1

Course Topics

©Mervyn Henderson Consulting

Topic	Theme and target audience
Title slide and topics page	Target: Management and practitioners Theme: Fundamentals
Some thoughts about change and excellence	
1. SA Context	
2. Overview of Asset Management	
3. Managing Asset Management	
4. Scope of Asset Management	
5. Case Study: AM & the Climate Emergency	
About – sources, acronyms, course presenter	

2

SARF better roads

South African Road Federation

2

Thoughts about change

©Mervyn Henderson Consulting

"You can't use an old map to explore a new world."
"We cannot solve our problems with the same thinking we used when we created them

— *Albert Einstein* —

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete."

— *Buckminster Fuller* —

American architect, systems theorist, author, designer, inventor, and futurist

"If the rate of change on the outside exceeds the rate of change in the inside, the end is near."

— *Jack Welch* —

CEO General Electric

3

About excellence

©Mervyn Henderson Consulting

Aristotle

Excellence is never an accident. It is always the result of high intention, sincere effort, and intelligent execution; it represents the wise choice of many alternatives - choice, not chance, determines your destiny.

AZ QUOTES

Aristotle 384 - 322 BC

4

South African Context

©Mervyn Henderson Consulting

- **Overview**
  - This section provides the context for the implementation of Asset Management in South Africa
- **The Road Maintenance Backlog in South Africa**
- **SABITA Roads Review 2020**
- **Challenges faced by road authorities**

The Road Maintenance Backlog in South Africa

©Mervyn Henderson Consulting

- **D Ross & M Townshend SATC 2019**
  - 'The estimated road maintenance backlogs are immense, particularly within the provincial and municipal networks.'
  - 'The consequences are provincial and municipal road rehabilitation backlogs that amount to more than 6 and 8 times what provinces and municipalities respectively spent on road maintenance in 2017/18'
  - 'The magnitude of these backlogs means they are unlikely to be addressed through national transfers and subsidies, especially given the National Treasury's commitment to fiscal consolidation, which in the continued absence of notable economic growth must be primarily realised through savings and efficiencies in departmental expenditure.'
  - '… it is unrealistic from a finance and resource perspective to alleviate a R416,6 billion maintenance backlog over a relatively short time horizon'
  - '… the NDOT's (2018) policy position that provinces and municipalities should absorb unproclaimed roads within their networks may exacerbate the road maintenance backlog by between R105,5 billion to R461,7 billion
  - '… many of the proposed and available funding mechanisms are not uniformly applicable across the road authorities, so either some authorities (most likely rural municipalities) must remain under-funded or complex ring-fencing and inter-governmental revenue sharing agreements are required

The Road Maintenance Backlog in South Africa

©Mervyn Henderson Consulting

- 'One of the obvious implications for road investment policy is that authorities are now forced to prioritise their road maintenance schedules'
- 'Within this context of severely limited resources, it is vital that authorities allocate their budgets towards roads that protect citizen's constitutional basic access rights and maximise potential economic growth'
- 'Without effective prioritisation, it is possible that one or even both objectives may be severely harmed'
- 'Authorities can also use prioritisation tools to identify and unproclaim unproductive roads, thus minimizing maintenance demand and limiting the contingent liability posed by unproclaimed roads'

- **The backlog has grown since 2018, and the COVID-19 crisis has made the funding situation significantly more challenging**
- **The only way of funding shortfalls is 'savings and efficiencies in departmental expenditure'**
- **Surely this is a clarion call for implementing good Asset Management?**

7

SARF better roads

South African Road Federation

7

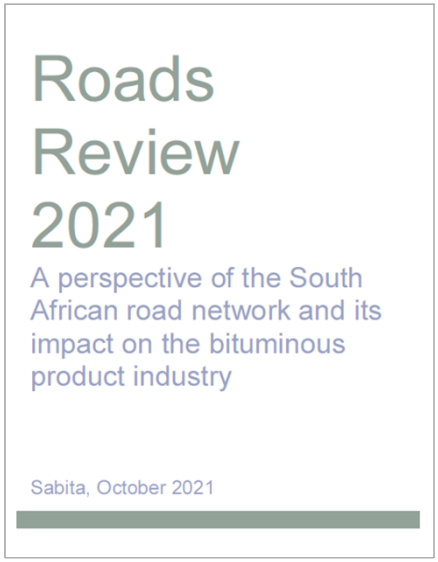
SABITA Roads Review 2021

©Mervyn Henderson Consulting

- **A perspective on revenues**
  - The Road Transport medium-term expenditure estimates are R34,166 billion for 2021/22, R43,363 for 2022/23 and R35,796 billion for 2023/24
- **SA road network**
  - The SA road network in 2018 is shown in the table (Ross)

The South African road network (km)

Authority	Paved	Gravel	Total
Provincial (9)	48 945	173 732	222 677
National	22 197	0	22 197
Metro (8)	51 682	14 461	66 143
Municipalities	40 648	266 416	307 064
Total proclaimed	163 472	454 609	618 081
Unproclaimed roads	-	131 919	131 919
TOTAL	163 472	586 528	750 000



8

SARF better roads

South African Road Federation

8

SABITA Roads Review 2021

©Mervyn Henderson Consulting

- **A perspective on road condition**
  - Since 1991, there has been a steady decline in the condition of the SA road network – especially at provincial and municipal level – for a number of reasons, ranging from curtailed allocations to roads in the past to ongoing shrinking capacity in the public sector resulting in inefficiencies in delivery
  - National roads
    - Compared to 2017/18, the pavement condition in 2020/21 shows a downward drift, with lower percentages in the good and very good categories
    - The proportion of roads in poor to very poor condition has increased steadily since 2017/18. In that year this proportion was 3.5% compared to 6.4% in 2019/20 – nearly double that value
  - In 2017, 32% of paved provincial fell within the poor or worse class – not near international norms
  - *The fact that this data has not been updated from 2017 is concerning (my comment)*
  - About half of the country's gravel road network was in poor or worse condition in 2017
    - It is evident that the upkeep of the provincial gravel road network poses challenges to the road authorities
- **A perspective on expenditure**
  - Expenditure on Provincial roads is likely to remain nearly static over the MTEF
  - Allocations to SANRAL are complex with cross – subsidisation from non-toll to the toll portfolio and compensation for reduced toll income
  - Estimated expenditure in all metros shows nominal growth in the region of 11% per annum during the MTEF, mainly as a result of a growth in capital works
    - It is noticeable that most of this increase came from one metro and is a jump from R255 million in 2021 to R6,757 billion in 2022 and R7 billion in 2023
    - Such a massive increase will not be possible to deliver

Implementing good Asset Management is vital for maintaining the road network

9

SARF better roads

South African Road Federation

9

Challenges faced by road authorities

©Mervyn Henderson Consulting

Funding constraints	Available funding has been constrained over decades and the demands on the fiscus due to the COVID-19 pandemic has constrained funding even more
Capability constraints	Available, capable professional staff have been constrained over decades. Changes to Public Service rules enable appointment of professional staff with inadequate experience
Customer expectations	Communities continue to seek higher levels of service and unplanned failure of a system impacts on economic growth. As new products and new technology offer more services, such as Smart Phones, they expect more from their infrastructure providers. Community demand increased accountability for effective & efficient spending of public funds
New technology & services	Road infrastructure is becoming more sophisticated, more complex, and more dependent on technology. Advances in vehicle technology and expectations for new services, e.g. driverless cars
Increasing demand	The usage of road assets is increasing, combined with a greater demand for safety, reliability and value-for-money
Risk and resilience	The infrastructure continues to get older, posing a risk to life and safety, with reducing resilience to the effects of the environment, particularly the effects of climate change and natural disasters. Any form of asset deterioration represents the consumption of the economic capital invested in the assets and a higher risk of failure
Conflicting priorities	The need to balance diverse and conflicting expectations and priorities of stakeholders
Crime	The rise of organised crime on construction sites with blackmailing, intimidation and demands for a percentage of the work impede and even could stop construction and maintenance projects

10

SARF better roads

South African Road Federation

10

An Overview of Asset Management

©Mervyn Henderson Consulting

- **Overview**
  - This section introduces Asset Management and describes the influences, drivers and key concepts
  - The abbreviation AM is used in place of Asset Management
  - Two case studies are provided

Topics

- **What is Asset Management?**
- **Purpose of AM**
- **AM the movie**
- **What does AM do?**
- **Managing Assets in the context of Asset Management**
- **Some questions that AM addresses**
- **Who does AM?**
- **Fundamentals of AM**
- **Historical development of AM**
  - Industry standards
  - Publications, guidelines & requirements including South African legislation & manual

Topics

- **Core Business Model and Decision Support System**
- **Features of an AM business approach**
- **The Total Transportation AM Process**
- **The Need for AM**
  - Business case
  - Operational effectiveness
  - Risk management
  - Compliance
  - Integration
- **Typical benefits**
- **What does good AM look like?**
- **The right environment for AM to flourish**
- **Key AM Concepts**

What is Asset Management?

