

A RATING TOOL TO ASSESS THE CONDITION OF SOUTH AFRICAN INFRASTRUCTURE

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Abstract

In 2006 the South African Institution of Civil Engineering (SAICE), in partnership with the Council for Scientific and Industrial Research (CSIR), released the first ever "report card" assessment rating of the condition of engineering infrastructure in South Africa. The purpose of the report card was to draw the attention of government, and of the public at large, to the importance of maintenance, and to factors underlying the state of repair of infrastructure. Its success was such that the CSIR and SAICE brought the next report card out in 2011, and are again working together to prepare a new edition, to appear in 2016.

1. Introduction

Many factors enable a city to be a liveable and viable entity, a desirable place for working, investing and living. The condition of the built environment infrastructure, i.e. that part of the public sector capital stock producing services utilised by households, such as hospital services, drinking water, sanitation, electricity, or which facilitates economic activity, such as electricity, roads and ports, is a very important such factor. Well-maintained infrastructure underpins quality of life and economic development. Studies are increasingly showing that dysfunctional sanitation facilities, for example, or unreliable water supplies, constitute not only threats to health and economic activity, but can – and do – also trigger service delivery protests.

National-level attention has over the years been given to policies and strategies to improve the maintenance of infrastructure, and hence its quality and reliability. Among other measures have been the National Infrastructure Maintenance Strategy, the Government Immovable Asset Management Act, the National Water Services Infrastructure Maintenance Strategy, and the "Green Drop" (wastewater) and "Blue Drop" (drinking water) quality assessments of the Department of Water Affairs (now the Department of Water and Sanitation (DWS)).

The importance of well-maintained infrastructure to the economic health of nations is clear. Indeed the positive relationship between gross fixed capital formation (GFCF) and economic growth, is well documented (Investec 2005, Kumo 2012), and is the basis for sustained economic and social development. If maintenance is inadequate, social and economic growth will be impeded – something that cannot be afforded.

In 2006 the South African Institution of Civil Engineering (SAICE¹), in partnership with the Council for Scientific and Industrial Research (CSIR)², released the first ever "report card" assessment rating of the condition of engineering infrastructure in South Africa (SAICE 2006). The purpose of the report card was to draw the attention of government, and of the public at large, to the importance of maintenance, and to factors underlying the state of repair of infrastructure. Its success was such that the CSIR and SAICE brought the next report card out in 2011, and are again working together to prepare a new edition, scheduled to appear in 2016.

The intent of the report card work has throughout been to inform the public about the importance of infrastructure in their daily social and economic intercourse, by highlighting the current status of its condition. Furthermore, many decision makers are technical lay-people. The report cards should enable better informed decisions to be made, especially regarding maintenance management and planning for new expenditure.

¹ SAICE has more than 9000 individual members in government, contractors, designers, education and other fields related to civil engineering, and is the largest learned society in the built environment. Its members collectively are very well placed to give an "insider" perspective of all aspects of the performance of engineering infrastructure.

² The largest research organisation, public or private sector, in Africa, has more than 2000 professional staff, many of them the leaders in the field of built environment matters.

It is anticipated that the findings of this next report card will be widely debated, because in the last few years service delivery problems, particularly those attributable to operation and maintenance of infrastructure, have received heightened attention across the country.

This paper:

- describes the process of research and compilation of the report cards;
- describes the origins and development of the methods – the assessment tools, indices and rating systems – which have been employed;
- reflects on the condition of infrastructure in South Africa as revealed by the 2006 and 2011 report cards, and the key factors and trends revealed, and begins to speculate what the 2016 report card might find in this regard; and
- recommends that the new report card be prepared along the lines of the previous, because their methodology worked well.

2. Infrastructure Report Cards

Infrastructure report cards are a reflection at a point in time on the state of built environment infrastructure, i.e. that part of the nation's public sector capital stock that produces services that are consumed by households, such as hospital services, drinking water, sanitation, electricity, or facilitates economic activity, such as electricity, roads and ports. This infrastructure is a public asset. All in a nation have a stake in its upkeep and operation, and all share in the expense of its construction and its ongoing maintenance.

Institutions in many countries publish infrastructure reports, but these are mostly in relation to commercial activity in the construction sector or on the general condition of infrastructure to the extent that it supports commercial activity. They generally do not attempt to grade the condition of the infrastructure or to comment on the trends in condition, or the constraints preventing improvement. They are also seldom prepared by the professionals intimately involved with the design, construction and maintenance of these assets.

