medupi is scheduled to come into operation in December 2012 and Kusile only in 2013. There is some risk attached to the achievement of these dates and the recent incident at Duvhe (with the loss of some 600MW for a year or more) might place additional pressure on the reserve margin.



The average age of Eskom's coal-fired (base load) stations is 30 years, while peak demand stations range in average age from 25 to 30 years old. This high age makes maintenance both more necessary and more difficult, a problem compounded by deteriorating coal quality and increased demand for production. Since the 2008 blackouts, however, Eskom has improved generation performance significantly, and is dealing with ongoing challenges through a variety of strategies including an increase in active stations, demand side management and alternative energy sources. It has also shifted from a reactive to a much more proactive maintenance programme.

Coal supply is a particularly serious problem. Apart from the serious environmental implications of our dependence, there are concerns that the degrading quality of coal could adversely affect the operational life of stations and increase requirements for planned maintenance. Further, extensions in the planned life of current power stations has resulted in a situation whereby coal supply contracts will end before the stations are at the end of their lives, and coal sourcing and/or contract renewal may be difficult for various reasons. However, Eskom is aware of these problems and engaged in a coal sourcing strategy.

Regarding the current state of maintenance of generation infrastructure, Eskom has managed to attend to most maintenance needs and compares favourably with international benchmarks. In recent years, however, Eskom has experienced a significant increasing trend in forced plant failures, which is reflective of harsh operating conditions, particularly plant overload and reduced available time (when demand doesn't require the plant to be operating) for planned maintenance to take place.

Eskom operates, expands and maintains the transmission network in South Africa. Presently it comprises 28 500 km of high voltage power lines and 399 transmission transformers, up from 28 200 km and 387 transformers in 2008. All Eskom generated electricity is fed into the national grid which also connects into some neighbouring countries in SADC.

Theft is a problem, costing Eskom over R10 million during 2010. The transmission network is currently in a good, well-maintained condition, but several risk areas exist that may become serious problems in the future. As with the generation infrastructure, this is mainly owing to ageing

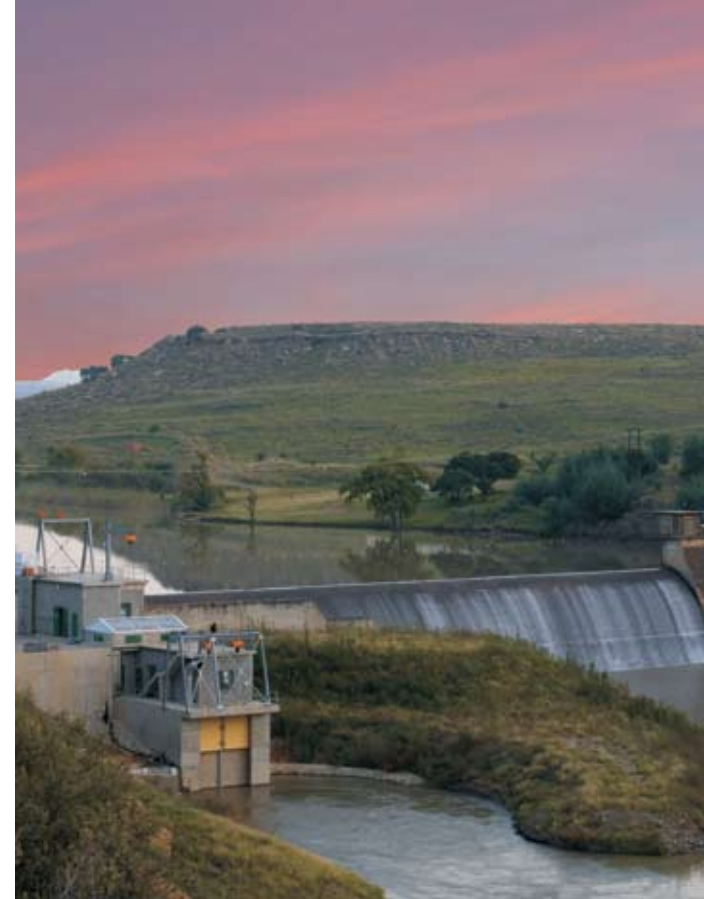
infrastructure (plant is on average 32 years old) and a limited skills base. However, Eskom is currently engaged in an asset management project that should address these issues.

