

A FUTURISTIC PERSPECTIVE FOR SUSTAINABLE INFRASTRUCTURE ASSET MANAGEMENT (SIAM)

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October 2014



THE *SHORT* DEFINITION OF ADVANCED INFRASTRUCTURE ASSET MANAGEMENT

Making the
right decision / adopting the right solutions
at the *right time*
for the *right cost*
for the *right reasons*
across our *whole portfolio of assets* as
part of the business strategies

‘Making good investment decisions’

October 2014



Across the nation, infrastructure is
under strain







ELECTRICITY ASSETS

DRAINAGE – STORMWATER ASSETS



STRATEGIC MANAGEMENT OF ASSETS

"Be smart about your assets"



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PARKS, LEISURE, RECREATION

Concrete Work

Cracks have developed at construction joints

Spalling found, reinforcing corroded

Cracks need to be resealed



PARKS, LEISURE, RECREATION

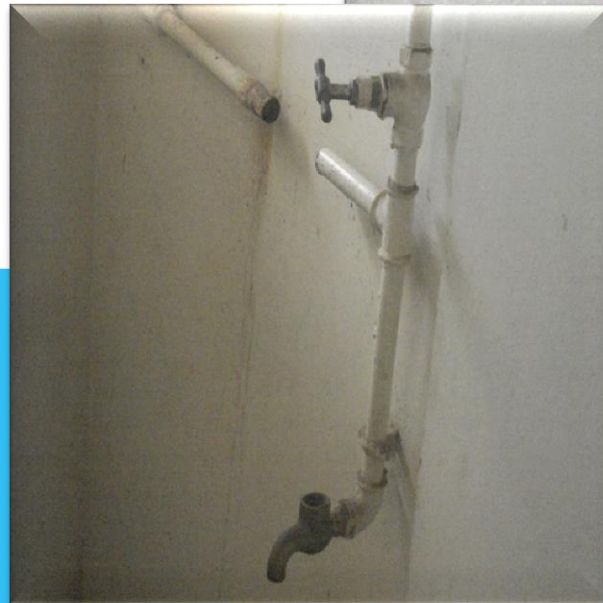
Steelwork

Wet services need to be repaired

Roof sheeting shows minor corrosion in places

Fit stainless steel bolts and nuts on benches

Repair fencing



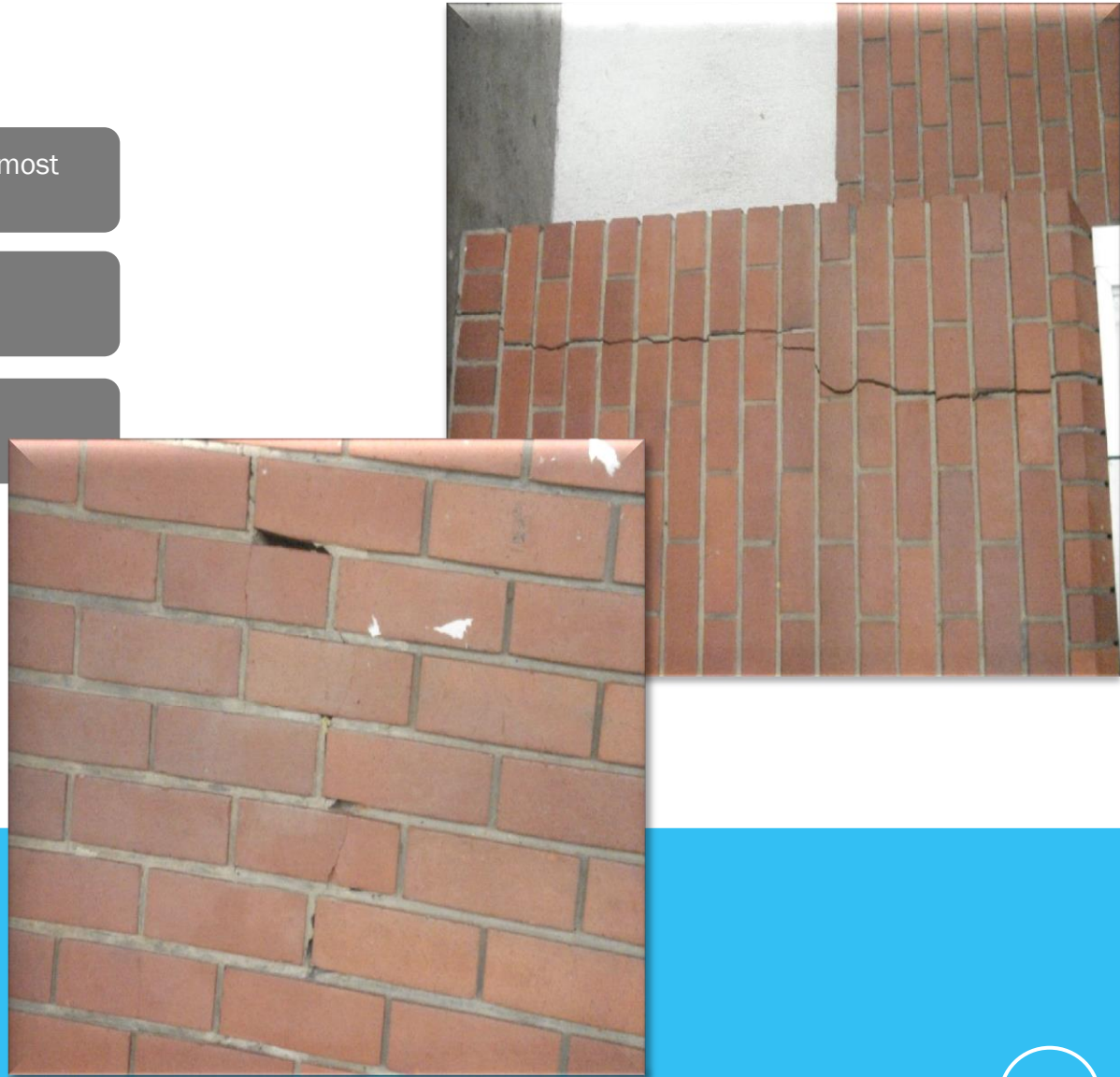
PARKS, LEISURE, RECREATION

Brickwork

Brickwork walls have vertical cracks in areas, most notably at floor joints

Brickwork needs to be repaired

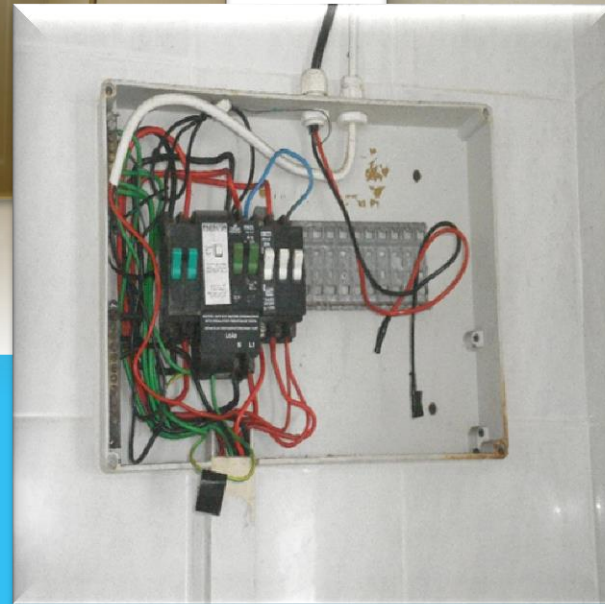
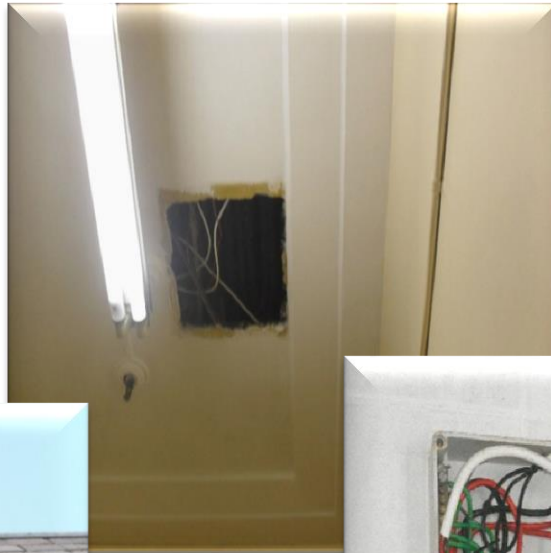
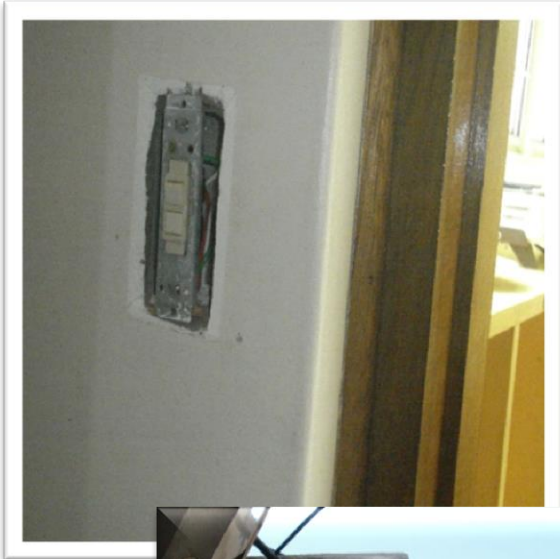
Mortar cracks need to be repaired



PARKS, LEISURE, RECREATION

Electrical

Repair and replace electrical wiring and switches



PARKS, LEISURE, RECREATION

Public Toilets

Public toilets shows major signs of vandalism

Wet services need to be repaired



PARKS, LEISURE, RECREATION



Seal leaks

Seal and repair cracks and major holes in ceilings

Roof and Ceilings



PARKS, LEISURE, RECREATION

Waterproofing

Areas of water damage are visible within buildings



PARKS, LEISURE, RECREATION

Miscellaneous

Damage to woodwork needs to be repaired

Cracks along fence columns need to be repaired



ARCHITECTURE

Concrete

Concrete work has deteriorated on building roof tops



ARCHITECTURE

Concrete

Repair spalled concrete

Repair and seal cracks on concrete floors



ARCHITECTURE

Brickwork



Replace brickwork

Seal and repair cracks



ARCHITECTURE

Electrical

Repair and replace electrical wiring and switches

Electrical outlets were found to be dangerous



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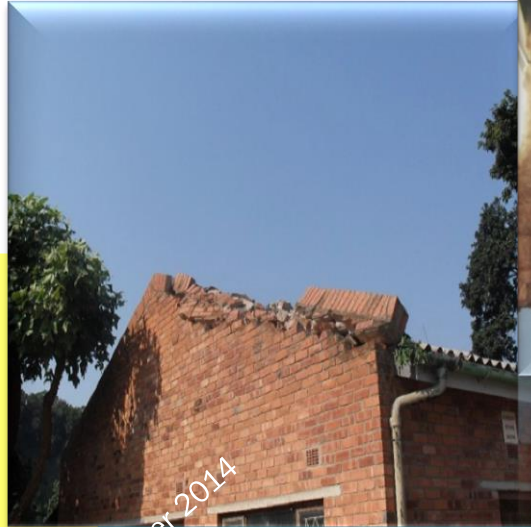
ARCHITECTURE