©Mervyn Henderson Consulting

- **ISO 55000 defines asset management (AM) generically as**
  - 'A coordinated activity of an organisation to realise value from assets'
- **2018 Austroads defines AM**
  - 'A systematic process of effectively maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, & providing the tools to facilitate a more organised and flexible approach to making decisions necessary to deliver optimal community benefits'
- **Other definitions, e.g. UK Roads Liaison Group, AASHTO, PAS 55, OECD, IIMM**
- **AM translates the organisation's objectives into asset-related decisions, plans & activities, using a risk-based approach**

- **AM is not**
  - The domain of a single department or group of people in an organisation that looks after maintenance
  - A 'one size fits all' approach
  - Just a tool or 'an end in itself'
- **AM is a 'whole-of-organisation' approach to creating & maintaining assets which deliver the services valued by the authority's customers in the most cost-effective & efficient manner**
- **AM processes are important in 'institutionalising' the focus on customers and reminding everyone involved that what they do supports the achievement of these outcomes**

Purpose of AM

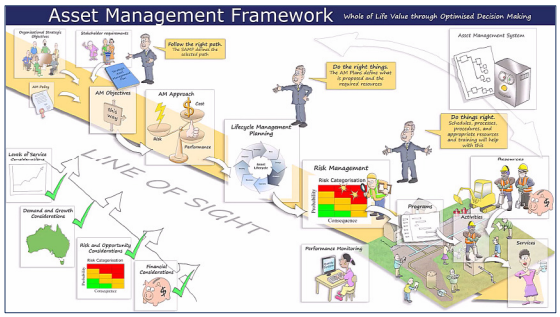
©Mervyn Henderson Consulting

- **To provide the required levels of service at the lowest lifecycle cost to present and future road users and customers, using a 'whole-of-agency' approach to the acquisition and management of physical assets**
  - It is important to remember that the key focus should be on conducting AM well, i.e. as good business practice

What is Asset Management?

©Mervyn Henderson Consulting

- **Institute of Asset Management video at:**
  https://www.youtube.com/watch?v=el0A8js4vK8
- **Asset Management**
  The Movie – next slide



Asset Management - The Movie

©Mervyn Henderson Consulting

Click on the box to the right to activate the controls and then click on the button ▶ to start the video clip

YouTube link: https://www.youtube.com/watch?v=FNntwJ0jisw

Distributed free by Barnewell Infrastructure Management & Martin Coates https://barnewall.com.au/

15

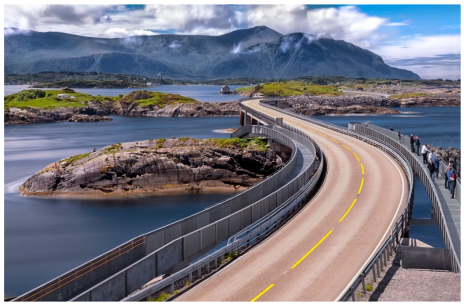
South African Road Federation

15

What does Asset Management do?

©Mervyn Henderson Consulting

- **It converts the fundamental aims of the organisation into the practical implications for choosing, acquiring (or creating), utilising (operating) and looking after (maintaining) appropriate assets to deliver those aims**
- **It does so while seeking the best total value approach – the optimal combination of costs, risks, performance and sustainability**
- **AM gathers together the knowledge & tools an organisation needs to use for its assets to achieve the organisation's purpose**
- **These techniques & processes allow such an organisation to demonstrate that it is managing its assets optimally – often of great interest to many stakeholders, whether owners, customers, regulators, neighbours or the general public**



16

South African Road Federation

This Photo by Unknown Author is licensed under CC BY

16

Managing Assets in the context of Asset Management

©Mervyn Henderson Consulting

- **The question is '*Do you mean Asset Management or Managing Assets?*'**
  - ISO/TC 251 WG4 note that '*People and organisations have been caring for assets since mankind first invented tools. Over the years we have derived entire disciplines to help define the best ways to care for those assets through their lives and as such we have been Managing Assets for ever. With the advent of the formal discipline of Asset Management some 20 years ago there has been a development of structured approaches to assure stakeholders that those care activities are focused on deriving value for the organization and not just promoting 'gold-plated' care arrangements. In this pursuit Asset Management and Managing Assets are not alternatives.'*
- **Managing Assets (things you do to assets) can be done with or without a structured organisational strategy and context**
  - An organisation gains more value from Managing Assets within a context of organisational purpose and strategy that steers this activity (and AM)
- **A Managing Assets focus**
  - Lifecycle activities & asset care – availability, reliability, dependability & safety
  - Asset location, condition, life extension and/or interventions
  - Asset databases, systems & IT, & performance
  - People, skills and work management
  - Budgets & key performance indicators/ cost of maintenance & current performance

17

SARF better roads

South African Road Federation

17

Managing Assets in the context of Asset Management

©Mervyn Henderson Consulting

- **AM has a broader focus than Managing Assets, encompassing many organisational levels & applying to all functions**
  - The terms and concepts are explained in ISO 55000 'Asset Management', which shows how the application of broader Asset Management approaches can help you extract most value for stakeholders
- **An Asset Management Focus**
  - The purpose of your organisation and what assets does it need – and why
  - Value, purpose and long term outcomes
  - Risk and context, e.g. markets / climate / regulation
  - Holistic approach to different funding streams, e.g. CAPEX and OPEX
  - Collaborative behaviours – breaking down silos
  - How assets contribute to organisational value

18

SARF better roads

South African Road Federation

18

Managing Assets in the context of Asset Management

©Mervyn Henderson Consulting

When you listen, what are others really focused on?	
Managing Assets	**Asset Management**
Your colleagues are focused on • Asset data, location and condition • Current KPIs • Departmental budget	**Your colleagues are focused on** • Information supported by decisions (strategic context and related to customer needs) • Strategies to select and exploit assets over their lifecycles to support business aims • Collaboration across departments to optimise resources allocated and activities
Your stakeholders are focused on • Costs • Current performance • Response to failures/ maintaining function	**Your stakeholders are focused on** • Triple bottom line and value • Clarity of purpose of the organisation • Focus on impact of activities on organisation's objectives
Your top management is focused on • Short term gain/ loss • Departmental/ individual performance • Savings, especially OPEX	**Your top management is focused on** • Long term value for the organisation • Developing competence and capability across workforce • Business risks understood and mitigated
Your suppliers are focused on • Short term contracts and performance • Service level agreements are focussed on contract specifications	**Your suppliers are focused on** • Long term contracts &/ or partnering relationships in support of client value & objectives • Understanding client strategy and needs in 5-10 years

Some questions that AM addresses

©Mervyn Henderson Consulting

Perspective	Typical Questions
Organisation & governance	• How do I get my organisation to embrace asset management? • What is the value we get from strategic asset management? • How do I know that what you're telling me is best practice? • Can you demonstrate effective/efficient management of public assets?
Outcomes, objectives & KPIs	• Noting that KPIs are made up of: (a) performance measures, and (b) targets, how do I manage the different focus of 'achievable' vs 'aspirational' targets? • How does a performance framework cater for the different uses of KPIs such as assurance reporting, investment decision-making and performance monitoring? • How do I link objectives, KPIs and programme/ project planning to ensure a 'line of sight'? • How do I link outputs to outcomes?
Funding & prioritisation	• How should limited funding be distributed between asset types, regions, etc.? • What level of funding is required to maintain the network to a given Level of Service? • How will asset management help make portfolio-wide investment decisions? • Why do the roads elsewhere look better than ours?
More technical	• How should I use condition data to assist my decision-making? • Are there any practical examples of implementing theory? • Why don't people want to do what our work shows they should?

Who does AM?

©Mervyn Henderson Consulting

- **Its vital to remember that people do AM and therefore people, and their knowledge, competence, motivation and teamwork have a huge influence on AM outcomes**
- **Tools and technologies are important, but**
  - Engagement of the workforce
  - Clarity of leadership
  - Collaboration between different departments and functions are the real differentiators of a leading AM organisation
- **AM engages at multiple levels within organisations and their supply chains**
- **It requires people from different functions and disciplines to *work more closely* than they may have done**
- **It also includes contributors from across the organisation, such as**
  - Business strategy, risk & assurance, planning & analytics, engineering, design, construction, operations, maintenance, quality, finance, information systems, safety and security, and environmental awareness
- **As the inter-dependence between activities increases, teamwork & collaboration becomes critical for organisational effectiveness**

21

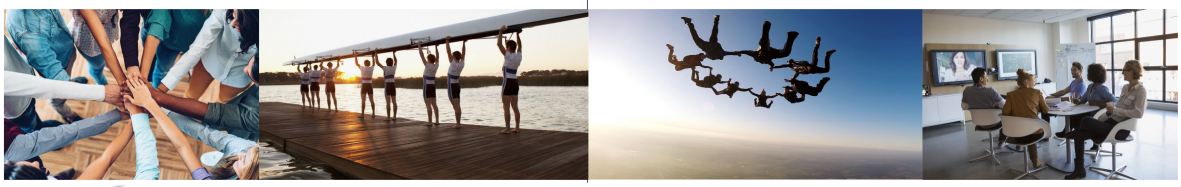
South African Road Federation

21

Who does AM?