Provision has been made for a significant number of new transmission lines to be added to the system over the ten year transmission development plan. These new transmission lines form part of the long-term strategy to develop a main transmission backbone from which regional power corridors can be supported. There is some risk associated with these planned expansion projects in terms of Eskom's funding gap.

Power at a lower voltage is distributed via a distribution network by Eskom and 187 municipalities. Since 2008, the distribution network has increased by 1 338 km, the reticulation network by 11 727 km, and underground cables by 766 km. The cumulative problems of inadequate maintenance and refurbishment also have a strong impact on distribution. Electricity theft in the distribution sector costs up to R4.4 billion annually.

Rolling blackouts were substantially a distribution problem, indicative of the extreme unreliability in this sector. Although various regulations have stipulated a minimum proportion of either asset replacement or revenue value to be allocated for maintenance, many municipalities have ignored or do not have the capacity to meet these requirements. This has resulted in a current backlog amounting to R27.4 billion, increasing by approximately R1.6 billion annually. The fragmented nature of this sector is also a problem in terms of coordination and communication. There is urgent need for restructuring, especially in light of the failure of the protracted process of Regional Electricity Distributors (REDS) establishment.

While Eskom faces a severe skills shortage at all levels, this is most acute in the distribution sector. Many municipalities also lack capacity to fulfil their responsibilities, to a large extent because these municipalities are generally unable to offer employment certainty or attractive salaries. The long-planned shift to regional provision through REDS was cancelled in December 2010 – municipalities, which use high local revenues from electricity distribution to cross-subsidise other functions, had strongly resisted REDS for much of the process.



electricity distribution



7.9 Hospitals and clinics

The Department of Health (DoH), along with the Department of Public Works (DPW) and provincial health departments, are responsible for South Africa's public health infrastructure. The current replacement cost for healthcare infrastructure is estimated at almost R200 billion including support facilities.

In the healthcare sector, as in most others, apartheid policies resulted in a legacy of inadequate and inequitable access to infrastructure. Thus, indications are that rural hospitals and clinics – especially those situated in the former homelands – are in significantly worse condition than urban health infrastructure. Further, the emphasis since 1994 has been on capital works to provide more equitable health access, without a concomitant emphasis on life-cycle costs (including maintenance and operation). As a result, provision of these works may be unsustainable. All available evidence suggests that South Africa's health infrastructure is already in a deteriorating condition.

However, a critical problem in the health category is the absence of much needed data, despite the existence of a national database, the District Health Information System (DHIS). The DHIS is known for incompleteness and inaccuracy. The last (and only) comprehensive national study on healthcare infrastructure was undertaken in 1995/1996, despite widespread acknowledgement of the need for another, updated audit.

Adequate, ongoing maintenance is essential for effective use of infrastructure, especially in the healthcare estate. Health equipment has a short life-cycle owing to technological advancements. More importantly, there is a strong body of international evidence-based research on the link between health facility design and management and health-service outcome. The design and condition of the physical environment can have a measurable effect on the well-being of patients and facility users. Areas of direct impact in health include reduced length of stay and improved patient safety (including a reduction of hospital acquired infection), improved staff performance, staff retention and satisfaction, and the reduction of life-cycle costs.

The DoH currently targets 3-5% of hospital operational budgets for maintenance. International guidelines suggest maintenance should lie between 2-4% of replacement cost, while South Africa's average annual health infrastructure maintenance budgeting amounts to 0.7% of replacement cost. However, very little is known about maintenance expenditure in terms of what and how it is being spent. Linked to this problem, the public health sector in general does not design or implement new projects using a life-cycle cost method, i.e. it does not recognise the close association between capital and operating costs, thus new facilities are built without any consistent maintenance plan or acknowledgement of future maintenance needs.

Health capital budgets at both national and provincial levels have increased dramatically since 1994; however departments have chronically underspent with further indications of fiscal dumping. In 2009, the Hospital Revitalisation Grant reported underspending of R813.6 million, in spite of its reputation as one of the most successful programmes for improving healthcare infrastructure. In light of this, National Treasury has indicated reluctance to allocate further increases in funding until the health departments and construction sector are able to effectively utilise the budgets they have.





hospitals & clinics



7.10 Public schools

Public education is the joint responsibility of the Department of Basic Education (DoBE) and the Department of Higher Education and Training, previously the Department of Education. This sector was not covered in the 2006 Report Card. Much like other basic social infrastructure, education has been severely imbalanced, owing to the legacies of apartheid policies, and correcting this imbalance has been the primary goal since 1994. This Report Card will consider only public ordinary schools, overseen by the DoBE and managed by the provincial education departments. The DPW is partially responsible for schooling infrastructure on the construction and maintenance side.