Roof and Ceilings

Rooftops require major repairs

Replace missing tiles

Repair leaks on rooftops and ceiling boards



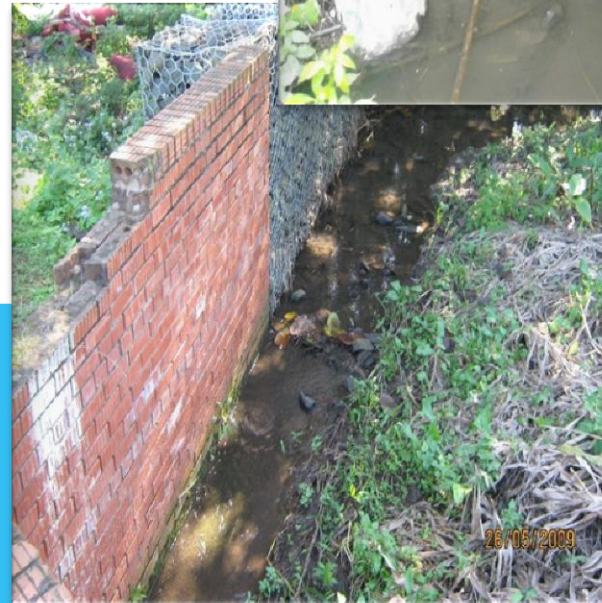
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COASTAL & STORMWATER



Canals & Culverts

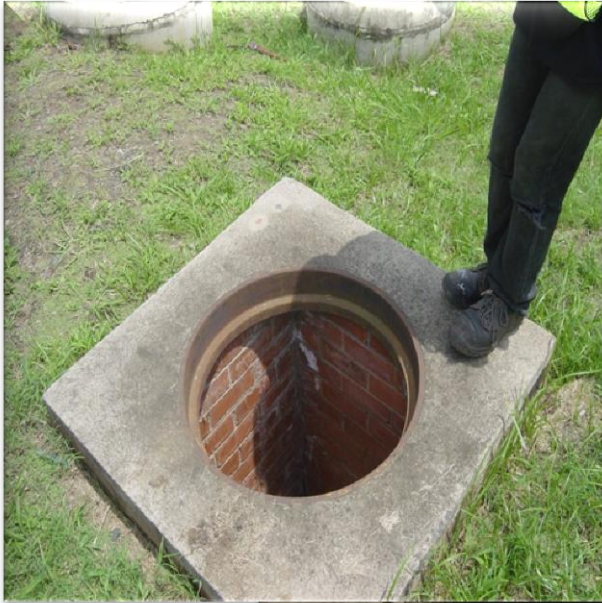
Removal of debris and silt



COASTAL & STORMWATER

Canals & Culverts

Repair damaged & vandalized manhole covers



*Piers
Handrails*

COASTAL & STORMWATER

Damaged rail pillars

Hand rails missing

Spalling and corroded rail pillars



A RUSSIAN FREEWAY



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This Russian federal freeway goes from Moscow to Yakutsk in Siberia.

This road has no asphalt, even if it is an essential road.

Every time it is raining, the road is paralyzed. These photos were taken some days before approximately 600 cars remained bogged down here. The hunger and the lack of gasoline followed. According to witnesses, a woman gave birth in a public bus.

The teams of construction are afraid of going on this site because, during a previous visit, some were beaten by people who had remained stuck during several days. People broke cars in search of food and of warm clothes.

The gasoline, the food, the firearms and the cables of steel are the most vital foodstuffs on this federal road. Oh, and the patience!!!

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RUSSIE













October 2014



October 2014



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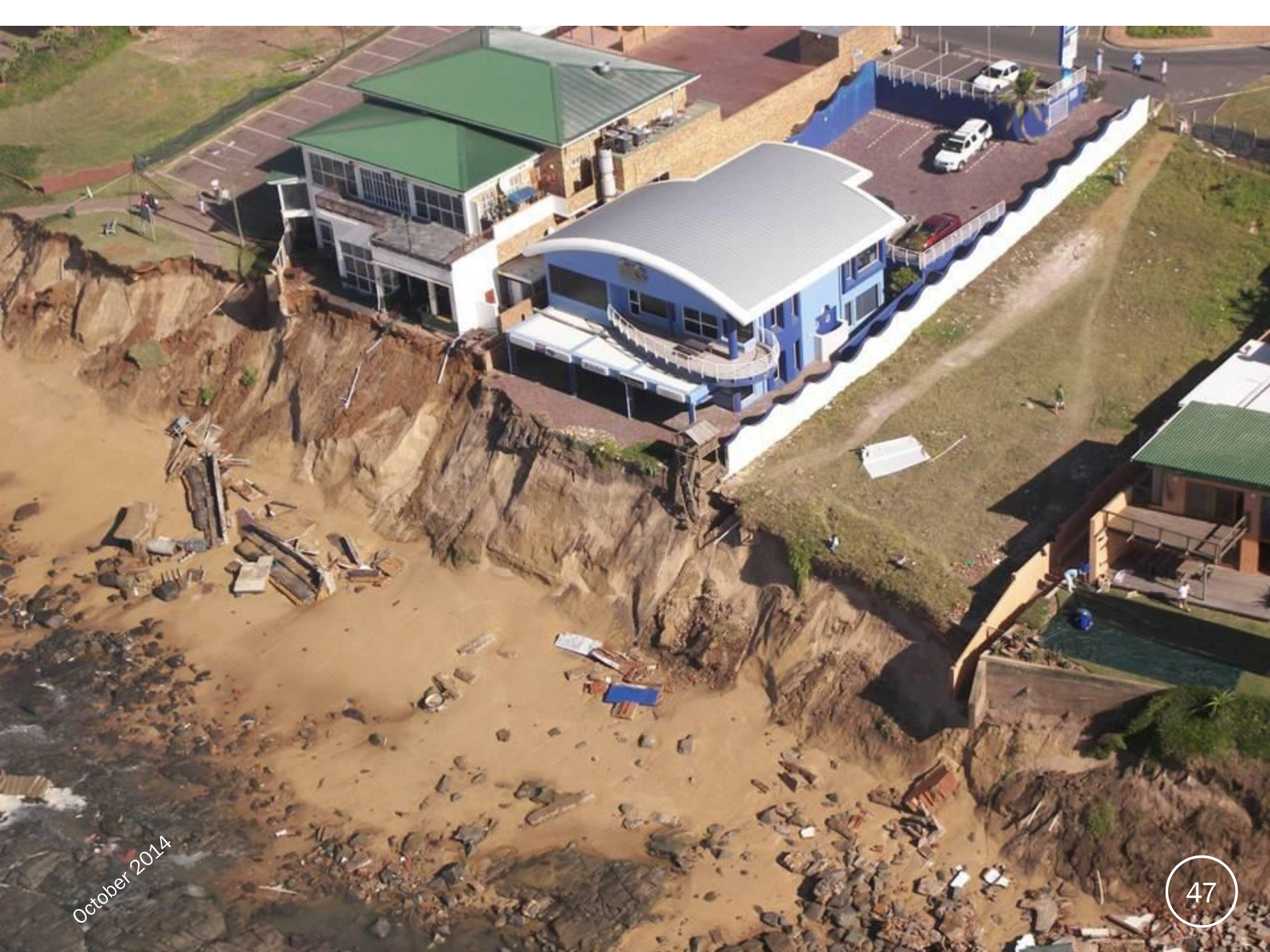








**THEN, THE NEXT TIME WHEN YOU WILL
COMPLAIN ABOUT ROAD CONDITIONS IN
YOUR COUNTRY, THINK OF THE RUSSIANS !**



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MUNICIPAL READINESS

- Almost all municipalities have no coastal management plans or erosion setback lines in place
- No municipalities have shoreline management plans to address coastal erosion
- All municipal responses are reactive

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5 0 2007

“I think there is still a lack of willingness by Local Government to commit to anything that is going to cost money, this includes long-term/ short-term plans for managing weather patterns and coastal conditions”



SOME FACTS – DID YOU KNOW?

**1 Million Person City Is
Being Built Every 5
Days Globally**



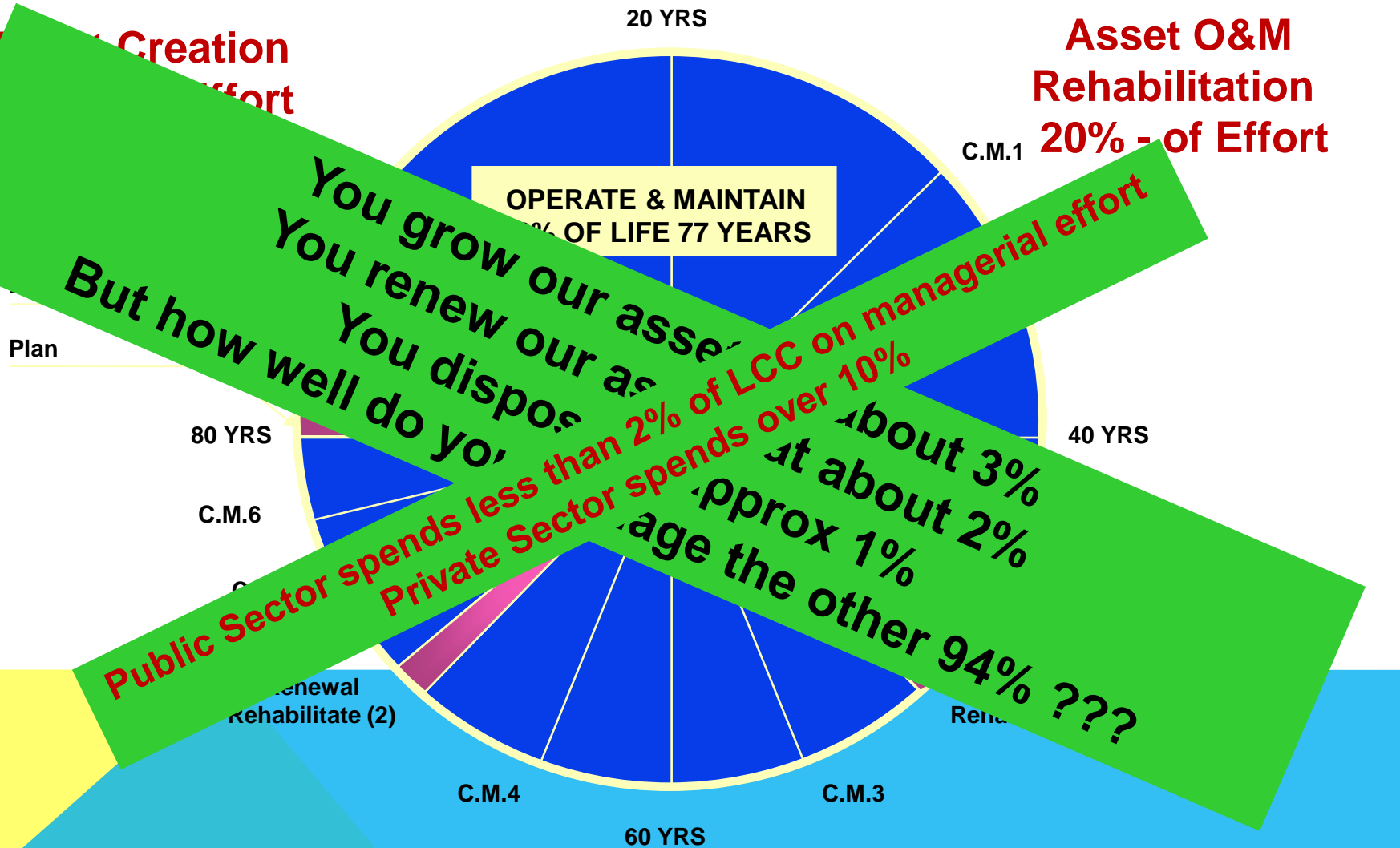
SOME FACTS – DID YOU KNOW?