©Mervyn Henderson Consulting

- **AM is a team effort**
  - The AM team requires executive sponsorship
- **At the enterprise or divisional level, the team concept provides a broad base of knowledge & skill to support AM, and it allows representation across the asset lifecycle and across the organisation**
  - No matter the size of the organisation, the team should be representative of the organisation and have executive sponsorship
- **The concept of 'line of sight' means that everyone who touches or influences what happens to an asset is involved in AM**
  - This brings into scope functional teams at the production level
  - It also means that teams often include members from outside the core of the organisation, including suppliers, consultants and in some cases customers
- **An AM system (AMS) can enable all those involved in AM activities to understand how their roles relate to those from other functions and/or levels that are covered by the AMS**



22

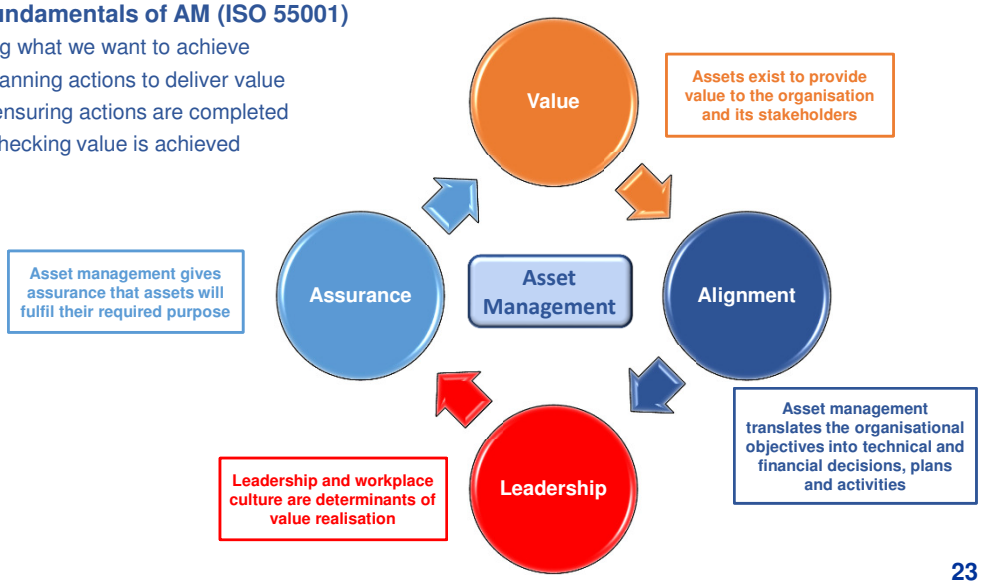
South African Road Federation

22

Fundamentals of Asset Management

©Mervyn Henderson Consulting

- **There are four fundamentals of AM (ISO 55001)**
  1. **Value** – knowing what we want to achieve
  2. **Alignment** – planning actions to deliver value
  3. **Leadership** – ensuring actions are completed
  4. **Assurance** – checking value is achieved



23

South African Road Federation

23

Fundamentals of Asset Management

©Mervyn Henderson Consulting

- **Value**
  - Means knowing what we want to achieve
  - Might be tangible & financial, or not
  - Is multi-faceted
  - Is a whole of life proposition
  - Must be understood to make good AM decisions
  - Is determined by internal & external stakeholders

Assets exist to provide value to the organisation and its stakeholders

- **Alignment**
  - Means planning to deliver value
  - Results in clear, achievable, resourced actions
  - Requires
    - Horizontal & vertical traceability of value
    - Information, decision tools & processes
    - Cross-functional integration & coordination

Asset management translates the organisational objectives into technical and financial decisions, plans and activities

- **Leadership**
  - Means ensuring the actions are completed
  - Starts at the very top
  - Drives the workplace culture over time
  - Requires
    - Commitment & discipline at all levels
    - An adequate, competent workforce
    - Clear roles/ responsibilities/ authorities

Leadership and workplace culture are determinants of value realisation

- **Assurance**
  - Means checking that value has been achieved
  - Covers
    - Action completion and effectiveness
    - Assets, AM and the AM system
  - Includes measures (KPIs, audit), analysis and continuous improvement

Asset management gives assurance that assets will fulfil their required purpose

- **More on these topics later…**

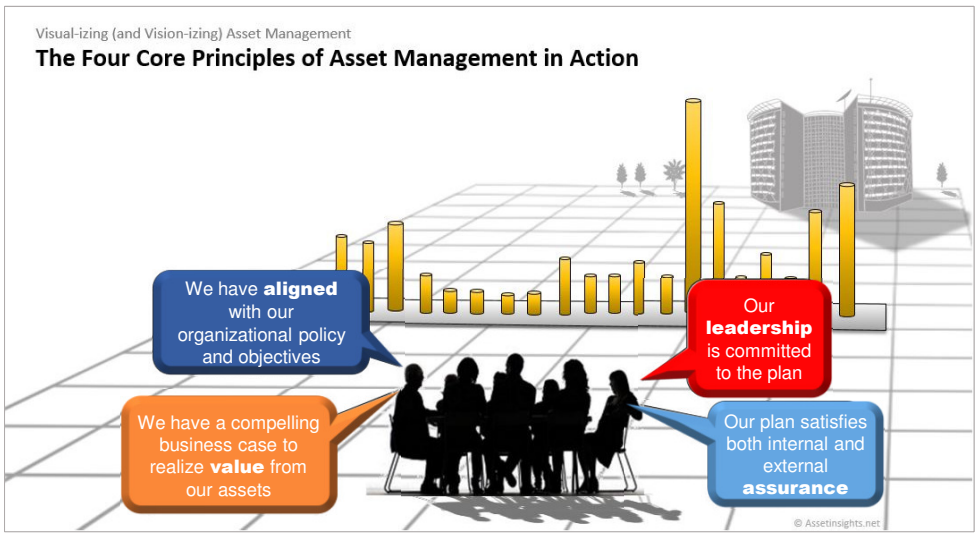
24

South African Road Federation

24

Fundamentals in action

©Mervyn Henderson Consulting



©Assetinsights.net

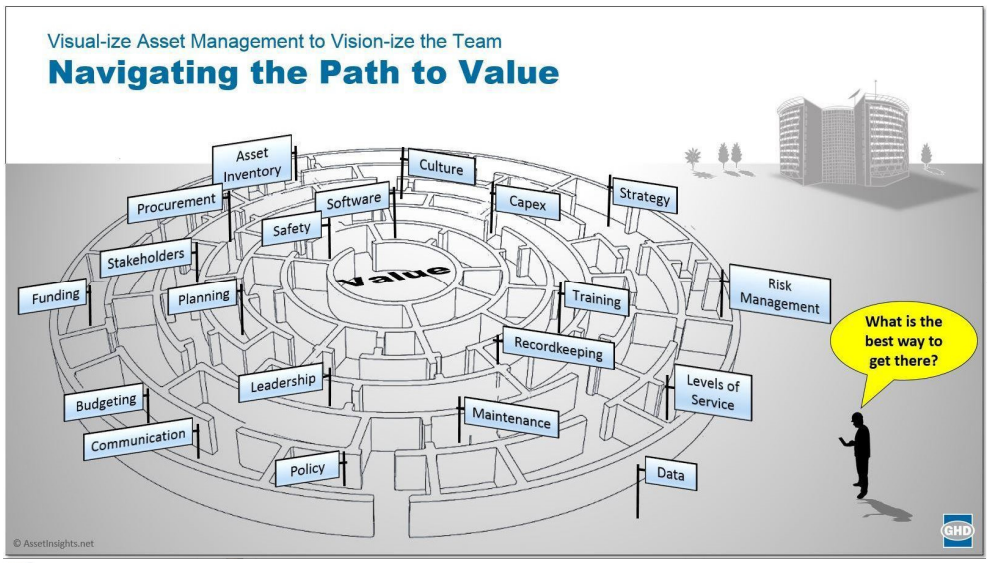
25

South African Road Federation

25

Which path to value?

©Mervyn Henderson Consulting



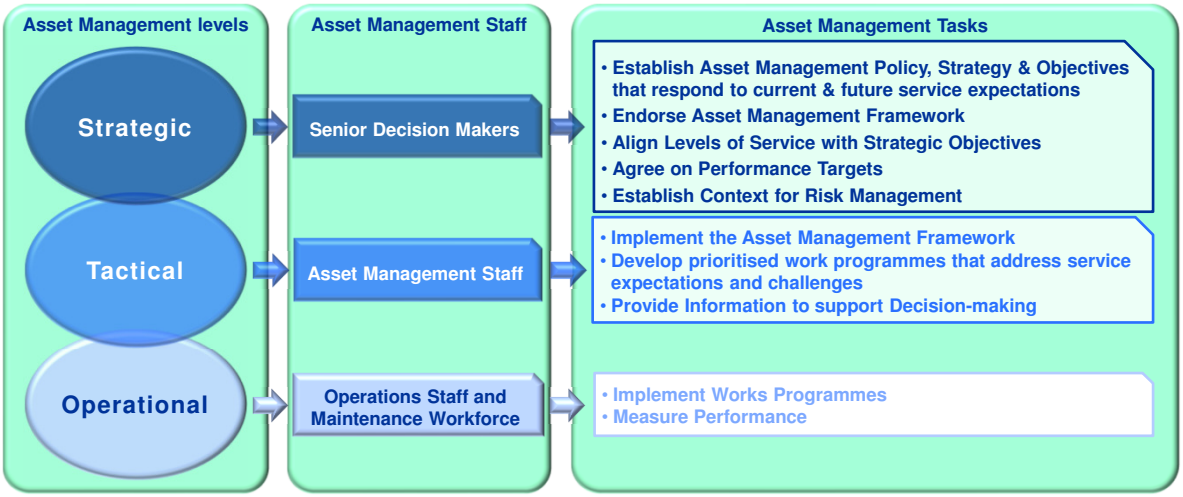
26

South African Road Federation

26

3 Levels of Asset Management

©Mervyn Henderson Consulting



Adapted from Highway Infrastructure Asset Management Guidance Document Department for Transport, UK, 2013 and Austroads Guide to Asset Management - Overview Part 1: Introduction, 2018