Infrastructure Report Cards (IRC) have since the 1990s been published at regular intervals by three other countries in the English-speaking world. The American Society of Civil Engineers (ASCE) has produced the 'Report Card on America's Infrastructure'³, the Institution of Civil Engineers (ICE) (UK) the 'State of the Nation' reports – both of these more or less annually – and Engineers Australia has published a national Infrastructure Report Card at less frequent intervals. They are intended to draw the attention of both government and the public at large to the importance of maintenance, and to factors underlying the state of repair of infrastructure – factors such as skills and finance, for example. In themselves, these reports have little technical value to infrastructure professionals, but they may be put to good use in macro level planning, lobbying for infrastructure funding, stimulating debate and highlighting the actions that civil engineers believe are needed to improve the state of a nation's infrastructure. By publishing them, learned societies and institutions provide more than information – they commit to a role of advocacy.

These report cards do not comment on backlogs as expressed in the absence of infrastructure to serve certain areas and communities. It is the condition of existing infrastructure which is the focus, together with the effect of that condition on service delivery (e.g. that a badly operated and maintained water treatment works is sometimes unable to supply the town for days at a time). Also important, but not the main focus, are the factors which lead directly to this infrastructure being in the condition that it is.

To reiterate: the focus of each report card is on the then current condition of existing infrastructure. The pertinent service delivery is the service which that infrastructure directly delivers. Thus, for a school for example, the infrastructure report card focuses on the condition of the infrastructure – in particular on the buildings and the water and sanitation facilities. The quality of the teaching and learning which takes place in the school is not of interest to the report card.

3. The South African Infrastructure Report Cards

Before embarking on the first IRC in 2006, the authors took the view that it would be a reflection at a point in time on the condition of public infrastructure in the built environment, and would not comment on the legacy of apartheid. This was not a decision made lightly. The inherited backlogs are large, but the past cannot be managed. Only the present can be managed in the hope and with the objective of creating a brighter future.

³ The early editions of the ASCE report cards were subtitled "A Voter's Guide to Renewing America's Infrastructure", and were punted as "a means of empowering citizens to lobby government" to address infrastructure issues. ASCE took the view that if citizens had the facts at hand, this should lead to closer and more informed collaboration between civil society and the various tiers of government.

It was also decided that the reports would not highlight the stated intentions of many agencies to improve infrastructure in the future, even when these are accompanied by plans with budgets – these intentions would instead be reflected through improved grades in future report cards. The focus would be entirely on the contemporaneous condition of infrastructure.

Since democracy in 1994, massive strides have been made by the government to correct infrastructural imbalances. Drinking water, sanitation, energy and transportation access have received focused attention, and, acting on its mandate, the government is continuing to invest at rapid pace in infrastructure for disadvantaged communities. However the combination of limited resources for the demands of existing infrastructure, priority provision for the previously disenfranchised, public sector restructuring, and shortages of key skills has led to extreme pressure on the condition of the public infrastructure asset base.

The answers to many issues posed in the report are neither simple nor easy. All the more reason for the public to be better informed about the serious decisions that must be taken about our infrastructure and, where appropriate, to change our behaviour. It is imperative that we do not continue to build only to permit decay. On the contrary, adequate budgets and maintenance management plans are required for existing and new additions to the infrastructure asset base.

SAICE decided about 10 years ago that the widely-reported condition of engineering infrastructure, and the effect which poor condition was having on quality of life and economic development, was of sufficient concern that it should compile a "report card" of the condition of infrastructure. It approached the CSIR for assistance with the research component – which assistance was readily given – and, in 2006, the first "National Infrastructure Report Card" was published.

This, the first ever report card of the condition of engineering infrastructure in South Africa, highlighted "the observations of the professionals responsible for the planning, construction, operation and maintenance of our nation's life-support system". It graded infrastructure (water, sanitation, solid waste, roads, airports, ports, rail, electricity and hospitals and clinics) on a scale from "A+" ("in excellent condition"), through to "E-" ("infrastructure has failed or is on the verge of failure, exposing the public to health and safety hazards"). Overall, it gave the infrastructure a D+ grade.