**We need infrastructure to produce
19 Billion meals a day (not all like this)**

To do this we will need :

- Viable land
- Water infrastructure
- Processing assets
- Transport infrastructure
- Waste disposal , and
- All the associated supporting infrastructure services

PUBLIC INFRASTRUCTURE & MANAGERIAL EFFORT



Long Lived Assets (60 - 80 YRS)

C.M. : CONDITION MONITORING
 BLUE AREA : OPERATION & MAINTENANCE
 NOTE: CONDITION MONITORING IS A PLANNED MAINTENANCE ACTIVITY

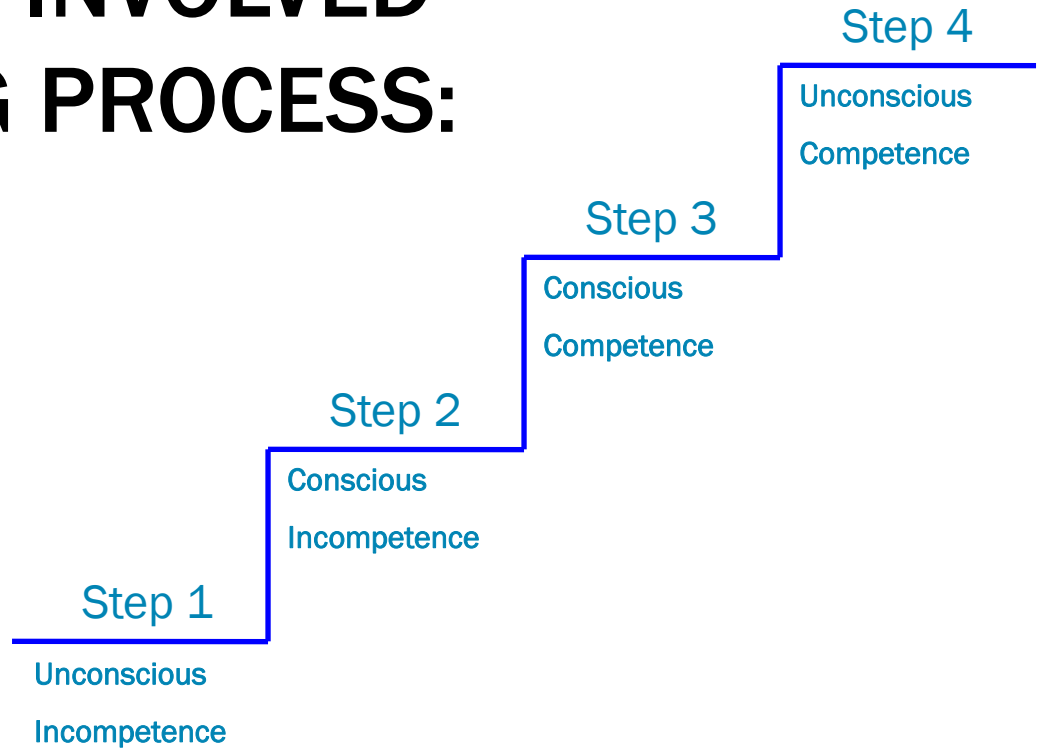
ACCORDING TO MASLOW, FOUR STEPS ARE INVOLVED IN THE LEARNING PROCESS:

At Step 1, you don't know what you don't know.

At Step 2, you know what you don't know

At Step 3, you know what you know and can do it when you think about it.

At Step 4, you know what you know and how to do it without having to think about it.



A close-up photograph of a young child's face, focusing on the eye and curly hair. The child has light-colored eyes and dark, curly hair. The background is a soft, out-of-focus green, suggesting an outdoor setting with foliage. The text is overlaid on the right side of the image.

Decaying
infrastructure
leaves a
liability for
future
generations

There are solutions
in local government
to share today



Neglect of local assets noted

Maintenance 'low on the list'

POLITICAL BUREAU

MUNICIPALITIES are not prioritising maintenance in their budgets, resulting in the generally poor state of municipal infrastructure, Finance Minister Pravin Gordhan has said.

Widespread problems with the supply of clean water, treatment of sewage and other infrastructure issues were noted in a report that has put pressure on the government on notice before local government elections, to be held in the first half of this year.

But municipalities seem ill-equipped to deal with the challenges, with only a vague picture of the assets in their care and a limited understanding of the importance of maintaining them. While they did make provision for maintenance expenditure, most did not set aside enough money for the upkeep of their assets, Gordhan said.

Municipalities had budgeted R151.4 million for repairs and upkeep for the past financial year, but they had failed to report on what had been done.

Gordhan, in a parliamentary written reply, said there were a number of reasons why municipal councils appeared not to prioritise maintenance. They were more focused on speeding up access to services and gave priority to investing



in new infrastructure, rather than spending money on repairs and upkeep.

"The potential cost savings that can be realised by preventive maintenance were not fully appreciated. Ideally, every municipality in the country should have an asset register and an asset management plan." Progress was being made, but there was still much work to be done, he said.

Lillian Develing, of the Combined Ratepayers' Association, said maintenance problems in eThekweni had been compounded when the Durban Municipality was formed as a result of the amalgamation of smaller municipalities.

Many skilled employees left and the state of infrastructure suffered, she said. "Although the government has money for maintenance, there's little way of implementing it properly, because it is beyond the municipality's capacity, in terms of manpower and skills."

Develing said roads in Hillcrest and Kloof, for example, were crumbling because of increased traffic flow, but little was being done.

"There has been a lot of work done in the city, but we

are still playing catch-up and there is a huge backlog."

Rishi Singh, chairman of the Clairwood Ratepayers' Association, said current infrastructure was largely being neglected.

"From the most affluent to the poorest areas, there are potholes. That is an example of how atrocious service delivery is." Singh added that he hoped the city's 2010 improvements – including the stadium and beachfront upgrade – would be looked after in years to come.

In another reply, Gordhan said municipalities across the country owed the auditor-general more than R231m in audit fees as at October 31 last year. Responding to a question posed by DA MP Dion George, Gordhan said: "Municipalities and municipal entities owed the auditor-general R231 634 070 for audit fees." The Eastern Cape was the worst offender, with R52.9m outstanding.

Coming in at second and third were the Free State, with outstanding fees of R33m, and the Northern Cape, owing R30m. The North West Province had racked up R26m, the Western Cape R21m and KwaZulu-Natal R22.9m.

"The National Treasury and provincial treasuries had engaged extensively with the municipalities concerned to settle their outstanding audit fees," said Gordhan. – additional reporting by Dasen Thathiah

Municipalities are not prioritising maintenance in their budgets, resulting in the generally poor state of municipal infrastructure Finance Minister Pravin Gordhan has said.

"The potential cost savings that can be realised by preventive maintenance were not fully appreciated. Ideally, every municipality in the country should have an asset register and an asset management plan."



IMESA IIMS - VISION & STRATEGY



Vision

- Help municipalities with GRAP17 compliance
- Standardise and create meaningful reporting tool
- Help municipalities with asset maintenance and improve service delivery
- Facilitate and enhance technical management

Strategy

- Compliance with GRAP17
- Improved infrastructure management and service delivery
- Understand infrastructure funding & budget requirements
- Train staff
- Enhance systems and integration – minimal interference



UNDERSTANDING WHAT TO DO FIRST?



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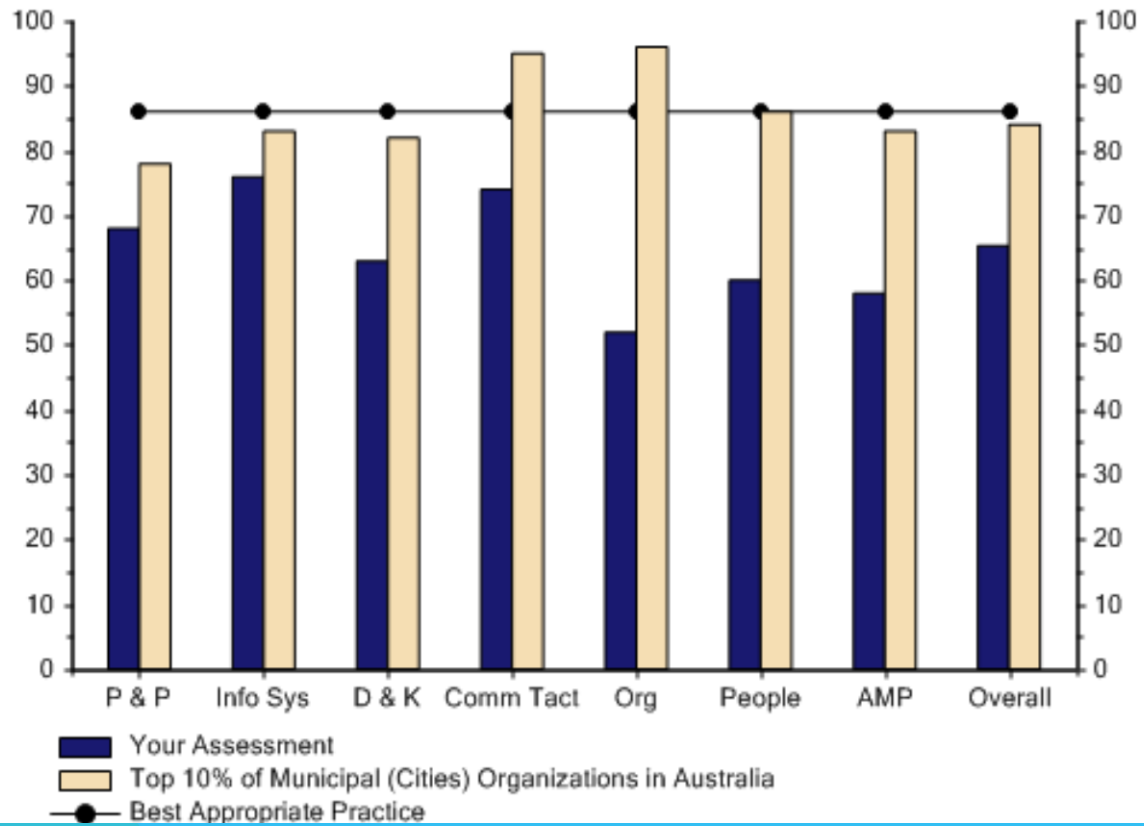
FITTING THE JIGSAW TOGETHER



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GAP-EX LEVEL 1



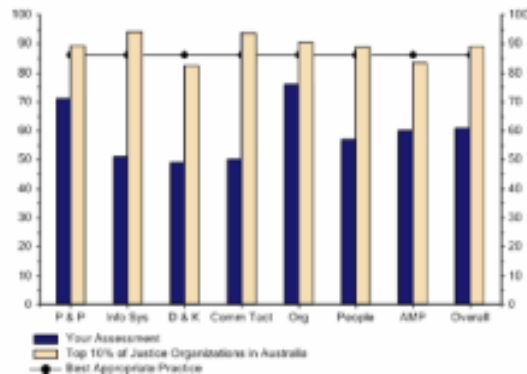
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GAP ANALYSIS

Audit Plus ASSET MANAGEMENT GAP ANALYSIS AND BENCHMARKING

Confidential Results for Dept of Emergency Services only



Gap Analysis

Quality Elements	Weighted Gap	Rank
Process and Practices (P&P)	15.0	6
Information Systems (Info Sys)	35.0	3
Data and Knowledge (D&K)	37.0	1
Commercial Tactics (Comm Tact)	36.0	2
Organizational (Org)	10.0	7
People Issues (People)	29.0	4
AM Plans (AMP)	25.0	5

Improvement Priorities

Based on this gap analysis, Dept of Emergency Services is equal to the top ten percentile of Justice Organizations in Australia category and 25.1% behind the best appropriate practice target level as deemed appropriate for an organization of this size and nature. Dept of Emergency Services has over \$371M worth of infrastructure assets, the management of which is crucial to the organization's performance in terms of both cost and levels of service.