Historical development of Asset Management

©Mervyn Henderson Consulting

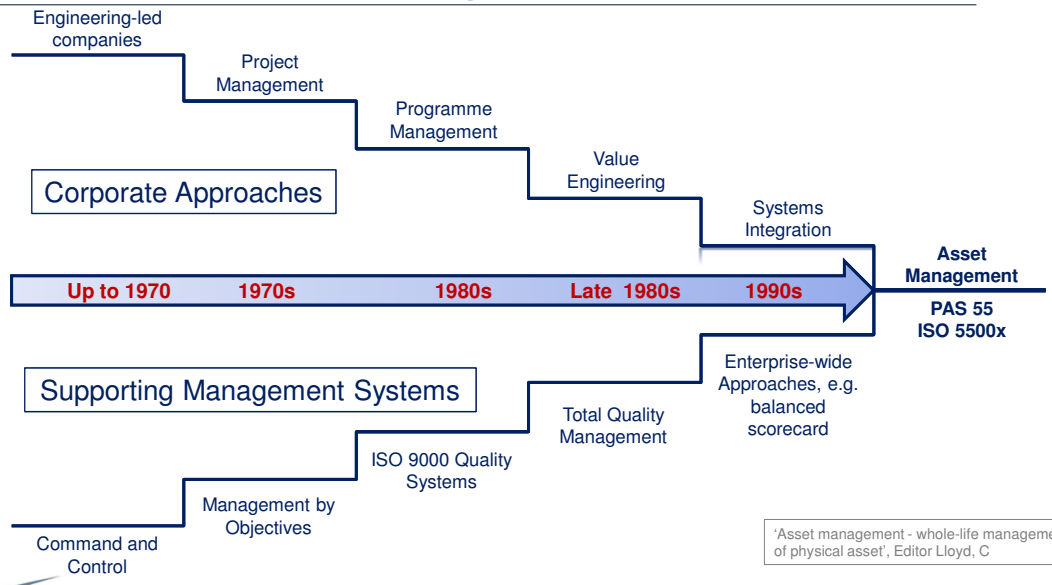
- **Managing assets is not new**
  - People have been managing assets for thousands of years, sometimes not very successfully…
- **What has changed is the cumulative recognition of what good AM involves**
  - The optimisation of cost, risk performance, resources and benefits over the whole asset life (time), within any absolute constraints
- **AM has evolved over several decades and has learned from and incorporated other disciplines and techniques**
- **Although the beginnings stem from the industrial age, the realisation commenced in the 1970s that the effective management of assets involved more than simply reactive maintenance**
- **There was a gradual evolution of different corporate approaches to the management of the business, and the management systems and frameworks that have supported them**

Pont du Gard, Provence, France. Photo: ©MG Henderson

Saint-Bénézet Bridge, Avignon, France. Photo: ©MG Henderson

Evolution of Asset Management for 6+ decades

©Mervyn Henderson Consulting



'Asset management - whole-life management of physical asset', Editor Lloyd, C

29

South African Road Federation

29

Early attempts in the UK, Australia & New Zealand

©Mervyn Henderson Consulting

- **1970 UK Department of Industry established the Committee for Terotechnology (from the Greek 'to care for')**
- **1975 The committee published 'Teratechnology. An introduction to the management of physical resources'**

  'A combination of management, financial, engineering, building and other practices applied to physical assets in pursuit of economic life cycle costs'
- **1977 BSI BS3843 'Guide to Terotechnology (the economic management of assets)'**
  - Last updated in 1992

- **1984-87 South Australian public sector 'True cost of services' & 'Cost and timing of asset replacement' resulting the 1st government task force on AM**
- **1988 Nick Geiner, new Premier of NSW, stated that 'the government should be run as efficiently as the private sector'**
  - 1st NSW Water Industry seminar on AM
  - 1993 1st NSW Public Sector 'Total Asset Management Manual'
  - 2006/2009 Austroads 'Asset Management Guide'
- **1995 New Zealand Asset Management Support Group established (NAMS)**
  - 2002 NAMS International Infrastructure Management Manual published

30

South African Road Federation

30

…and in North America

©Mervyn Henderson Consulting

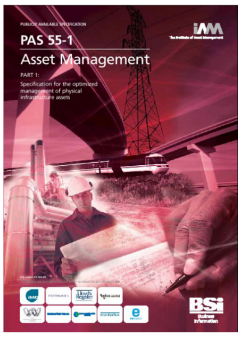
- **1988 US National Council on Public Works 'Fragile Foundations' report**
  - 1999 US DoT 'Asset Management Primer'
  - 2000 ASTM Property Management Systems guidelines
  - 2002 AASHTO Asset Management Guide
  - 2011 AASHTO Asset Management Guide – A Focus on Implementation
- **Moving Ahead for Progress in the 21st Century (MAP-21)**
  - A streamlined, performance and outcome-based surface transportation programme
    - Asset management is a key enabler
    - Required to develop risk-based asset management plans; or federal funding cut

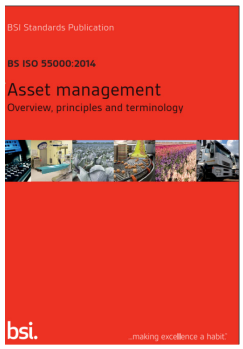
- **2004 Canadian NRCC publishes 1st 'Municipal Infrastructure Asset Management' guide**
- **2009 PSAB 3150 requirement of public assets' amortized valuation**
- **Canadian Asset Managers Network (CNAM) founded**

Industry Standards

©Mervyn Henderson Consulting

- **2004 BSI PAS 55 published '*Optimized management of physical assets*'**
  - Part 1: Requirements specification
  - Part 2: Implementation guidance
- **ISO 55000/1/2 published February 2014**
  - ISO 55000 Overview, principles and key terms in Asset Management
  - ISO 55001 Asset management: management systems - requirements
  - ISO 55002 Guidance for implementation of ISO55001, revised in 2018
  - Now SANS ISO 55000:2016 – Asset Management
- **ISO 17021 part 5 Asset Management competency requirements for auditors of ISO 55001**





Some publications, guidelines and requirements

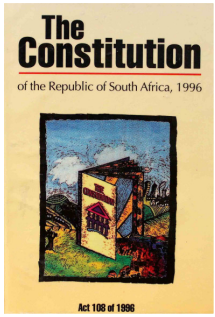
©Mervyn Henderson Consulting

Nationalities	Publications, guidelines and requirements
Australasia	• Austroads Guide to Asset Management • Australian Transport Assessment and Planning (ATAP) Guidelines
South Africa	• TMH 22 – Road Asset Management Manual (draft) • Mandatory requirements of Government Immovable Asset Management Act 19 of 2007
United Kingdom	• Institute of Asset Management (IAM) publications • Transport Research Laboratory (TRL) publications • Mandatory requirements, in particular the Highways Maintenance Efficiency Programme (HMEP)
USA	• American Association of State Highway & Transportation Officials (AASHTO) Asset Management Guides • Federal Highway Administration (FHWA): various publications, guidelines and requirements • Transportation Research Board (TRB): various publications • Mandatory requirements, in particular the 2012 Re-Authorization Bill and Moving Ahead for Progress in the 21st Century (MAP-21)
Other international peak bodies	• World Road Association (PIARC) Asset Management Manual, publications and guidelines • Institute of Public Works Engineering Australia International Infrastructure Management Manual & other publications and guidelines • Global Forum on Maintenance and Asset Management (GFMAM) Asset Management Landscape • Asset Management Council, Australia: various publications

South African Asset Management Legislation

©Mervyn Henderson Consulting

- **Constitutional mandate to manage the road network**
- **Government-wide immovable asset management (GIAM) policy**
  - Approved by Cabinet on 17 August 2005
  - The objective of the policy: to introduce a government-wide immovable asset management framework which will be implemented through the promulgation of the GIAM Act
  - Applicability of the policy, which includes provincial government departments
- **Conclusions**
  - Immovable assets have to be managed throughout their lifecycle within a framework of cost effectiveness, efficiency and reduced risk



SA Asset Management Legislation & TMH 22

©Mervyn Henderson Consulting

- **Government-wide immovable asset management Act covers**
  - Principles of immovable asset management
  - Immovable asset management plan, its contents and submission to Treasury, revision and amendment annually
  - Compliance, which is mandatory. A standard issued by the Minister in terms of this Act is compulsory. The Minister may incorporate any guideline issued in terms of this Act or any best practice or part thereof into that standard; and
  - Offences and penalties for non-compliance with the Act
- **Treasury adopted TMH 22: Road asset management manual (draft) as the best practice guideline for production of the strategic Road Asset Management Plan (RAMP)**
  - TMH 22 was informed by the draft ISO 55001 (2014) before it was published

35

South African Road Federation

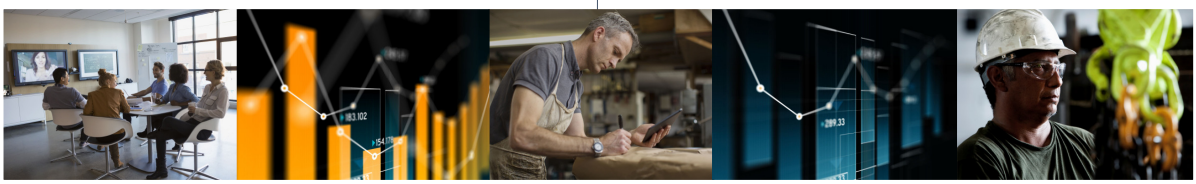
35

AM as a Core Business Model & Decision Support System

©Mervyn Henderson Consulting

- **AM is a '<u>whole of organisation</u>' business approach configured to the needs of both the organisation and its customers, and which includes decision support systems and business processes**
- **AM processes are important in focussing on customers and reminding everyone involved that what they do supports the achievement of these outcomes**

- **Key concepts**
  - Recognises the needs of customers
  - Whole-of-organisation approach
  - Sequence of integrated business processes
  - Not a 'one size fits all' approach



36

South African Road Federation

36

Features of an AM business approach

©Mervyn Henderson Consulting

- **Recognising Customer Needs**
  - Road agencies provide services to a wide range of customers, many of whose needs and expectations differ or are in conflict
  - These groups typically include private motorists, tourists, commercial users, heavy vehicle drivers, cyclists, pedestrians, and utilities with their own infrastructure in the road corridor, etc.
- **Whole of Organisation Approach**
  - AM is a core business activity that involves most functions across an organisation, a theme that is emphasised in ISO 55001
  - Departments/ business functions that should be involved with AM include
    - Planning; Capital Projects; Operations and Maintenance; Finance; Human Resources; Information Technology; Customer Services; Risk and Quality
- **Sequence of Integrated Business Processes**
  - AM is a sequence of processes aimed at achieving a road agency's goals and objectives
    - These processes are termed an 'AM cycle' (IIMM Guide) and a 'conceptual model' (IAM). They are complementary and are further discussed in relation to roads assets
  - These processes are about
    - Understanding and defining what services the assets are to deliver – both now and within the future planning horizon
    - Determining which strategies will be the most effective in terms of delivering the services, considering both lifecycle costs and risk
    - Supporting capabilities, processes and tools to enable effective planning and decision-making