In 2009 the decision was taken that, whereas so much construction had been taking place in preparation for the Soccer World Cup, the next edition of the IRC should be published late in 2010 or early in 2011. This would allow a reasonable period for the new infrastructure to be used before being graded.

The acceleration of projects required for the 2010 Soccer World Cup – highways, mass transit, airports and the many stadiums – provided South Africa with a welcome buffer from the negative consequences of the global financial crisis since 2008. The downside is that this appears to have distracted authorities from the core business of maintenance and upgrading of other infrastructure – with predictable consequences⁴.

The modest resources available to a learned society such as SAICE motivated the development of a partnership for the research component of the process. As in 2006, for the 2011 report card SAICE recognised the CSIR as the organisation best placed to assemble and analyse the body of data required. Thus an understanding was in 2009 reached between SAICE and CSIR – CSIR would draw up the research reports across all sectors. SAICE would then refine and interpret these findings through the input of its network of engineering professionals and technical divisions, perform the grading, and publish and publicise the report.

The new Report Card was launched in April 2011, weeks before local government elections. Once again, skill shortages and lack of maintenance across all sectors were highlighted. Two new key themes also emerged, viz. holistic systems and sustainability.

The 2011 IRC covered ten sectors⁵, one more than in 2006. These were further divided into 27 sub-sectors, six more than the previous time. It was found that, in comparison to 2006, nine of the sub-sectors showed

⁴ A more recent very major example of the long-term effect of the World Cup has proved to be the ongoing power crisis in South Africa. This has been caused by a number of factors, prominent among which, it must be noted, is the neglect of maintenance because of the imperative that "the lights stay on during the World Cup", as admitted by the CEO of Eskom at his widely-reported and most revealing press conference in January 2015. (Matona 2015)

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- Water and sanitation services infrastructure.
- Solid waste management.
- Roads.
- ACSA-owned airports.
- Commercial ports.
- Rail permanent way and structures.
- Electricity generation infrastructure.

improvement, twelve remained unchanged and four had deteriorated. The Public Schools sector and the Fishing Harbours sub-sector were new and therefore did not have trend indicators. Overall, a grade of C- was awarded.

This overall improvement from a grade of D+ in 2006 reflected marginal improvement in the average condition of South Africa's infrastructure over the past five years, influenced by the heavy investment in, especially, national assets such as ports, rail, airports and national roads, much of this in preparation for the 2010 FIFA Soccer World Cup. The authors strongly cautioned, however, against a perception that the rise to C- represented 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" (SAICE, 2011).

4. Research Methodology 2006 and 2011

The IRC2006 was published under intense time pressure and without the comfort of a defined budget. As a first initiative, the work was executed by a small, mostly voluntary, team. Access and (usually) generous assistance was gained from various key executives in public sector infrastructure bodies from whom strategic information was gleaned. Maximum use was made of research already undertaken by SAICE experts, and of some peer review. SAICE also took the view that a synthesis of the perception of field experts is at least as credible and informative as primary research data. The grading was uneven to the extent that it was in some areas based on extensive primary and secondary research, whereas in other areas the grading relied heavily upon the expert opinion of a small number of key SAICE members practising in those areas.

The process towards the 2011 report card had the comfort of a more formal agreement between SAICE and the CSIR, a much bigger budget and longer timeframe, and a more formal and more intensive process of peer review.

In summary the following research methodology has in the past been followed by the CSIR:

- Drafting sector reports (desk top work) for infrastructure sectors to be identified and for which it has the required in-house expertise;
- Endeavouring to arrange for the drafting of reports for selected sectors where it does not have sufficient expertise itself; and
- Contributing to the process of grading and, particularly, to the drafting of the report card itself.

SAICE has then used a number of peer review groups, selected for their knowledge and expertise in each subsector, to review the CSIR output and use a consensus grading of the condition of infrastructure in each of the subsectors as mentioned above.

The same principal research questions have been posed to the 2016 report card team as were posed to the earlier teams. These questions are simply stated:

- What is the condition of key elements of South Africa's bulk infrastructure?
- How does this compare with the 2006 and 2011 assessments? What is the overall trend, and what are the trends by sectors?
- What contributes to the condition and its trends? What recommendations can be made?

The methodology used in 2006 and 2011 has worked well, and therefore the 2016 report card will be prepared following more or less the same principles.