This form of the benchmarking does not allow a detailed analysis, however, based on ISM's weighted gap shown above, the following items are likely areas where improvement should be considered in more detail. The improvement recommendations have been automatically generated based on the information supplied by Dept of Emergency Services in response to the questionnaire and is not intended to replace a detailed audit and improvement plan.

For the purposes of this study we have restricted this to the top 50 poorly performing quality elements in order of importance. Note that the selected quality elements are based on the weighted gap and not the element rating shown in the graph.

Processes and Practices

Processes and practices form the basis for all asset management activities within an organization. Therefore, without clearly defined and documented procedures the ability for your organization to conduct consistent practices are greatly reduced. These processes should cover the entire life cycle of the asset and individual practices will be required for different asset types, eg. condition assessment is a common process for all assets, however, the actual practice applied will differ for each asset type.

Improvements within this area are listed below.

Knowledge of Assets

The key improvements in this area include:

- Review, document and implement processes for determining what assets to collect utilization data on and for undertaking the collection. This should include the creation of a data standard.

Accounting and Costing

The key improvements in this area include:

- Review, document and implement processes for tracking and reporting operational costs against the asset register items at a suitable level.
- Review, document and implement processes for tracking and reporting maintenance costs.

Capital Expenditure Evaluation

The key improvements in this area include:

- Review, document and implement processes for economic evaluation of capital projects, and develop the organizations policy on the methods to be adopted, including the use Net Present Value's, Internal Rate of Return etc. type measures.

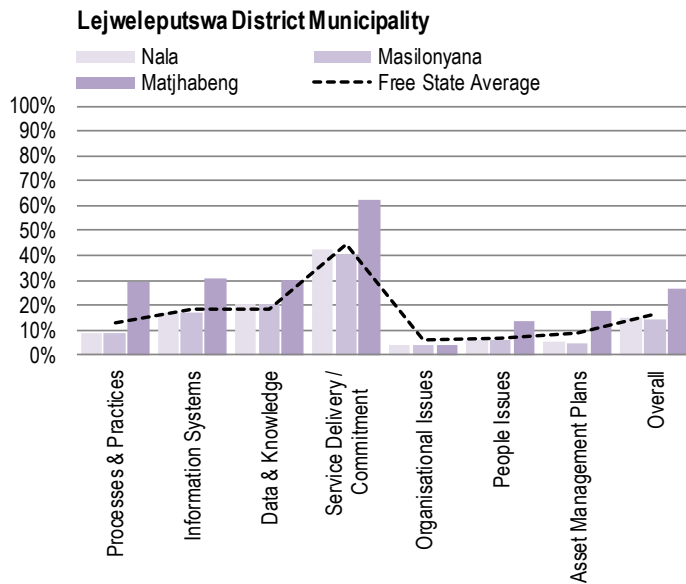
Operations

The key improvements in this area include:

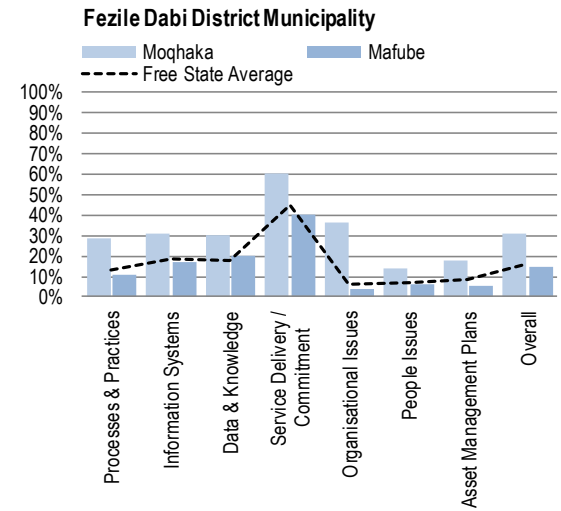
- Review, document and implement processes for developing and maintaining operations manuals.
- Review, document and implement processes for handling customer and stakeholder complaints, including the way they are tracked through the business from receipt to resolution.
- Review, document and implement processes for maintaining and developing Emergency Response Plans, including for what events, against what level and criticality of asset should these be completed. These should also include how new assets are automatically included, how often are they reviewed and what triggers the need for upgrades.

GAPEX ANALYSIS EXAMPLES

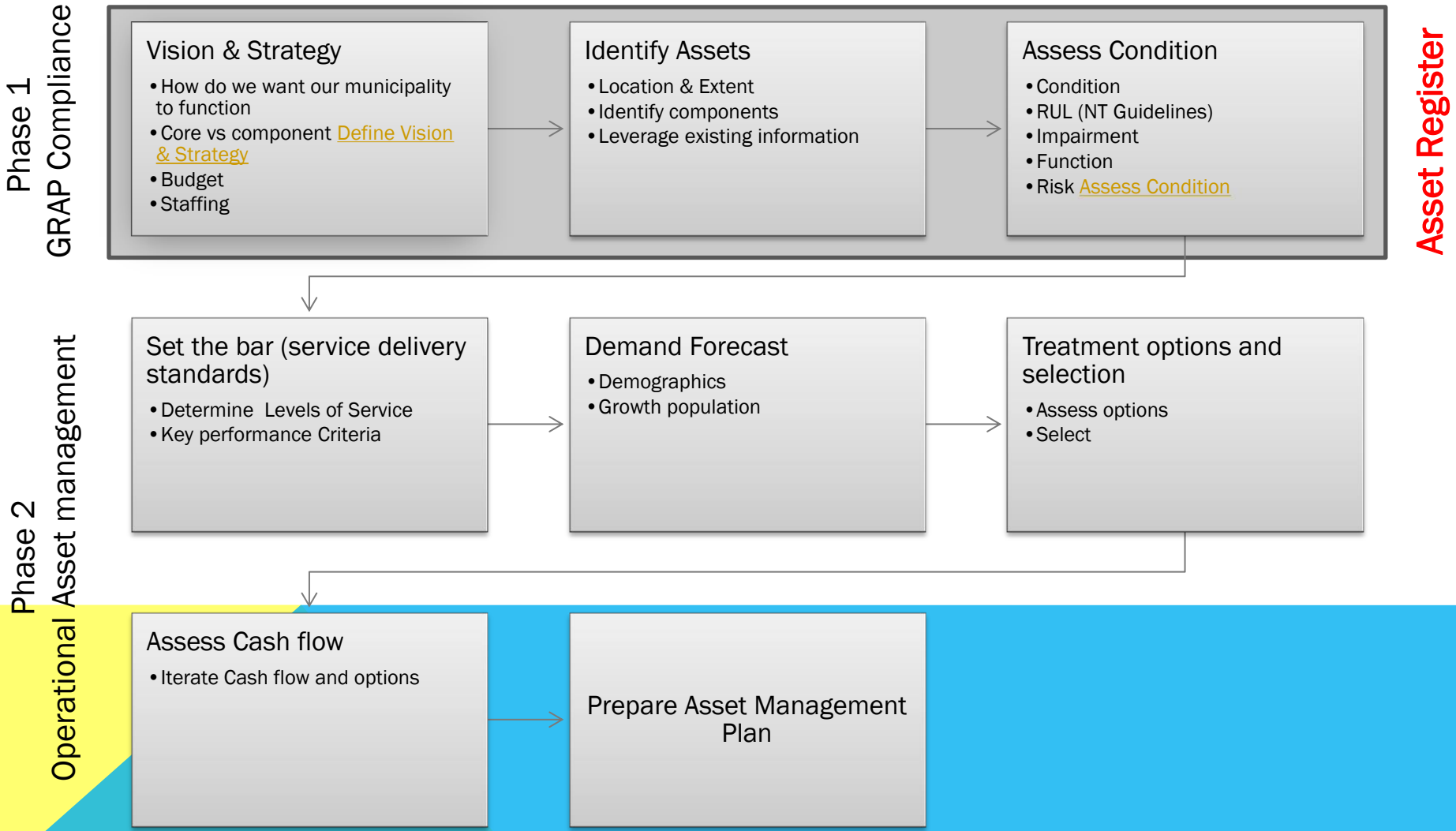
Local Municipality	Town
Nala	Bothaville
	Wesselsbron
Masilonyana	Theunissen
	Brandfort
	Soutpan
	Verkeerdevlei
	Winburg
Matjhabeng	Welkom
	Allanridge
	Hennenman
	Odendaalsrus
	Ventersburg
	Virginia



Local Municipality	Town
Moghaka	Kroonstad
	Renovaal
	Steynsrus
	Vierfontein
	Viljoenskroon
Mafube	Frankfort
	Cornelia
	Tweeling
	Villiers



ASSET MANAGEMENT ROADMAP



ASSET MANAGEMENT PLAN

A plan developed for the management of one or more infrastructure assets that combines multi-disciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost effective manner to provide a specified level of service.

A significant component of the plan is a long-term cash flow projection for the activities.

ASSET REGISTER

A ***record of asset information*** including some or all of inventory, historical, service, financial, condition, construction, technical and financial information about each asset.

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THE ASSET REGISTER

Does not tell us:

- The replacement strategy of an asset
- The planned maintenance program
- The economic life of the asset
- The reliability and capacity of the asset

In other words

It does not tell us its state of decay
(when it will fail)

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THE PROBLEMS WE SEE

- **Everyone is doing their own thing.**
- We have over 30 different approaches to asset management being used.
- Training programs are being created at a great rate, promoting even more approaches.
- We are re-inventing the wheel. There are best appropriate practices available around the world and,
- A large movement exists for a global approach to SIAM with BAP industry models for the maturity needed by the organisation and their assets.
- We should pool all materials, develop a national approach and concentrate all our efforts on implementing it cost effectively, not re inventing it.