37

SARF better roads

South African Road Federation

37

Features of an AM business approach

©Mervyn Henderson Consulting

- **AASHTO states a AM perspective**

  '*involves the collection and integration of multiple practices into a coherent and managed whole, the establishment of new approaches to AM problems, and the linkage of business processes to measures of an agency's mission and goals*'

- **Agencies vary widely in the effectiveness of business processes, particularly the ability to maximize the accomplishment of the agency mission using AM**
- **There is no 'one size fits all' AM solution for an agency**

- There are many reasons why the appropriate level of AM practice varies among/ within organisations
  - Agencies vary in their level of AM maturity, knowledge, experience, political and physical environment, & resources
  - Some aspects, such as consultation with customers over levels of service, may be new to an agency
  - Agencies may wish to integrate other aspects, such as demand forecasting, risk management, asset criticality, asset valuation, & cost optimisation
  - The characteristics of different transport networks vary considerably, for example
    - The needs of a sparsely populated rural area may differ significantly from those of a major metropolitan area or of an interprovincial system

38

SARF better roads

South African Road Federation

38

The Total Transportation AM Process

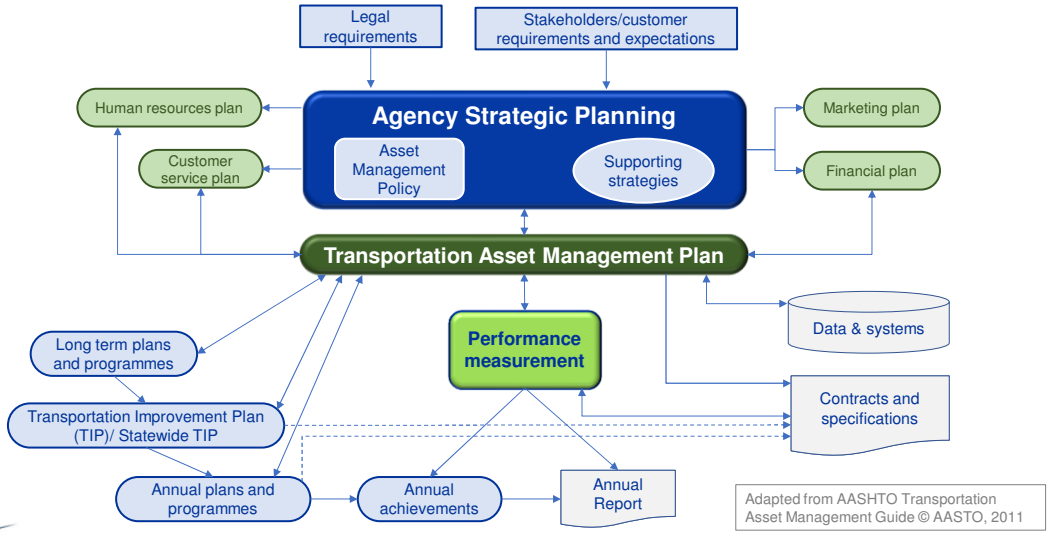
©Mervyn Henderson Consulting

- **AASHTO suggests that the Transportation Asset Management (TAM) needs to be embedded in the business planning processes of an agency, from strategic through tactical to operational planning**
- **TAM includes the development of AM policy, an organisational statement that can establish the framework for securing alignment and providing direction for AM planning**
  - It extends through producing and using the TAMP to daily operation of facilities and reporting on the achievement of programmes and outcomes
  - TAM can be visualized as a sequence of integrated inputs, business processes, & outputs as illustrated in the figure in the next slide
- **TAM is therefore wider than a simple focus on maintaining or preserving assets**
  - TAM follows a path from the inception of the need for an asset to its creation, operation, maintenance, preservation, replacement, reconstruction, improvement, and possible eventual disposal
  - TAM is more than just tools, but rather, it represents the integration of tools with organisation, leadership, people, and business processes
  - It incorporates other important processes such as risk management and sustainability

The Total Transportation AM Process (AASHTO)

©Mervyn Henderson Consulting

AM drivers and relationships



Adapted from AASHTO Transportation Asset Management Guide © AASTO, 2011

The need for Asset Management

©Mervyn Henderson Consulting

- **Roads and associated infrastructure are vital links in the chain of communications providing access & mobility for communities & industry**
- **Roads provide a means for safely and efficiently moving goods and services, enabling economic growth and prosperity**
- **The substantial investment in infrastructure justifies robust, long-term management practices**
- **Effective stewardship – the responsible planning and management of resources – is**
  - Essential to help ensure public safety
  - For retaining the value and serviceability of these assets for future generations, and
  - For providing best value to users and investors

SARF better roads

41

South African Road Federation

41

The Business Case for Asset Management

©Mervyn Henderson Consulting

- **A traditional business case for AM focusses on cost savings through reduced operations & maintenance costs, along with improved productivity through increased reliability & availability**
- **Other elements that may prove equally important**
  - Effective management of value, risk and liability
  - Good governance & a good understanding & control of assets can improve stakeholder confidence
  - Effective AM improves both personal safety & process safety, reducing the risk of injury & catastrophic events
  - Assets contribute to the reputation & image of the organisation

  - Improved understanding of asset performance through improved data & analytics
  - The management of outsourced services is more effective with AM in place
  - The projected profit & loss account & cash flow statement
  - Safety, health & security programmes require current asset knowledge
- **A key role of AM is to assure the delivery of value, in line with**
  - Agreed performance
  - Return on investment and/ or Return on Net Assets
  - Required residual risk profile – safety, asset reliability, reputation, etc.

SARF better roads

42

South African Road Federation

42

Organisational Effectiveness case for AM

©Mervyn Henderson Consulting

- **AM provides the means to improve aspects of organisational effectiveness**
  - Boards of Directors, and political office bearers will use it as a tool for assurance
  - Chief Executive Officers find it to be a powerful tool in resolving conflicts among divisions over resource allocation
  - Chief Financial Officers will use it as a source of data to improve integration and performance
  - Public Relations Officers expect to use it as a way to improve image & reduce or deflect exposure from incidents
  - Asset related managers see it as the way to improve their influence and budget
  - Operations & Maintenance workers expect it to help them improve working conditions & job satisfaction
  - The majority of employees favour sound environmental policies & practices related to asset maintenance

Improved Risk Management

©Mervyn Henderson Consulting

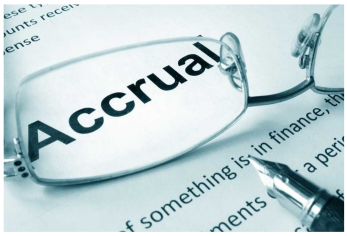
- **An organisation's assets are often the leading edge of its exposure to external risk**
  - Bridges and roads are exposed to environmental risks from weather and climate change
  - Road infrastructure is exposed to increasing safety and security risk
  - Resource depletion or constraints
  - Poor economic conditions
- **Risk also arises from internal circumstances, including the construction, operation, maintenance and disposal of assets**
- **AM's risk based approach supports organisations in strengthening their resilience to external risks, enabling better control & mitigation of risks that can arise from the management and operation of assets**
  - Where assets have been neglected, these can often be more appropriately managed by systematically assessing and taking account of their potential risk to the organisation
  - This approach is particularly useful for assets nearing the end of their useful life

Photo: ©MG Henderson

Supporting compliance with Financial Reporting Obligations

©Mervyn Henderson Consulting

- **A technically and financially integrated AM system allows compliance with the general features of Generally Recognised Accounting Practices**
  - This enables organisations to meet their financial reporting objectives
- **Accrual accounting**
  - Requires organisations to understand the relationship between their operational and capital expenditures (related to physical assets) and the delivery of the required value to that organisation
  - Requires transactions to be recorded at the time they are agreed, rather than at the time that cash of equivalents change hands
- **Materiality and aggregation**
  - Every material class of similar items has to be presented separately
  - Component accounting is mandatory – if fixed assets comprise two or more major components with substantially different economic lives, each component should be accounted for separately for depreciation purposes



Source: Corporatefinanceinstitute.com

A Framework to integrate other standards

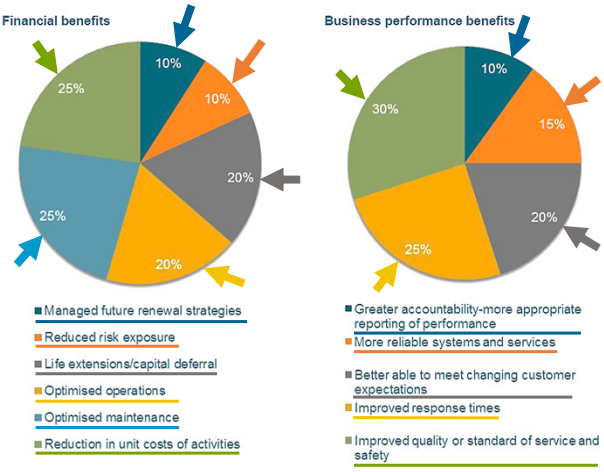
©Mervyn Henderson Consulting

- **An organisation may need to use and apply thousands of technical standards, codes, and industry guidelines**
  - These standards address the performance requirements and issues related to AM
- **AM does not replace other existing disciples, but provides a framework where these can be used more effectively to deliver value by helping to describe and communicate the context in which the other disciplines can be applied and integrated, e.g.**
  - Risk management (ISO 31000)
  - Systems engineering (ISO/IEC 15288)
  - Quality management (ISO 9001)
  - Reliability engineering (ISO 2394), etc.
  - Other internal business/ management systems, e.g. financial, health & safety or risk management