5. Key Findings, 2006 and 2011

In both 2006 and 2011, two key themes ran as a thread through all the grades. The first is the extreme shortage of skills and the impact of this on planning, procurement, design, construction and care of infrastructure. The second is the lack of adequate funding for the maintenance of the existing asset base and the new assets that come on-stream each day.

South Africa suffers an acute skills shortage in the infrastructure sector. Just two illustrations should highlight how serious this is. Firstly, a survey undertaken by SAICE some years ago showed that more than one-third

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- Health care infrastructure.
 - Public ordinary schools infrastructure.
 - The large-scale water resources infrastructure owned by DWS.

of all 231 local municipalities did not have a single civil engineer, technologist or technician – vacancies in local government for engineering practitioners exceeded 1000. Secondly, while the link between engineering infrastructure and economic growth may be clear, it is not always clear that a similar link exists with social health. It is obvious, though, that cleaner drinking water, proper sanitation, better shelter, access to transport and electricity, all improve the quality of life. Indeed, SAICE research indicates that, in general, developing countries have more doctors than engineers, whereas the opposite is true in developed countries. The reason is obvious: proper infrastructure prevents disease and sickness.

It is concerning then, that South Africa has only half as many engineers as doctors. By comparison, Australia, North America, Western Europe and even China and India, have a similar number of engineers to doctors, or more engineers than doctors. Furthermore, the ratio of population to engineer in South Africa is of the order of 3200 to 1, twenty times less than some of the countries just mentioned. Furthermore, while the average ratio is 3200 to 1, the ratio amongst the white population is approximately 300 to 1, similar to America and Western Europe, while the ratio in the black population is in the order of 50 000 to 1, amongst the worst in Africa or the world. The case for transformation cannot be clearer.

The links between technology professionals, infrastructure provision and quality of life must be recognised. The provision and maintenance of infrastructure that performs well and is sustainable into the future also depends on the quality of human capital and technological capacity in a country. Thus the technology achievement index (TAI) in South Africa, as defined by the United Nations, is an important indicator of infrastructure provision. The UN indicated that a direct positive relationship exists between the TAI and both GDP and the Human Development Index (HDI) (Roux 2007).

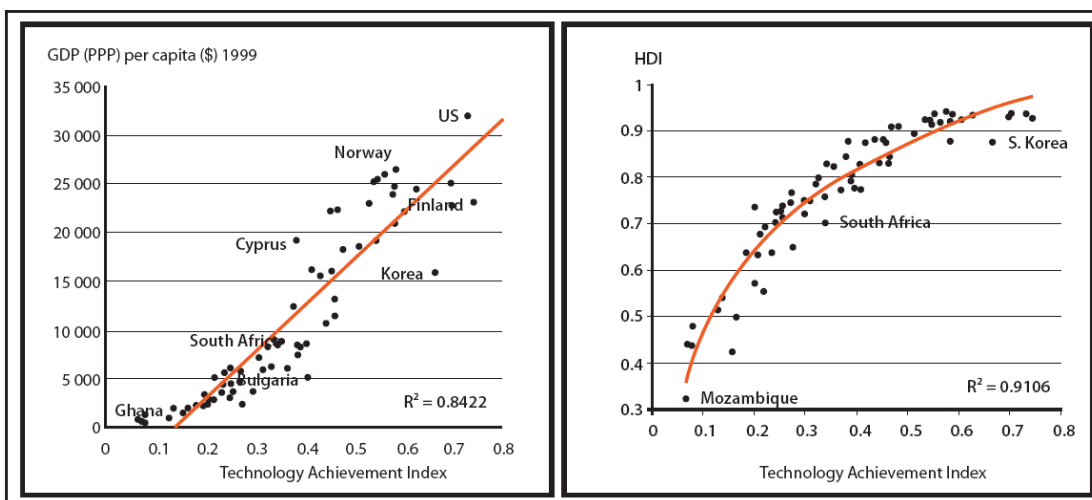


Figure 1: The dependence of wealth and living standards on technology (after United Nations reported in: Roux, 2007)

More relevant to infrastructure maintenance is the low skills base of so many in the public sector who are responsible for infrastructure. This manifests itself in many ways, one of the most important of which is the frequent underspending of the capital budgets of many public sector institutions – particularly municipalities, some of which grossly underspend every year. Another manifestation of the low skills base is the frequently encountered poor quality of workmanship, public and private sector.