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FOCUS AREAS IRO GRAP17 REQUIREMENTS

- **Knowledge / identification of Assets**
 - On IIMS database – in GIS format
 - In the Fixed Asset Register (JDE)
 - Corporate GIS database
- **Condition Assessment of Assets**
 - It's required to assist in the review of the useful lives of assets and impairment costs.
- **Useful Life of Assets (based on National Treasury Guidelines)**
 - To be reviewed at least each reporting date
 - Estimation of UL is a matter of judgement based on experience.
- **Impairment**
 - Loss in future economic benefits
 - The carrying amount (cost – accumulated depreciation) of an asset exceeds its recoverable amount (amount asset can be sold for)
- **Unbundling / Componentisation**
 - Identify each component with a different useful life
 - Depreciate each component over its expected useful life

CONDITION ASSESSMENT AND BUSINESS RISK EXPOSURE



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VISUAL CONDITION INDEX



Very Good = 86% to 100%
Good = 71% to 85%
Fair = 51% to 70%
Poor = 31% to 50%
Very Poor = 0% to 30%

Rehabilitation
Backlog



Very Poor Condition



Very Poor Condition



Poor Condition

6 4 2007



Fair Condition



Very Good Condition

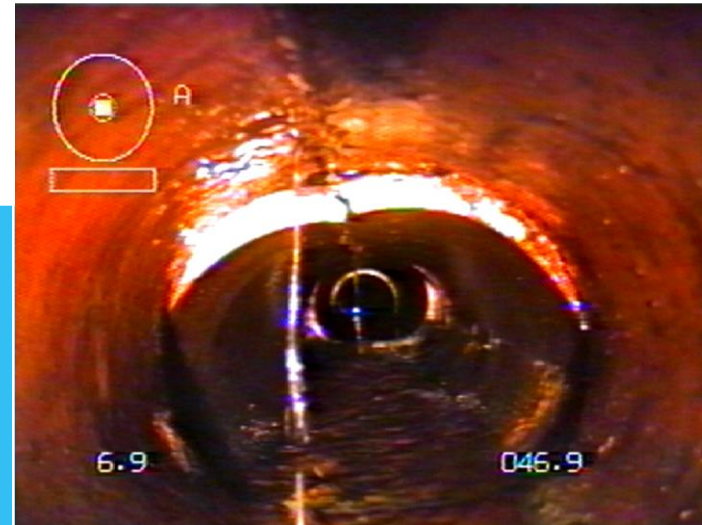


Very Good Condition

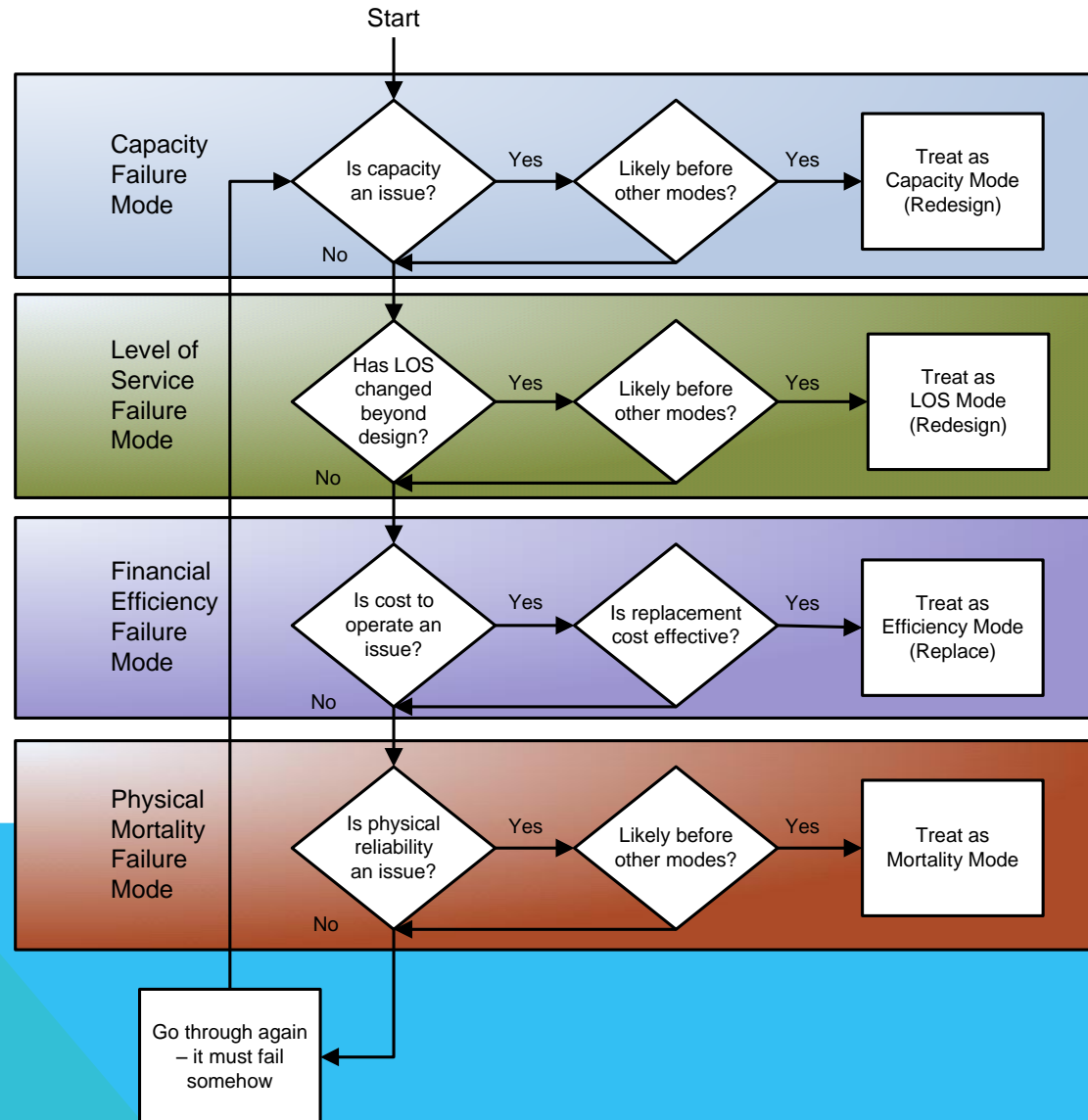
METHODS TO ASSESS COLLECTION SYSTEM CONDITIONS

- Smoke testing
- Dye testing
- Lamping
- Video inspection (CCTV)
- Sonar
- Ground-penetrating radar

- CCTV (closed-circuit television)



FOUR FAILURE MODES



SMART IDEAS FOR CONDITION DATA COLLECTION

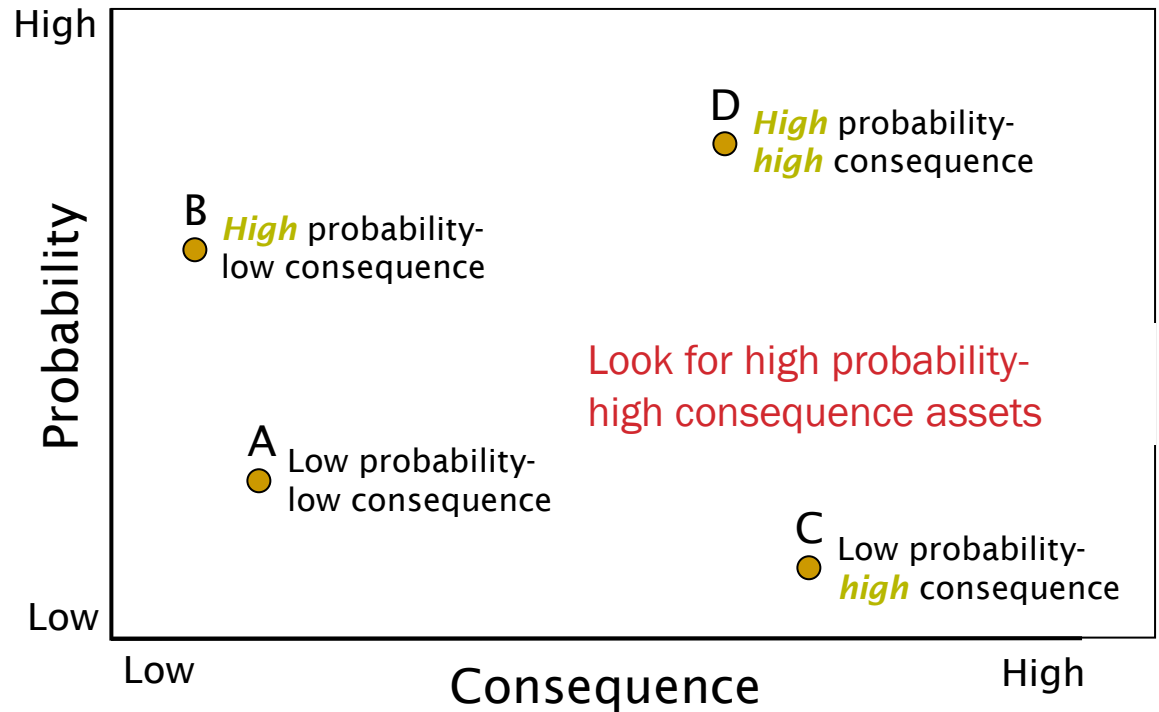
1. **Business risk-driven**, with focus first on high risk, high consequence assets
2. **Problem assets-profiled**, noting that 20% of assets cause 80% of problems
3. **Sampling approach**
4. **Stepped approach**, applying more sophisticated assessment techniques to higher-cost, higher business risk-assets
5. **Failure mode-guided**, do I need condition data?
6. **Root cause-driven**
7. **Valued judgment/Delphi approach**, as supplement to minimal data



BUSINESS RISK-DRIVEN

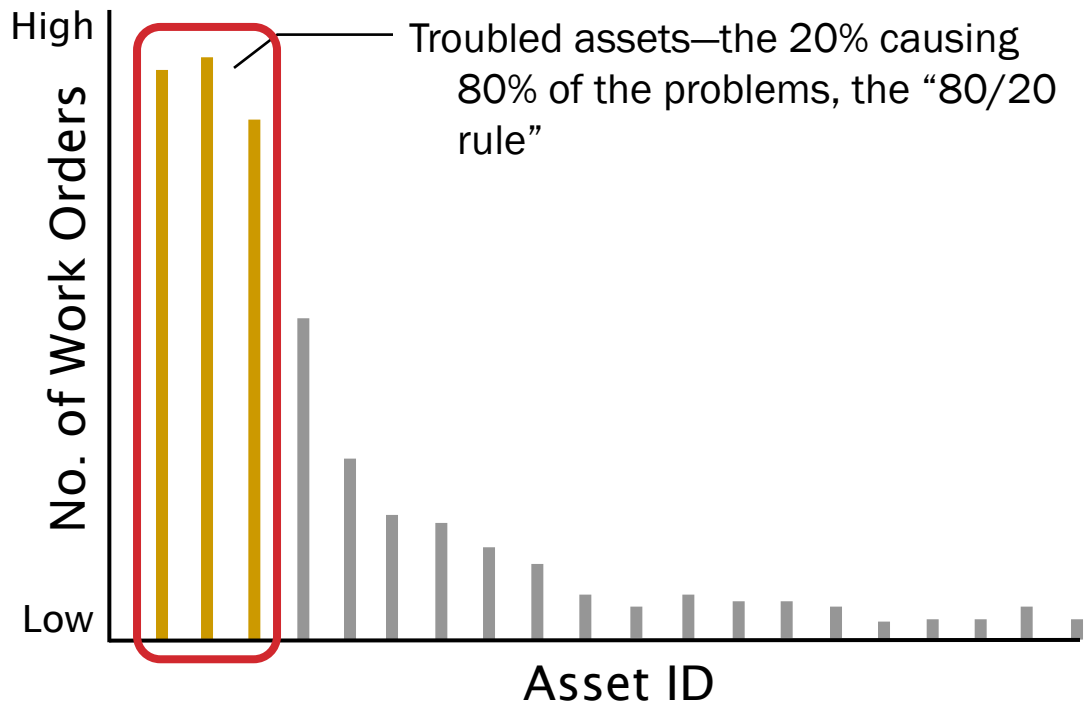
What is probability of failure?