Case Study: Business Case for AM

©Mervyn Henderson Consulting

- **Water Services Association of Australia**
  - The following information is based on the outcomes of international surveys undertaken by GHD Pty Ltd from various sectors and recorded in GHD's corporate knowledge database (unpublished)
  - The nature of the financial and business performance benefits achieved through the implementation of AM programmes is shown in the pie charts on the right



'Effective implementation of an asset management improvement program', Teske, C, Proceedings of the ICOMS asset management conference, Gold Coast, Australia, 2011, paper 21, 12 pp

Typical benefits of AM according to ISO 55000

©Mervyn Henderson Consulting

Benefit	Examples
Improved financial performance	• Improving the return on investment and reducing cost, while preserving asset value and without sacrificing the short- or long-term realisation of organisational objectives
Informed asset investment decisions	• Using a consistent, documented, balanced-scorecard approach involving cost/benefit analysis on the lifecycle costs of both asset and non-asset solutions, including demand management • Having improved decision tools which consider costs and benefits of alternative solutions, prioritisation of investments and interventions. • Enabling the organisation to improve its decision-making and effectively balance costs, risk, opportunities and performance
Better managed risk	• Reducing risk exposure through application of a structured risk mitigation framework for assessing, quantifying and mitigating risks related to AM and service delivery • Reducing financial losses, improving health and safety, good will and reputation, minimising environment and social impact, can result in reduce liabilities such as insurance premiums, fines and penalties

Typical benefits of AM according to ISO 55000

©Mervyn Henderson Consulting

Benefit	Examples
Improved services & outputs	• Improving understanding of asset capabilities and their limitations in delivering or meeting service requirements • Assuring the performance of an asset can lead to improved services or products that consistently meet or exceed the expectations of customer and stakeholders
Demonstrated social responsibility	• Improving an organisation's ability to, for example, reduce emissions, conserve resources and adapt to climate change, enables it to demonstrate socially responsible and ethical practices and stewardship
Demonstrated compliance	• Transparently conforming with legal, statutory & regulatory requirements, & adhering to industry 'best appropriate practice' in AM standards, policies & processes
Enhanced reputation	• Gaining and enjoying an enhanced reputation by having the confidence of legal, statutory & regulatory authorities & the satisfaction of informed customers & stakeholders
Improved organisational sustainability	• Effectively managing short- and long-term assets maintenance and renewal requirements over the long term, including their expenditures and performance
Improved service efficiency & effectiveness	• Concentrating on understanding customer and stakeholder needs and desires. • Reviewing and improving processes, procedures and asset performance

Kubler-Dunning Curve

©Mervyn Henderson Consulting

- **The Dunning–Kruger effect is the cognitive bias whereby people overestimate their ability**
  - Some researchers also include in their definition the opposite effect for high performers: their tendency to underestimate their skills
- **People with low ability tend to overrate themselves because they do not see the qualitative difference between their performances and the performances of others**
  - This has also been termed the 'dual-burden account' since the lack of skill is paired with the ignorance of this lack
- **The Dunning–Kruger effect is relevant for various practical matters**
  - It can lead people to make bad decisions, such as choosing a career for which they are unfit or engaging in behaviour dangerous for themselves or others due to being unaware of lacking the necessary skills
  - It may also inhibit the affected from addressing their shortcomings to improve themselves
  - In some cases, the associated overconfidence may have positive side effects, like increasing motivation and energy (Wikipedia, accessed15 March 2022)
- **I sincerely hope this course in AM will fill the gap so that people do not overestimate their ability to understand and implement AM**
- **If you are fortunate enough to be a high performer, I hope that others will recognise your skills and make good use of them!**

What does good Asset Management look like?

©Mervyn Henderson Consulting

Sweating the assets?

Maintaining them?

Purchasing or creating the right assets?

51

South African Road Federation

51

Distinguishing characteristics of good AM

©Mervyn Henderson Consulting

- **Holistic and multi-disciplinary**
  - Looking at the whole picture, i.e. the combined implications of managing all aspects
  - AM crosses departmental & disciplinary boundaries & is focused on creating or increasing 'value' – whether this be tangible or intangible, financial or nonfinancial
- **Systematic**
  - A methodical approach, applied consistently and sustainably, promoting consistent, repeatable & auditable decisions & actions
- **Systemic**
  - Considering the assets in their systems context, and optimising the asset systems value
- **Risk-based**
  - Consideration of risks and liabilities is inherent in all decision-making
  - Focussing resources & expenditure & setting priorities, appropriate to the risks & associated costs & benefits
- **Optimal**
  - Seeking the best value compromise between competing factors, such as costs, risks, opportunities and performance over the asset lifecycle
- **Sustainable**
  - Considering the long term consequences of short term activities to ensure that adequate provision is made for the future requirements & obligations, e.g. economic or environmental sustainability, system performance, societal responsibility, etc.
- **Integrated**
  - At the heart of good AM lies the need to be joined-up
  - Recognising that interdependencies & combined effects are vital to success
  - This requires that a combination of all the above attributes are coordinated to deliver a joined-up approach & net value – the total jigsaw puzzle needs to work as a whole, & be more than the 'sum of the parts'

52

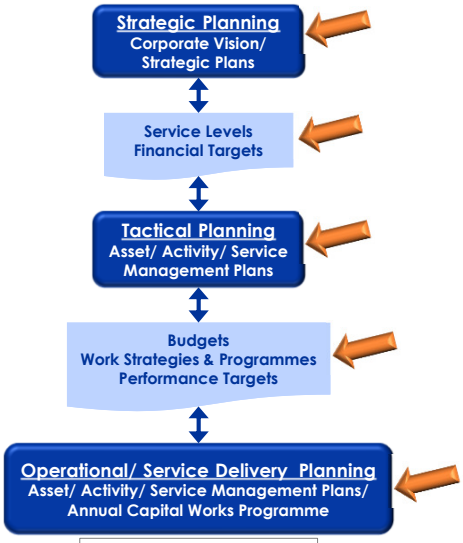
South African Road Federation

52

Distinguishing characteristics of good AM

©Mervyn Henderson Consulting

- **Integration *continued***
  - Good AM is characterised by strong coordination vertically across the organisation, from strategic to operational level – figure on right shows
    - The connections run from strategic planning, though Service Levels to Tactical Planning and through Budgets, work strategies & programmes and performance targets to Operational & Service Delivery Planning
  - Equally important is coordination across organisational boundaries to enable sharing of AM resources and expertise & coordination of strategies & programmes
  - Strategic planners, financial managers & asset managers need to work closely in determining LOS & financial targets as these provide a key link between the strategic & tactical plans



Adapted from © IPWEA, 2015

Good AM answers many important questions

©Mervyn Henderson Consulting

- **Do you understand the risk profile associated with your asset portfolio and how this will change over time?**
- **Can you demonstrate the business consequences of reducing – or increasing – your capital investment or maintenance budgets by 10% over the next 5 years?**
- **Can you justify your planned asset expenditures to external stakeholders?**
- **Can you easily identify which investment projects to defer when there are funding or cash flow constraints?**
- **Do you have the appropriate asset data and information to support your AM decision-making?**
- **Do you know if your people have the right competences and capabilities to manage your assets?**
- **Do you know which AM activities to outsource?**

The right environment for AM to flourish

©Mervyn Henderson Consulting

- **AM must have the right environment to flourish**
- **Good leadership, competent people, & a suitable management system are vital, & supported by the following elements**
  - Culture and common mental maps
  - Technology
  - Organisational structure
  - Business processes
  - Learning
  - Communication
  - Good relationships & positive emotions
  - An effective reward system
- These elements provide the foundation for good AM
- It is imperative that all these elements function together if the desired outcome is to be achieved

55

South African Road Federation

55

Key Asset Management Concepts

©Mervyn Henderson Consulting

- **Important contemporary AM concepts should be explicitly recognised in a road agency's policy and strategy and in the 'way the agency works' on a day-to-day basis**
- **These concepts are emphasised in ISO 55001, the IIMM and other international references**
  - Asset stewardship
  - Optimisation
  - Lifecycle agency costs vs total transport costs
  - Continuous improvement

56

South African Road Federation

56

Asset Stewardship

©Mervyn Henderson Consulting

- **Stewardship:** '*the careful and responsible management of something entrusted to one's care' (Mirriam-Webster dictionary)*
- **Effective stewardship is essential in retaining the value and serviceability of road assets for both current and future generations, & for providing best value to users & investors over the long term**
- **It can be demonstrated through the proper long-term financial management of assets**
- **The objectives of asset stewardship are shown in the table below**

Key objectives	Description
Make fair long-term decisions	Make decisions today that do not compromise the ability of future generations to enjoy similar transport services as current generations, putting aside changing technology
Fair and equitable pricing	Ensure that road users today and tomorrow pay a fair and equitable price for equivalent or similar levels of service and access to the road network
Effective management of lifecycle costs	Avoid work which may be a short-term quick fix, but which leads to significantly higher future costs or elevated risks that other road users have to bear

Asset Stewardship

©Mervyn Henderson Consulting

- **Characteristics of road networks that road agencies need to recognise to be effective stewards are shown below**

Key characteristics	Description
Roads are long life assets	• Stewardship is relevant to organisations responsible for managing road assets for both current and future generations of users • Stewardship has an organisational dimension as long-life assets such as bridges and pavements that typically outlive existing staff • Future managers and personnel will inherit the legacy of AM decisions made by today's managers and personnel
Roads are for communities	• Government regulatory bodies are aware of the need for demonstrated, sustainable management of long-life public infrastructure assets, particularly where originally funded by government grants • Treasury have required accounting for the whole-of-life costs of municipal public assets, using accrual accounting practices, valuation methodologies and consideration of depreciation in financial planning, but not for provincial long life assets which cannot be effectively managed without these practices in place