After skills, the second key constraint was the lack of adequate funding for the maintenance of the existing asset base and the new assets that come on-stream each day. An annual maintenance budget allocation of 4% of replacement cost is commonly regarded as the minimum needed in order to keep assets in good condition. However, such allocation is rare. Moreover, it is simply not sufficient, especially when it is expected to cater for a maintenance backlog that usually requires upgrading, repair or refurbishment rather than routine maintenance.

There is an old saying that somebody pays for maintenance, whether it is done or not. For example, on roads, maintenance that is delayed for one year could cost three to six times more. The consequences of neglect are severe, impairing both quality and, sometimes, length of life, through outbreaks of water-borne disease, reduced safety on roads and rail, inconvenience and inefficient commercial activity.

In 2011, two additional key themes also ran as a thread through all the grades, viz holistic systems and sustainability.

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, on the basis of early enquiries in preparation for the 2016 report card, it would appear that the availability of data and its reliability are not likely to have improved. Reliable, consistent data is a prerequisite for the urgently required shift from reactive "repair" to planned "maintenance". Data permits planning, prioritisation of targets and adequate budgeting for maintenance. A small number of municipalities have shown how this should be done – they have utilised their data consistently in order to prioritise spending, even while their budgets are invariably less than required for comprehensive maintenance of all their infrastructure, or even of all of their most strategic infrastructure.

The allocation of maintenance funding is by owners of public sector infrastructure, 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, reducing the need for expensive refurbishment 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 operated and 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 Gauteng Freeway Improvement Project and the incomplete public transport initiatives for the province. In this case the competence of one agency (SANRAL) 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 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, which is so often performed in a way that ignores life-cycle costing. That is, the bid with the lowest capital price is favoured, although accepting this bid usually means significantly more expensive maintenance and repair costs in the long term.

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 is finite and generally speaking defies any attempt at its multiplication.

6. Impact of the South African Report Cards

In brief, the following might be regarded as the primary positive achievements of the previous report cards:

- The first publication in South Africa (or Africa) of consolidated reports on the condition of a broad range of infrastructure by a credible institution, drawing attention to its condition and importance by headlining issues in a manner understandable to technical, decision making and lay persons. It provides the headline issues requiring attention and a benchmark for further monitoring.
- The primary objectives of informing the public and decision makers achieved through the numerous live interviews and presentations, print, visual and audio media exposure and discussions with client and sector organizations.
- The credibility of SAICE and the CSIR as institutions with the authority, indeed the duty, to comment broadly on engineering infrastructure has been enhanced.
- The role of civil (and all) engineering professionals as creators and custodians of all aspects of infrastructure brought to the attention of the public.
- The awareness raised of the public, parents, learners, educators and government to the urgency of the infrastructural crisis in South Africa.

Compared to the 2006 experience, in the preparation for the 2011 report card it was found that some infrastructure owners had in the interim become very sensitive to criticism, irrespective of whether they perceived it to be fair or unfair. One of their "defence mechanisms", it seemed, was to restrict access to information. The 2011 IRC research team consequently found great reluctance on the part of professionals in certain areas to share information with the team.

Another disappointment and concern in 2011 – but it must be made clear that this was in respect to a minority of infrastructure sectors – was the discovery that less monitoring of the state of infrastructure was taking place than had been the case a few years before. On the other hand, it was pleasing to report that condition monitoring had greatly improved, both in breadth and in quality of coverage, in at least one sector – viz. the water services sector.

7. The Next Report Card

When each of the 2006 and 2011 report cards appeared, the interval until the next report card should appear was left undefined – this was left for the future leaders of the CSIR and SAICE to decide upon. Several years have since passed, and the process is now underway to prepare a new report card, to appear in 2016. The agreements between the CSIR and SAICE are at the time of writing (September 2015) being finalised. Once again, as in previous years, the key roles of the two parties will be:

- The CSIR takes responsibility (including carrying its costs) for compilation of the basic research reports, and initial gradings; whereas
- SAICE takes responsibility (including carrying its costs) for moderation of the gradings and determination of the final gradings to be published, and for everything to do with writing of the report card itself, its launch, and any following up.

In addition, and subject to the availability of additional funding, and perception at the time of the importance of this work, the CSIR is considering undertaking:

- Research of, and reports on, topics material to the condition of infrastructure. (For example opportunity cost of not doing maintenance, and selected issues around supply chain management.)
- The design, conduct and analysis of a perception survey, and reporting on the findings. (This survey will solicit opinions regarding the current state of infrastructure and what this implies for priorities to be addressed.)