There are approximately 24 460 public schools in South Africa. To address apartheid legacies, capital works in areas with little or no access to education, and upgrading of schools lacking basic infrastructural facilities, are emphasised. Thus, schools with overcrowding halved (50% to 24%), schools with electricity access doubled (11 174 to 20 713), water was provided to almost 6 000 schools and on-site toilets to almost 2 000. Yet significant infrastructural backlogs remain, especially with regards to learning facilities (in particular, libraries and laboratories), electricity and water access. These backlogs exist in addition to the need for new schools, and the maintenance needs of current schooling infrastructure.

The two key themes of the Report Card, i.e. inadequate maintenance and inadequate skills, pertain equally urgently to the public education sector, as is well known. Certain problems were raised across all provinces. These included insufficient maintenance funding, lack of staff capacity, inequitable access to funding and maintenance programmes, and a lack of respect for school buildings and their role in communities, which in several provinces translated to significant vandalism. Maintenance budgets are also in competition with other school requirements, instead of being separately managed, meaning that maintenance funding is often used to purchase school materials such as textbooks instead. It is hoped that the implementation of the Government Immovable Asset Management Act (GIAMA) will solve these problems.

These problems are serious, not simply because of the infrastructural implications, but because schooling infrastructure, as in healthcare, impacts directly on the effectiveness of the actual function which that infrastructure serves (i.e. learning). As one example, there are reports that girls who are menstruating would often rather not go to school than have to deal with the lack of privacy in school restrooms. Therefore improving sanitation facilities could during the course of the year almost double the contact hours for many learners.

It has been suggested that the key problems with maintenance and maintenance backlogs can be addressed in a few ways. Firstly, a structured system to assess infrastructure and prioritise required maintenance; secondly, different models of maintenance, e.g. allocating simple maintenance tasks to school staff rather than escalating them to district and provincial level; and finally, improving skills and capacity at all levels.

Within the sector there is a shortage of officials with the skills to plan, budget and manage school maintenance programmes. This applies to all levels in the school system from provincial education departments, district and circuit offices, as well as at the schools themselves. Budgeting for maintenance at schools in all provinces has been and remains inadequate, resulting in generally deteriorating school infrastructure overall in South Africa.



schools



8 Acknowledgements

To ensure independence, SAICE chose to not seek sponsorship for this undertaking, but it would not have been possible without the considerable investment in research made by the CSIR Built Environment unit. A special acknowledgement is thus due to the CSIR for preparing research reports in respect of each of the specific infrastructural sectors at its own cost. SAICE had previously benefited from this generosity in 2006, and once more the CSIR research team proved equal to the task – assembling and synthesising available data and undertaking fieldwork when necessary.

A project of this magnitude and sensitivity requires an especially astute, diplomatic and versatile professional to champion the initiative. Sam Amod, as he did for the 2006 IRC, rose to the occasion again, contributing hundreds of voluntary hours, and with impeccable diligence, steered the 2011 IRC to completion.

Kevin Wall was also part of the core team in 2006, and again managed to cajole and persuade a team of researchers and commentators to produce the raw data which largely underpins this report.

Special thanks are also due to Paul Roberts for assistance on the state of water resources, Philippus Fouche on fishing harbours, Stan Jewaskiewitz on solid waste, Phiroshaw Camay as independent observer and Shaista Amod for additional research and writing.

At SAICE, many volunteers including some who are not members, generously contributed time and effort. In particular, the members of the SAICE Divisions, the Steering and Reference Groups and the Moderating Panel, volunteered many hours of their time. The team at SAICE National Office, under the guiding hand of CEO Manglin Pillay, managed the detailed logistics that are such a vital part of this initiative.

Finally, the sanction and continuous support of SAICE's Executive Board endorses the authenticity and continuity of the IRC. SAICE is an NGO and depends upon subscriptions from its approximately 9 000 members for its operation. Their contribution to furthering awareness and dialogue around infrastructure made this project possible.

9 Further information

This detailed Infrastructure Report Card for South Africa document and the abbreviated report card may be downloaded from the SAICE website, along with previous report cards, relevant papers and presentations.

Visit the website at www.saice.org.za/IRC2011

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