Asset Stewardship

©Mervyn Henderson Consulting

Key characteristics	Description
Roads are utility corridors	• Roads and associated infrastructure are also vital in providing corridors for other utilities which modern society depends on, e.g. electricity, gas, water and waste water, telecommunications • The space within road corridors in cities will often need to be carefully managed to ensure that all utilities can safely and efficiently construct and maintain their network infrastructure over the life of their assets • Utilities are important customers and stakeholders
Risk and resilience are important	• Roads must be able to provide hospital facilities, emergency services and other essential services with reliable access to deal with major events (e.g. sport), disasters (e.g. floods, fires, earthquakes, cyclones) & service disruptions (e.g. storms, blackouts) • A resilience approach that addresses physical and organisational dimensions is necessary to safeguard assets and ensure that the organisation can respond to hazards and continue to deliver safe accessibility • Resilience is also about ensuring that the organisation has the systems, processes, arrangements, and people in place so that it is able to quickly respond, adapt and recover should a major event occur

Optimisation

©Mervyn Henderson Consulting

- **Doing AM well means**
  - Having the right processes for investment planning and prioritisation
  - Making the right trade-offs between maintenance and capital expenditure
  - Being able to successfully balance the costs of providing the service against the risks to loss of service
- **Two approaches to optimisation are**
  - Making trade-offs across the three dimensions of service, risk and cost
  - A framework which 'values' the relative benefits that different solutions offer
- **Risk/ Cost/ Service balance**
  - AM addresses the issues of level of service (LoS), risk and cost in a coordinated and integrated way

- E.g., when funding is constrained, what is the most important service to the customers?
- What assets, if they failed or were no longer available, would have the greatest impact on customers?
- What activities, works and programmes should be carried out first?
- What impacts would there be if some assets were allowed to fail before they were replaced?
- Is the agency fully aware of the long-term financial implications of the decisions they make?
- AM is 'standards driven'. In order to optimise, there must be criteria or standards against which optimisation can be measured
  - Standards can relate to a level of service, a minimum condition or performance level of the asset, or an acceptable risk tolerance
  - The standard of work carried out on assets can also be described and is measurable

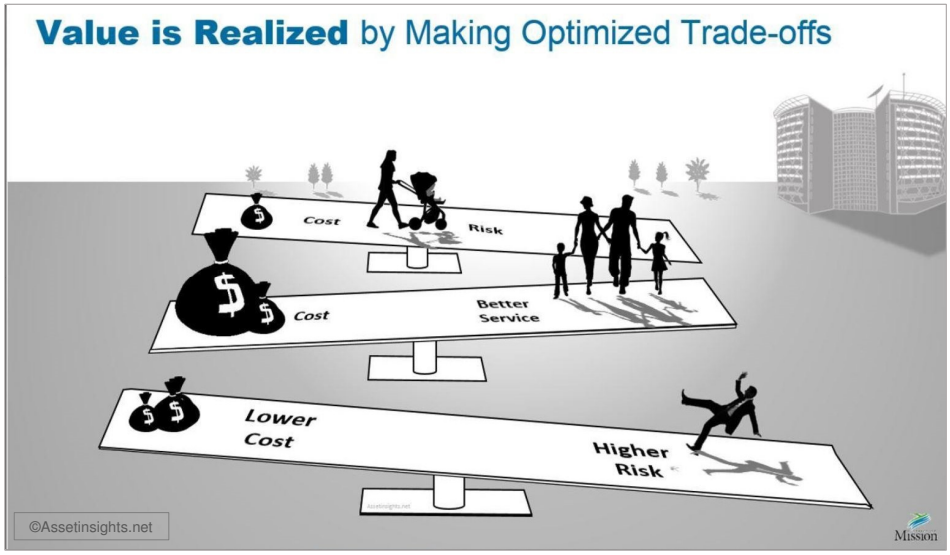
Optimisation - dimensions

©Mervyn Henderson Consulting

- **Explanation of dimensions**
  - **Levels of service**: represents the service provided to road users: criteria such accessibility, journey reliability, safe journeys, etc., usually determined by
    - Customer expectations balanced with the price willing to be paid
    - Legislative requirements which may impose minimum standards & penalties for not meeting them
    - Internal strategic objectives, the availability of resources and financial constraints
  - **Risk**: represents the possible consequences arising from loss of service, including
    - Crashes
    - Impacts of hazard events such as storms, fire, etc.
    - Road/ bridge deterioration due to lack of maintenance or poor construction
    - Other service disruptions
  - **Cost**: represents the lifecycle costs needed to provide and maintain the assets
    - Capital investment costs
    - Operational and maintenance costs
    - Asset rehabilitation and renewal costs
    - Disposal costs
- **Factors for consideration if the correct balance between risk and financial budgets for agreed LoS is to be achieved**
  - If the agency has a low risk tolerance then funding needed to maintain the same levels of service is likely to be greater
  - A higher risk tolerance means that the agency accepts an increased exposure and a higher level of adverse consequences to customers
  - Should funding be reduced then the level of risk to service continuity is likely to increase

Optimised trade-offs

©Mervyn Henderson Consulting

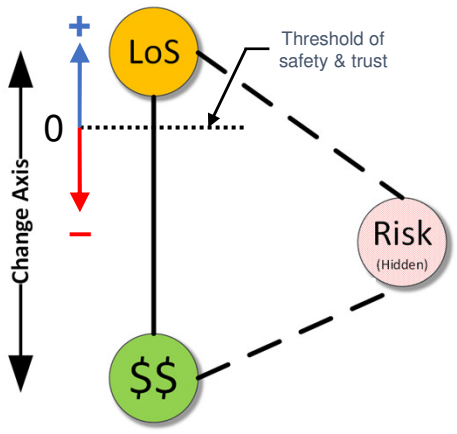


Optimisation - Risk-Cost-Service balance

©Mervyn Henderson Consulting

- **Asset managers may choose to optimise against 1, 2 or all 3 criteria simultaneously, with increasing levels of analytical sophistication required**
- **Ideally, the optimisation process should address all three: ISO 55001 and the IIMM emphasise the importance of balancing the competing elements of service level-cost-risk diagram ►►►**
- **There is a threshold level of safety and trust below which it becomes dangerous and expensive to reinstate the safety**
- **It is difficult to restore trust once it has been lost**

Service level-cost-risk diagram



Ross Waugh, Deighton User Conference 2016

Two optimisation approaches

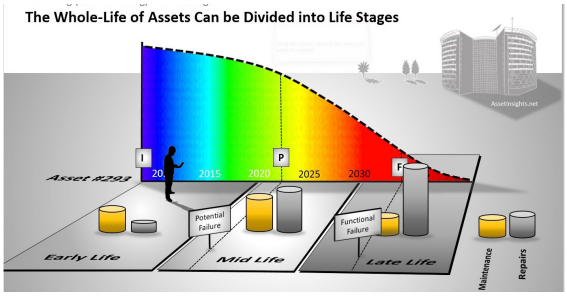
©Mervyn Henderson Consulting

- **Benefits approach to optimisation**
  - An alternative high level way to approach the question of optimisation is by determining the relative benefits that different programme and project scenarios offer
  - This approach offers a more qualitative means of establishing programme priorities than the more analytically focussed optimisation method
- **Lifecycle Costs vs Total Transport Costs**
  - Agency (lifecycle costs) are the direct costs that an agency incurs in planning for, developing, maintaining, renewing and eventually disposing of physical assets
  - The optimisation process should always address the question of lifecycle costs in determining the long-term funding needs of the asset
    - Asset managers need to ensure that lifecycle costs are minimised in providing a given level of service
- It is also important to consider the wider 'system or social costs' of transport
  - Total transport costs include the costs incurred by road users, such as vehicle operating costs, travel time & crash costs
- When making capital investment decisions, the benefits to road users need to be factored into the decision-making process
- These benefits can be quantified in monetary or economic terms and may include
  - Improved levels of service (e.g. road widening which delivers shorter or more reliable journey times) or
  - Reduced risk, e.g. crash barrier installation improving highway safety
- Maintenance activities can also have an effect on the LoS and risk to road users, e.g.
  - Resurfacing to improve carriageway smoothness and skid resistance offers economic benefit to all road users

Two optimisation approaches

©Mervyn Henderson Consulting

- **Lifecycle Costs vs Total Transport Costs** *Continued*
  - When considering costs, there are therefore two approaches which can be used depending on the type of decisions the agency wishes to make
    - For reasons of internal economic efficiency or
    - To maximise economic utility for both road users and the road agency



©Assetinsights.net

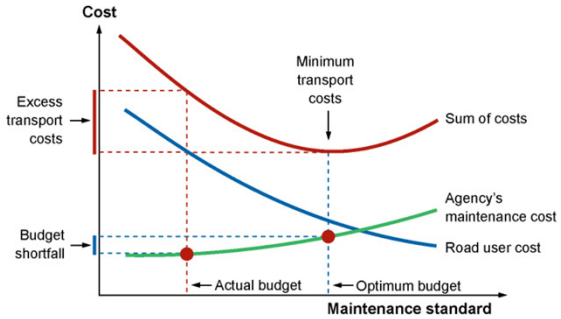


Figure 2.4.11.1 Comparaison of total cost streams against a minimum standard (HDM-4, 2004)