As emphasised earlier, the focus of these report cards is on the condition of the infrastructure. However increasing importance has over the years been accorded to recognising the factors which lead directly to this infrastructure being in the condition that it is. The writers of the sector reports are currently being briefed to include material of this type in their research. (See Annexure A.)

There is little doubt that skills factors and financial factors will be shown to be playing an important role in the condition of infrastructure. Studies over the years, highlighting the inadequacy of the current technical skills base in the public sector (in some areas much more than in others) have regrettably made little difference (e.g. the far-reaching study of technical skills in municipalities which was published in Lawless 2007). More recently, work undertaken on behalf of the Water Research Commission (WRC), and as yet unpublished, has come up with findings on the skills encountered in a small sample of water services institutions. The worst-performing municipality was found to have a "skills gap" of 92% – i.e. A gap determined by comparing the number of the current staff who possess the minimum qualification and years of experience against the "required staff" as determined by the infrastructure which the municipality is supposed to be taking care of. (And, yes, allowance is made for the extent to which the municipality outsources its responsibilities.) (Vienings, awaiting publication)

The same study also looked at a larger sample of municipalities and other water services institutions (e.g. catchment management agencies), and found that people get appointed to technical posts without having the necessary qualifications. Particularly scary is that "40% of respondents said the minimum requirements of job profiles were overridden when recruiting staff". (Ibid)

The effect of this lack of skills on the condition of infrastructure, due to inadequate operation and maintenance of the infrastructure, can be imagined.

On the financial side, National Treasury has of late increasingly been voicing its concern about the financial sustainability of municipalities, and about factors which undermine that sustainability. For example, in the most recent of its annual assessments (a report which came out at the end of 2014), Treasury classified 86 of the 278 municipalities as "financially distressed". Nine of them, it said, are "in serial distress", having been on the list four years in a row. (Bruce 2014)

Financial distress of this type is likely to affect residents' quality of life quite profoundly. Shortage of finance could (and usually does) result in repairs and maintenance being neglected (sadly, this is often a favoured target for municipal cost-cutting). It could also result in inability to operate services, to send accounts and collect revenue due, and to pay bulk suppliers. (It was at the same time reported that 60 of the municipalities owed Eskom R 4 billion, which has since threatened to bypass municipalities and instead supply electricity directly to consumers (Lund 2015).) Furthermore, shortage of financial and technical skills has been a direct

contributor to the inability of many municipalities and provincial government departments responsible for infrastructure to spend the whole of their capital budgets each year.

It is disturbing that many of the interventions to support ailing small municipalities and help them to function seem to have borne little fruit. The same Treasury report stated that: "Over the last number of years, national government has made available substantial amount of money for capacity building. Yet there is very little indication that such funds ... have yielded the intended outcomes." (Bruce 2014.)

8. Conclusion

The intention behind the infrastructure report card initiative has been for engineering professionals to provide a public opinion on the condition of infrastructure in the manner of "expert witness". By the professionals highlighting the current status of the condition of infrastructure, the public is informed about the importance of infrastructure in their daily social and economic intercourse. Furthermore, whereas many decision makers are lay people, and not technical, the reports will empower those responsible to make better informed decisions, especially decisions regarding maintenance management and planning for new expenditure.

At the same time, the report cards highlight the role and relevance of civil engineers and the professional engineering institutions.

Reception of the previous report cards by the media and the general public, and in official circles, can be described as "mature". For example, there was only minimal questioning of the credibility of the report card findings, and no serious criticisms were received. There was in 2006 and 2011 broad recognition that the process had provided the first national-scale credible benchmark against which progress (or regress) can be measured.

SAICE and the CSIR agree that the initiative should be sustained and extended, but that at the same time the independence of the benchmarking process should not be compromised.

The future of the project must also consider embracing the participation of partners such as aid agencies, and SAICE's own partners such as statutory institutions, Voluntary Associations, the African Engineers Forum, the World Federation of Engineers Organisation, UNESCO and others. Future cooperation might include the promotion of the process in other developed and developing countries as a leadership initiative by societies of engineers.