What is consequence of failure?



PROBLEM ASSETS-PROFILED

Do we know which are our problem assets?



VALUED JUDGMENT/DELPHI APPROACH SUPPLEMENTS MINIMAL DATA

“Valued judgment” is used to assign condition scores

- Assemble team of most-knowlegeable personnel
- Poll each member for opinion on condition score and why
- Augment with work order data and failure patterns
- Use photos and process schematics
- Facilitate group consensus through discussion



IMPORTANT NOTE ON CONDITION ASSESSMENT

- Condition assessment is not an end in itself, but is a *means* to an end
- The *end* is to determine *remaining useful life*
- *Good-Fair-Poor*-type ratings have little utility *unless* they lead to an effective estimate of remaining useful life
- The remaining useful life of an asset is *what we have left to try to manage*



RISK IS THE HEART OF AM



ALL ASSETS HAVE A PROBABILITY OF FAILURE

Two key questions...

1. Is the failure reasonably *predictable*?
2. Is it cost-effectively *preventable*?



UNDERSTAND ASSET RISK

- Failure of 1 asset can cause catastrophic failure of other/supporting assets
- Combination of small failures (pump station and blocked drainage channel) coupled with a large storm event caused major damage worth significantly more than the value of the failed assets

Total Damage R20m

Total Asset Cost R4m

Maintenance Cost ±R20,000

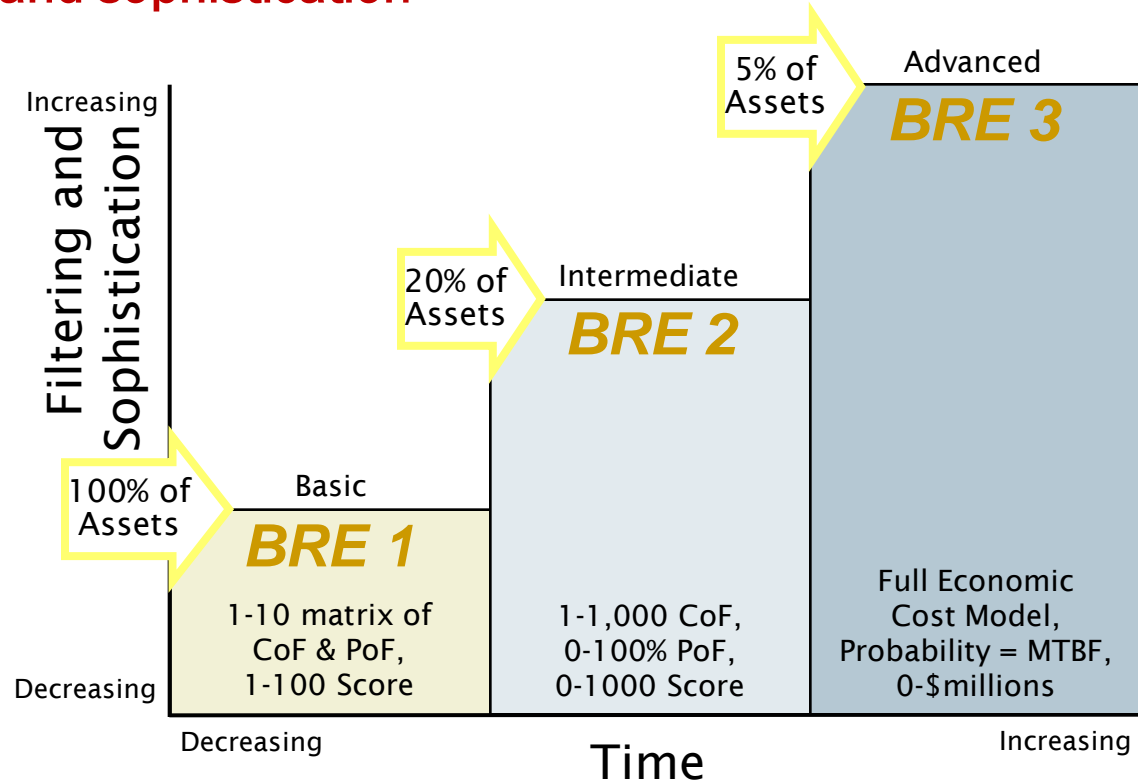


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STEP-BY-STEP BRE METHODOLOGY

Levels of filtering and sophistication



BRE is business risk exposure, CoF is consequence of failure, PoF is probability of failure, MTBF is mean time between failures

SERVICE RISK FACTOR (WEIGHTING) ADOPTED FOR THE MUNICIPALITY

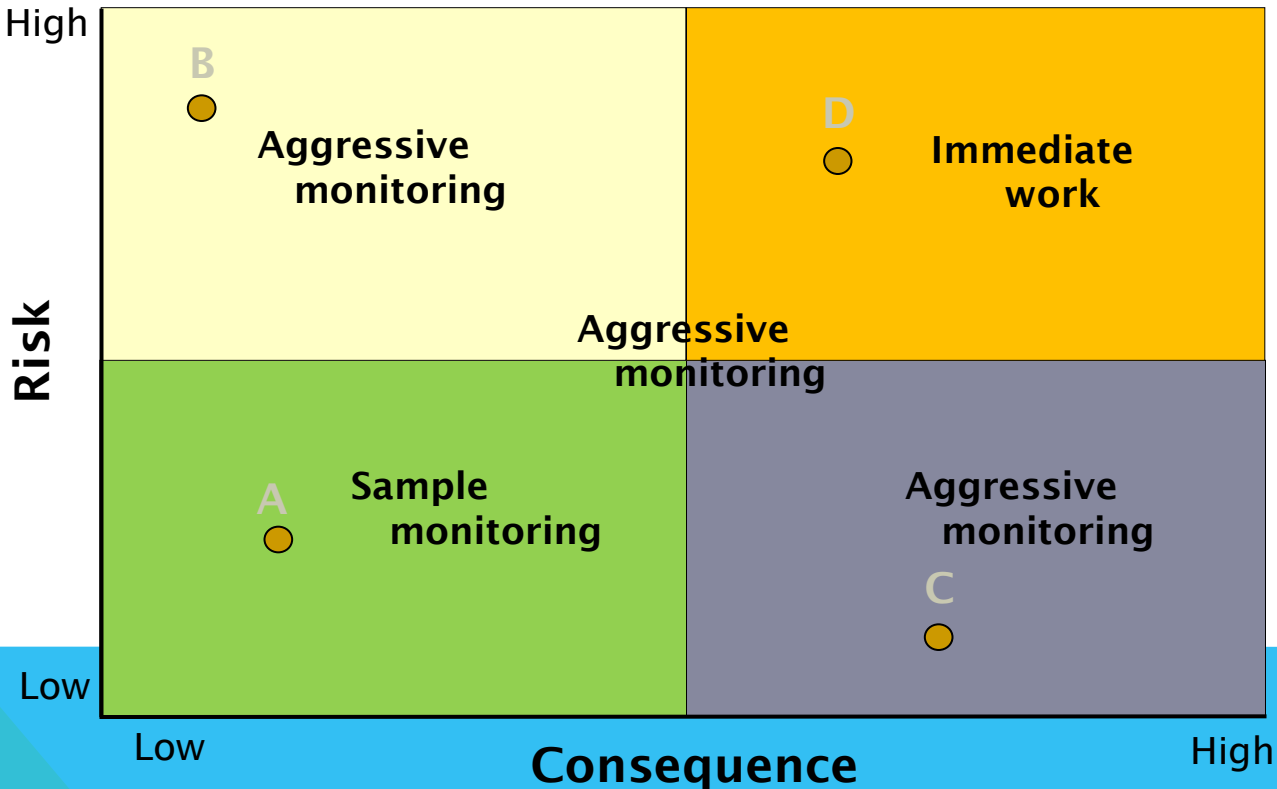
Water	19
Sanitation	14
Roads	12
Bridges & retaining walls	12
Stormwater	7
Buildings	7
Parks	4

Risk Exposure = Probability of Failure x
Consequence of Failure x Weighting

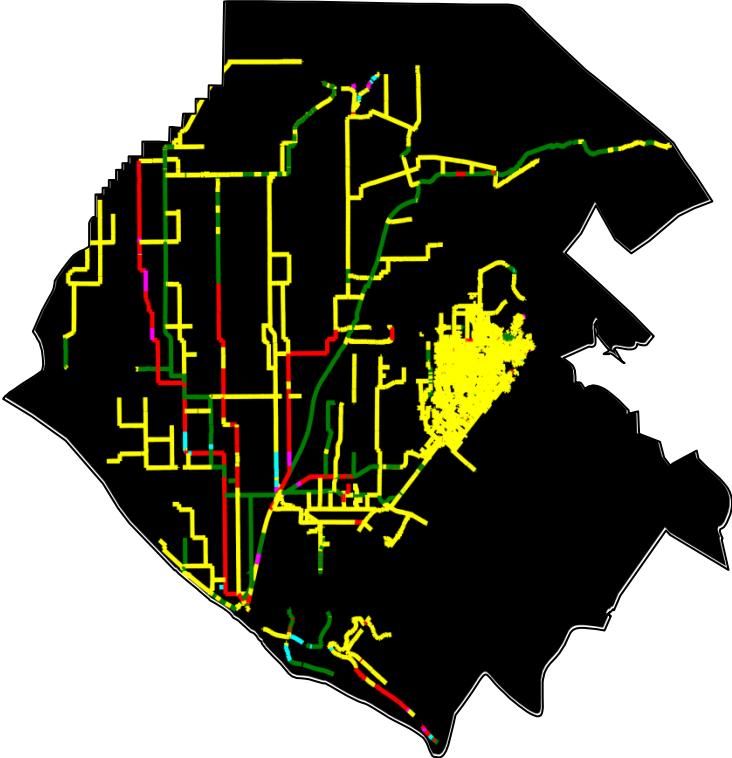
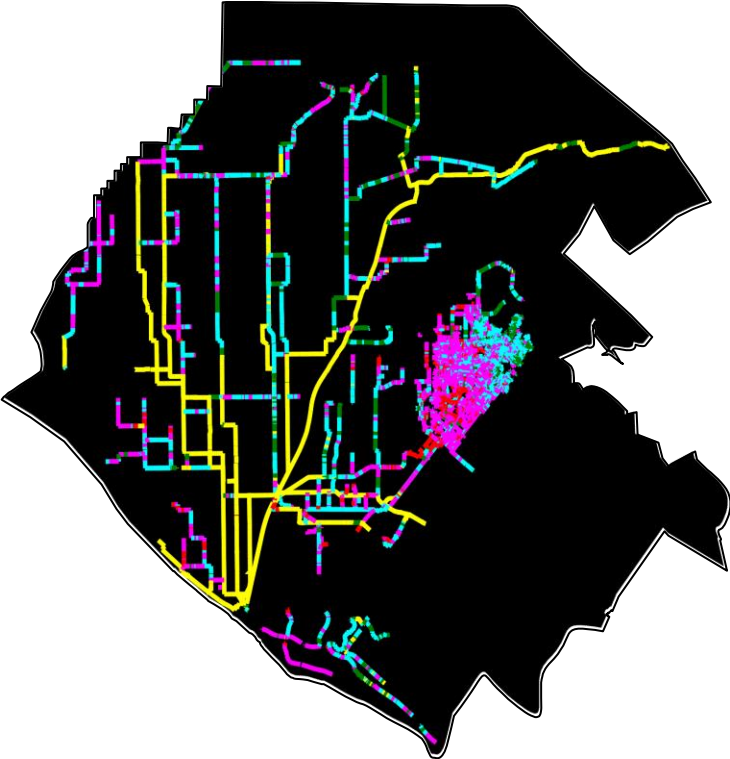


BUSINESS RISK EXPOSURE DRIVES WORK PROGRAM

Work program response



RISK MAPPING



Operational failure

Least likely → Most likely

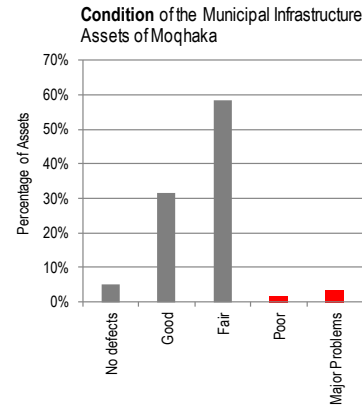
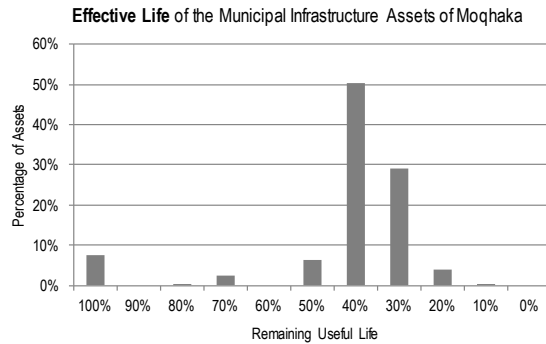


Structural failure

CONDITION ASSESSMENT EXAMPLE

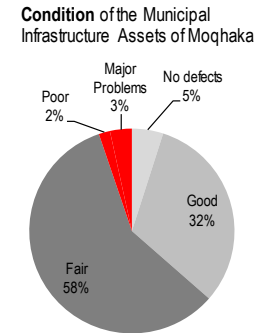
Moqhaka LM – All Infrastructure Assets

Moqhaka



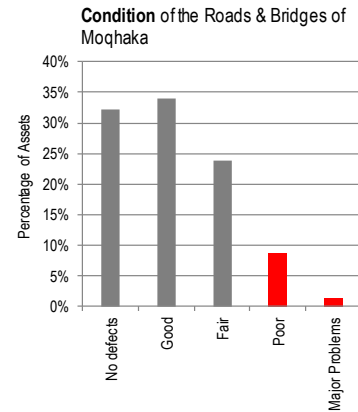
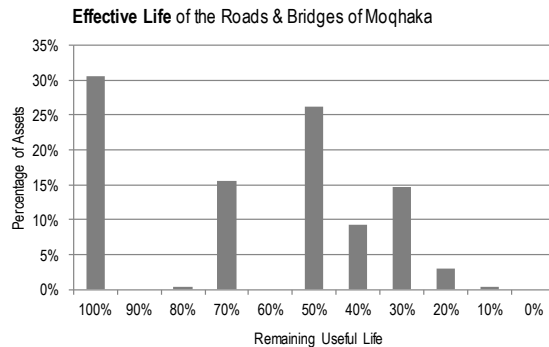
Present Value
R 2 086 560 443

Replacement Cost
R 7 661 953 385



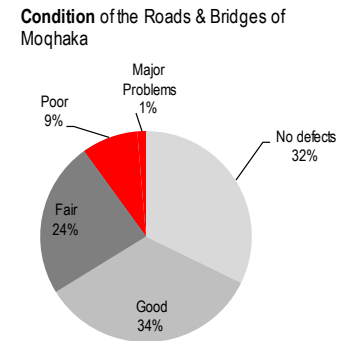
Moqhaka LM – Roads & Bridges

Moqhaka



Present Value
R 1 376 922 267

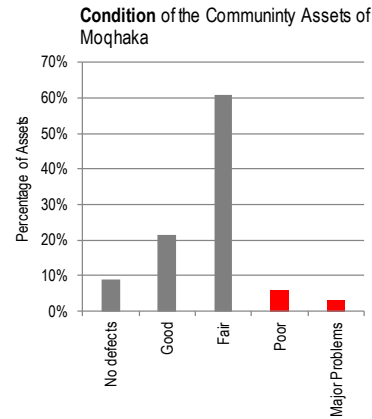
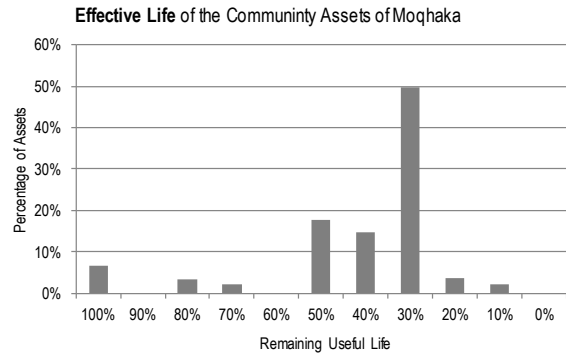
Replacement Cost
R 3 734 087 112



CONDITION ASSESSMENT (MOQHAKA EXAMPLE)

Moqhaka LM – Community Assets

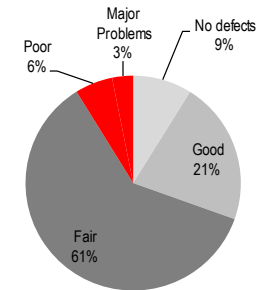
Moqhaka



Condition of the Community Assets of Moqhaka

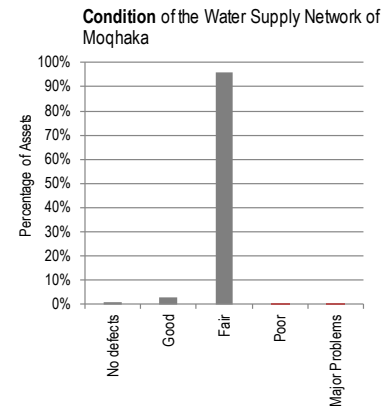
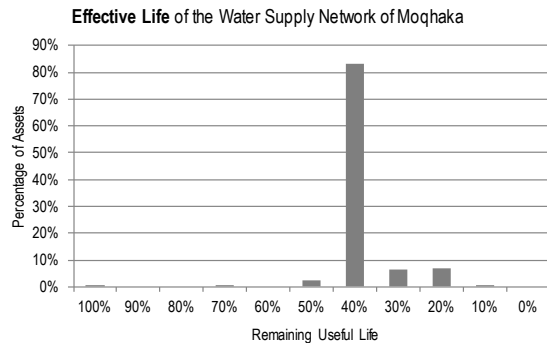
Present Value
R 160 096 896

Replacement Cost
R 758 757 098



Moqhaka LM – Water Supply Network

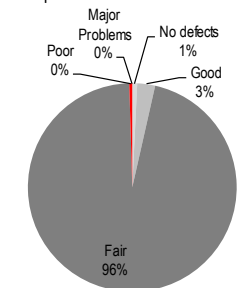
Moqhaka



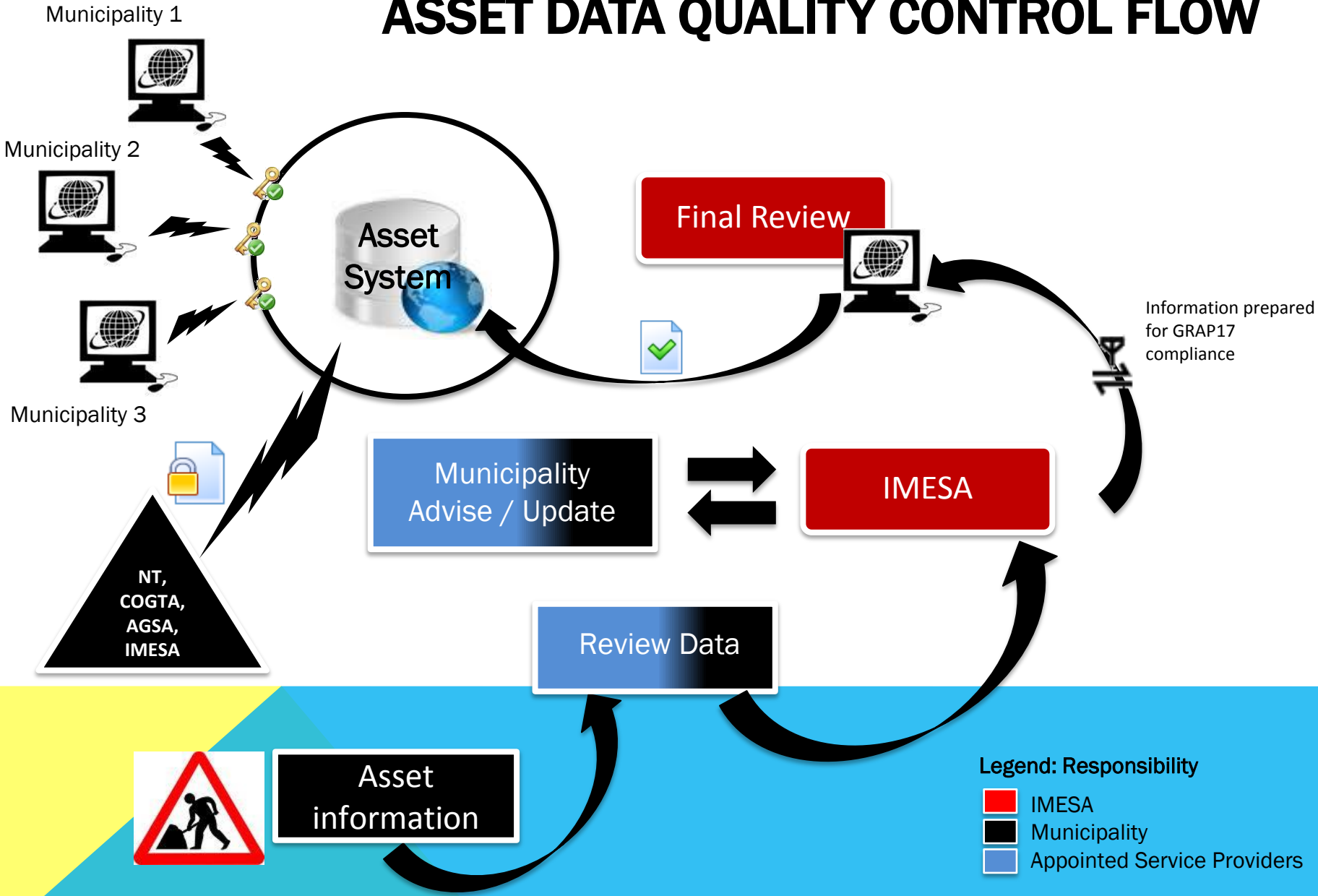
Condition of the Water Supply Network of Moqhaka