The reports and the indicated trends from 2006 to 2011 made it possible to conclude that, while government should not change its drive to provide new infrastructure to address backlogs, the challenge is to supplement this by at the same time also focusing on the maintenance of both new and old infrastructure. If this is not done, the already considerable legacy of that infrastructure which is dysfunctional for want of sound operation and adequate maintenance in the past, and which therefore needs rehabilitation or replacement at considerable cost, will increase rapidly.

Infrastructure, once created, is unrelenting in its demand for maintenance, and this demand will escalate increasingly the longer it is ignored.

As a developing nation, South Africa's engagement in the global economy, and the upliftment of its citizens, are constrained by the infrastructure capabilities. The challenges revealed by the infrastructure report cards are no less acute because they are chronic in many parts of the country, but they can be overcome. Skills and budgetary constraints notwithstanding, bold leadership and effective management are irreplaceable ingredients for a successful and sustainable infrastructure services delivery.

The public in general, as well as many civil engineering professionals, have over the years increasingly expressed concerns about the state of our infrastructure. A new infrastructure report card will, as its predecessors were, be of interest and value to all tiers of government, business, industry and the general public.

The work of the Presidential Infrastructure Coordinating Commission (PICC) has thrown further light on the condition of infrastructure and the reasons why this condition ranges from excellent through to very poor. The PICC Technical Task Team has followed up on this with proposals to Cabinet (with which Cabinet has agreed) for a greater focus on infrastructure maintenance. Responsibility for the design of a process to improve maintenance has since been assigned to the Municipal Infrastructure Support Agent (MISA).

While there is no doubt that a new report card is needed, and that it will be a valuable resource for government and civil society alike, the current Cabinet and PICC sentiment increases the importance of this proposed partnership between the CSIR and SAICE. Indeed, the PICC Technical Task Team has already indicated that it wishes to keep in close touch with progress on the new report card.

The CSIR and SAICE feel that government needs to be aware of the opinion of the professions (as represented by SAICE and the infrastructure professionals within the CSIR) on where maintenance or replacement is most needed, such as where infrastructure is ageing or approaching obsolescence, and what needs to be done to improve the condition of infrastructure and thereby service delivery.

This thinking is in line with government's National Infrastructure Maintenance Strategy. (Public Works *et al* 2006.)

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Annexure A: summary of the ground to be covered in the sector reports

In brief, the sector research reports will draw from interviews and suitable research documentation which can be sourced, on relevant material that can be gleaned on:

- In the broadest of terms, who owns what.
- Also in the broadest of terms, what has been done to monitor condition of infrastructure.
- **The condition of infrastructure.** (The primary focus – all others are secondary.)
- Generic comments about contributors to the condition of infrastructure (e.g. in respect of roads, vehicle overloading might prove to be a factor).
- The state of management of the infrastructure (including comments about resources, skills, leadership, etc.).
- Trends since 2006 and 2011, and observations on these.
- Observations on the stability of the current condition.
- Anything which drives current operation and maintenance practices, including, particularly:
 - issues to do with the owner of the infrastructure, such as financial stability, or political infighting, which affect all operations, and not just maintenance of infrastructure;
 - standards – including whose standards, how valid and/or useful it is for those standards

to be applied, and why and in what way these standards influence current operation and maintenance practices;

- measuring and monitoring, whether internal, or external (e.g. Green Drop and Blue Drop, citizen monitoring, media); and
 - legal and/or regulatory compliance requirements (for example, in respect of airports, the International Civil Aviation Organisation standards; for another example, the standards for drinking water quality).
- If information is not available:
 - Does it actually exist, but is being withheld?
 - Does it not exist at all? And/or that it is unreliable and/or incomplete?
 - What does this say about the owners of the infrastructure? And what does it say about the authorities whose responsibility includes monitoring the owners of this infrastructure?
 - The range of conditions that the infrastructure is in, and if any patterns which can be discerned within that (e.g. urban versus rural; e.g. municipalities in a certain area as opposed to municipalities in a different area), while pointing out that grading major infrastructure investments on their average condition unfortunately conceals this range.
 - If any policies or mechanisms are discerned which are used by infrastructure owners to assist them to cope with the difficulties they face, or in order to make best use of the resources they have available, these policies or mechanisms will be recorded. (For example that some provincial roads authorities are said to be consciously focusing their resources on the more highly trafficked roads, and have in effect, because of insufficient budget allocations, abandoned maintenance of the least important roads.)