Present Value
R 156 023 096

Replacement Cost
R 1 009 528 729



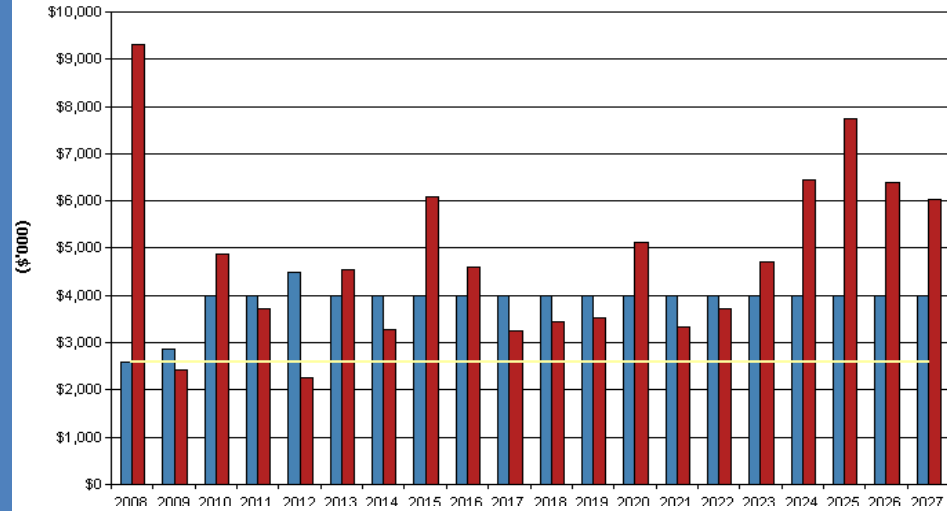
ASSET DATA QUALITY CONTROL FLOW



Key Element 3 – LTFP

SUSTAINABLE FINANCIAL
MANAGEMENT NEEDS TO
BE AN ESSENTIAL PART
OF BUSINESS

Sample Council - Projected & Planned Renewals and Current Renewal Expenditure (Roads_DKH)



Move from annual budgeting to long term financial planning



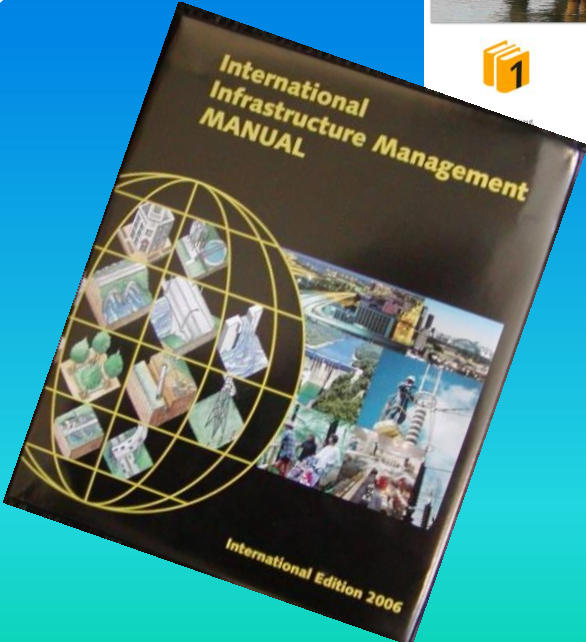
CENTRE OF EXCELLENCE IN LOCAL GOVERNMENT (6 PROGRAM AREAS)



**THE GOAL IS TO DELIVER SUSTAINABLE
LEVELS OF SERVICE THAT THE
COMMUNITY COMES TO EXPECT**



IMESA TRAINING PROGRAMS



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IMESA TRAINING COURSES

Course Name	No. of days
Infrastructure Asset Management 4 day	4
Infrastructure Asset Management 2 day	2
Levels of Service	1
10 Step Program to Developing an Asset Management Plan	1
GRAP 17	1
Risk Management Guidelines	1
Condition Assessment Guidelines	1
Maintenance Guidelines	1
Project Management	3



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TRAINING SCHEDULE – MISA COURSES

Course Name	APRIL 2014 – MARCH 2015	APRIL 2015 – MARCH 2016
Infrastructure Asset Management 4 days	9 – 12 September 2014 Polokwane, Limpopo	6 – 9 October 2015 East London, Eastern Cape
	7 – 10 October 2014 East London, Eastern Cape	
	20 – 23 January 2015 Polokwane, Limpopo	25 – 28 January 2016 Polokwane, Limpopo
	3 – 6 February 2015 Cape Town, Western Cape	
Levels of Service 1 day	24 October 2014 East London, Western Cape	31-Jul-15 Potchefstroom, North West
		26-Aug-15 Cape Town, Western Cape
10 Step Programme to Developing Asset Management Plan (2 days)	17 – 18 October 2014 Durban, KwaZulu Natal	28-Jul-14 Bloemfontein, Free State
	15 – 16 October 2014 Potchefstroom, North West	23-Sep-14 Durban, KwaZulu Natal
	2 – 3 November 2014 East London, Eastern Cape	21-Oct-14 Potchefstroom, North West
		29-Jan-15 East London, Eastern Cape
GRAP 17		22-Oct-14 East London, Eastern Cape
		19-May-14 Bloemfontein, Free State
		23-Jun-14 Durban, KwaZulu Natal
	22-Aug-14 Kimberley, Northern Cape	25-Jul-14 Potchefstroom, North West

Risk Management Guidelines

27-Jul-15
Pretoria, Gauteng

25-Sep-15
Durban, KwaZulu Natal

23-Oct-15
Potchefstroom, North West

19-Jan-16
Cape Town, Western Cape

19-Oct-15
East London, Eastern Cape

22-May-15
Pretoria, Gauteng

26-Jun-15
Durban, KwaZulu Natal

24-Jul-15
Potchefstroom, North West

Condition Assessment Guidelines

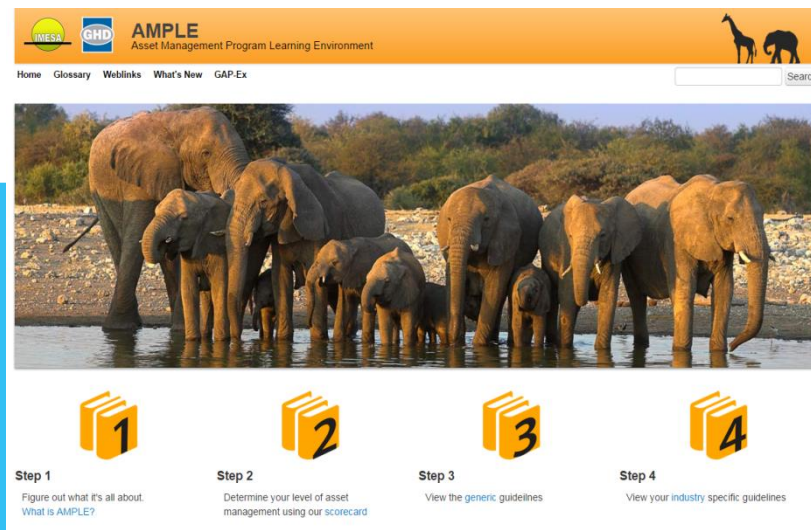
Maintenance Guidelines

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ASSET MANAGEMENT PROGRAM LEARNING ENVIRONMENT (AMPLE)

AMPLE is a web-based tool (knowledge management system) that has set of on-line guidelines, templates and decision support tools to:

- Simplify the development of consistent Asset Management Strategic Plans
- Provide effective Implementation Guidelines for agencies to assess and drive meaningful improvements in asset management.
- List Asset Management systems from around the world.



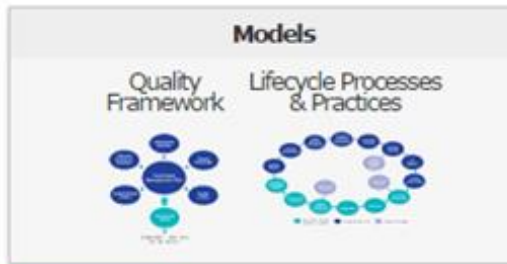
The screenshot displays the AMPLE website interface. At the top, there is a navigation bar with the IMESA and GHD logos, the title 'AMPLE Asset Management Program Learning Environment', and a search bar. Below the navigation bar, there are links for 'Home', 'Glossary', 'Weblinks', 'What's New', and 'GAP.Ex'. The main content area features a large photograph of a herd of elephants at a watering hole. Below the photo, there is a four-step process flow:

- Step 1**: Figure out what it's all about. What is AMPLE?
- Step 2**: Determine your level of asset management using our scorecard
- Step 3**: View the generic guidelines
- Step 4**: View your industry specific guidelines

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AMPLE - NOVICE



Novice	Aware	Competent
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Novice Contents

- Acknowledgement
- ⊕ • How to use AMPLE
- ⊖ • What is AMPLE?
 - Executive Overview
 - Vision
 - Benefits
- What is Asset Management?
- Getting Started in Your AM Program
- ⊖ • Quality Framework
 - ⊕ • What Is TEAMQF?
 - ⊕ • Life Cycle Practices and Processes
 - Data and Knowledge
 - Asset Information Systems
 - Organizational Issues
 - People Issues
 - Commercial Tactics
- ⊖ • Generic AM Guidelines
 - ⊕ • Core Lifecycle Guidelines
 - ⊕ • Data and Knowledge
 - ⊕ • Information Systems
 - ⊕ • Organizational Issues
 - ⊕ • People Issues
 - ⊕ • Commercial Tactics
- IMESA Training Program

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AMPLE – AWARE

Novice	Aware	Competent
Aware Contents		
	<ul style="list-style-type: none">• Acknowledgement	
	<ul style="list-style-type: none">⊕ • How to use AMPLE	
	<ul style="list-style-type: none">⊖ • What is AMPLE?<ul style="list-style-type: none">• Executive Overview• Vision• Benefits	
	<ul style="list-style-type: none">• What is Asset Management?	
	<ul style="list-style-type: none">• Getting Started in Your AM Program	
	<ul style="list-style-type: none">⊖ • Quality Framework<ul style="list-style-type: none">⊕ • What Is TEAMQF?⊕ • Life Cycle Practices and Processes<ul style="list-style-type: none">• Data and Knowledge• Asset Information Systems• Organizational Issues• People Issues• Commercial Tactics• Total Asset Management Plans	
	<ul style="list-style-type: none">⊖ • Generic AM Guidelines<ul style="list-style-type: none">⊕ • Core Lifecycle Guidelines⊕ • Data and Knowledge⊕ • Information Systems⊕ • Organizational Issues⊕ • People Issues⊕ • Commercial Tactics⊕ • Total Asset Management Plans	
	<ul style="list-style-type: none">• IMESA Training Program	

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AMPLE - COMPETENT

Novice	Aware	Competent
Competent Contents		
• Acknowledgement		
+ • How to use AMPLE		
+ • What is AMPLE?		
• What is Asset Management?		
• Getting Started in Your AM Program		
- • Quality Framework		
+ • What Is TEAMQF?		
+ • Life Cycle Practices and Processes		
• Data and Knowledge		
• Asset Information Systems		
• Organizational Issues		
• People Issues		
• Commercial Tactics		
• Total Asset Management Plans		
- • Generic AM Guidelines		
+ • Core Lifecycle Guidelines		
+ • Data and Knowledge		
+ • Information Systems		
+ • Organizational Issues		
+ • People Issues		
+ • Commercial Tactics		
+ • Total Asset Management Plans		
+ • Effective Implementation		
+ • Developing an Improvement Program		
+ • Specific Industry Practices		
• IMESA Training Program		

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Questions...???