Asset Management Manual, ©PIARC 2019

65

South African Road Federation

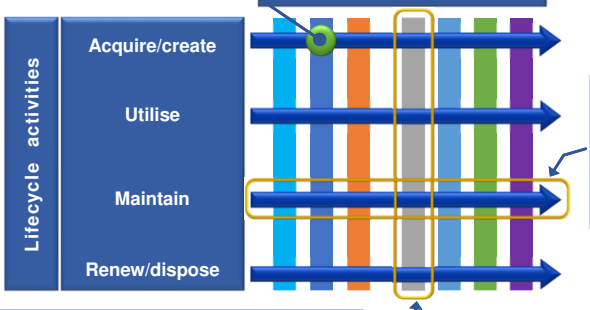
65

Optimisation of Asset Lifecycle for AM decision making

©Mervyn Henderson Consulting

1. Specific intervention optimisation
Is it worth doing and, if so, when?
(cost/benefit/risk/timing)

Portfolio of assets & systems
(types, criticalities, condition, performance)



3. Activity programme optimisation
What is the best combination and timing of projects?
e.g. capital investment programmes, outage strategy
(cost/benefit/risk/timings)

2. Asset lifecycle optimisation
What is the best mix of investment, utilisation, maintenance, lifespan & risk?
(cost/benefit/risk/sustainability)
a. Individual assets (whole lifecycle)
b. Asset system integration level (performance sustainability)

'Asset management - whole-life management of physical asset', Editor Lloyd, C

66

South African Road Federation

66

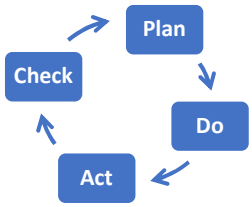
Implementation & continuous improvement

©Mervyn Henderson Consulting

- **Implementation & continuous improvement in AM practices**
  - Good AM establishes, implements, maintains and continually improves an AM system, including the processes needed and their interactions (ISO 55001:2014, Clause 4.4)
    - AM is a way of doing business in the broadest sense
      - It is not simply about implementing certain activities to achieve specified technical standards, nor is it primarily concerned with the application of modern software tools, although each has a role to play
    - AM is also about delivering better performance and results through appropriately targeted investment in the introduction and improvement of people skills, products and processes – the ultimate goal is to deliver benefits to all road transport stakeholders

- AM improvement is therefore different to asset improvement or managing assets
  - Asset improvement is about constructing new assets & improving existing assets to provide increased levels of service, and to gain benefits from improved service lives or from reduced operating and renewal costs
  - AM improvement is a continuous process of improving the way AM is conducted in an organisation and the skills of those at all levels conducting it
  - The difference between AM and managing assets has been dealt with earlier

Plan-Do-Act-Check continuous improvement cycle



67

South African Road Federation

67

Implementation & continuous improvement

©Mervyn Henderson Consulting

A great nation is like a great man: When he makes a mistake, he realizes it. Having realized it, he admits it. Having admitted it, he corrects it. He considers those who point out his faults as his most benevolent teachers.

Lao Tzu, 6th century BC

Shooting the messenger: South African culture?

68

South African Road Federation

68

Case Study: AM in the New Zealand Transport Agency

©Mervyn Henderson Consulting

➢ **Learnings from 20 Years of AM evolution**

- NZTA was established in the late 1980s. Changes included the outsourcing of all physical works and most professional services. To protect its knowledge base and ensure it could remain a 'smart buyer' of externally provided activities, it invested in data, systems & processes and cultivated a 'community of interest' around the newly-defined AM discipline
- As well as legislation, a range of other factors has influenced the evolution of practice, including
  - Managing increasing costs in a constrained budget environment
  - Allocating funds nationally on an equitable basis (geographical equity)
  - Having a rational and objective approach, rather than one based on subjectivity or emotion & politics
  - Consistency and funding justification, from which has come national standards and levels of service
  - A wider approach to prioritisation than a purely economic one, which had sometimes resulted in assets not meeting customer expectations
- Over the last 20 years, AM practices have continued to develop within NZTA. The regions, suppliers and other divisions are taking part in the development of AM plans and long-term financial programmes
- With increasing constraints on expenditure for managing existing assets, AM as an organisation-wide business process has become much more important

Photo: Pascal Habermann on Unsplash

Case Study: AM in the New Zealand Transport Agency

©Mervyn Henderson Consulting

- Despite a rising trend of demand for more maintenance & renewal funding given an increasing capital asset base, a Government requirement for a restrained forward budget while maintaining levels of service has meant some tough decisions have had to be made, e.g.
  - 'Managing risk', allowing more assets to run to failure
  - 'Sweating' pavement assets (enabling pavement expenditure to be reduced from 65% to 50% as a proportion of all expenditure)
  - Changing the classification of some highways have all contributed to a bottom-line reduction in funding demand of around $160 million annually
  - Interventions must be 'at the right time'
- A key learning is the consequences or effects that these actions have, e.g.
  - What real changes have occurred in the pavement condition profile?
  - How have maintenance & lifecycle costs been affected?
  - What failures have occurred?
  - How have the customers been affected?
- Answering these questions with real data enables the validity of the original decisions to be tested & ratified
- Decision-makers are able to weigh up the consequences, & determine whether further changes are required
  - NZTA's AM planning process, State Highways Activity Management Plan and Life-cycle Asset Management Plans together provide the mechanism for this to happen

Case Study: AM in the New Zealand Transport Agency

©Mervyn Henderson Consulting

- **A common set of learnings is evident, with one of the most important continuing to be the need to collect good data**
  - A key priority for NZTA is making informed decisions means having timely access to high quality data

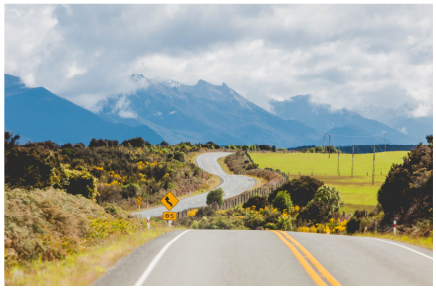


Photo: Munir Rani on Unsplash

- **Learnings**
  - A high level vision is critical: for NZTA today, this means providing value for money, defining an acceptable level of risk and delivering specific outcomes to customers
  - Buy-in is needed from the top: the vision needs to be shared, from governance to operational levels
  - Embed principles and objectives in planning and accountability documents: plans are aligned with the Government Policy Statement and Statement of Intent
  - AM is a normal part of NZTA's day-to-day business

Photos by Unknown Author is licensed under CC BY-SA

Case Study: AM in the New Zealand Transport Agency

©Mervyn Henderson Consulting

- **Learnings *continued***
  - Write it down: AM plans focus attention on the process and take a long-term view
  - Having champions grows commitment: it takes energy, enthusiasm, determination and focus
  - AM is a continuous improvement journey, tailored to the organisation
  - Do not expect a single 'silver bullet' solution to provide all the answers: multiple systems or a single Enterprise Resource Planning solution may be best
  - Meaningful performance measures provide a bridge between the required outcomes and what contractors do on the road

Photo by Tom King on Unsplash

Photo by sterlinglanier Lanier on Unsplash

Managing Asset Management

©Mervyn Henderson Consulting

- **Overview**
  - This section describes the 'management of asset management'
  - AM should be regarded as one of the most important functions of a road agency
    - It is vital to have commitment and direction from directors, senior management and staff throughout the organisation
    - Governance of AM should not be left to practitioners and those charged with service delivery; it should be a joint responsibility of senior management and the corporate governance levels of the organisation
  - Two cases studies are provided

Topics

- **Managing the fundamentals of AM**
  - Leadership and culture
  - Value
  - Alignment
  - Assurance
- **Change management**
- **Understanding the strategic context**
- **Introducing SANS/ ISO 55000/1/2**
- **The AM System**
- **Whole of asset lifecycle activities**
- **AM Framework planning & implementation elements**
- **AM Policy, Objectives, Strategy, Plans, draft TMH 22 template for the Road AM Plan**
- **Achieving effective AM**
- **Organisational & individual AM Journeys**
- **Performance management**
- **Reporting organisational performance**

Leadership and culture

©Mervyn Henderson Consulting

- **Leadership, organisational structure, and roles and responsibilities are all important enablers of effective AM**
- **Leaders need to determine, communicate and inspire direction in an organisation**
- **When it comes to managing change, people-based leadership skills matter, rather than 'command and control' management attributes**
- **Good leaders inspire others in the organisation to follow, to engage with the vision, and to do what it takes to achieve the goals & objectives**
- **Making a 'step-change' in what AM means to the organisation, and making it happen, needs leadership skills not only at the top but also throughout the organisation**
- **Leadership attributes are critical to successful change management, while management attributes are important in ensuring that an organisation consistently delivers its services in a stable and steady-state condition**

AM Leadership

©Mervyn Henderson Consulting

- **Leadership and workplace culture are determinants of realisation of value, including**
  - Clearly defined roles, responsibilities & authorities
  - Ensuring that employees are aware, competent, & empowered
  - Consultation with employees and stakeholders regarding AM
- **Leadership & culture are critical, indispensable enablers for successful AM Leadership**
  - Acts as a translator of stakeholder requirements into organisational objectives
  - The driver to change behaviour & culture
  - Establishing the antecedents & consequences of behaviour, with a flow-on effect within the organisation and culture
  - Enables teamwork to be translated into planned results, potentially at the level of excellence
  - When there is no longer a single leader, all employees are guided by the values & culture of the organisation
- **Management and leadership are different**
  - They are both important and need to co-exist in large and complex modern organisations
  - The table lists the characteristics of managers and leaders

Managers typically	Leaders typically
Control complexity	Create change
Develop plans	Set new directions
Allocate resources	Create strategy
Organise and manage staff	Align people
Prevent negative outcomes	Promote positive outcomes
Control people & processes	Empower people & processes

AM Leadership

©Mervyn Henderson Consulting

- **Effective leaders understand the external and internal factors that may affect the organisation or the transport networks it is managing**
  - Questions to be addressed in determining strategic direction and strategy cover a wide range of policy, social, environmental, financial and economic perspectives
  - Providing clear vision and direction is critical – giving people the context for what they are doing and why they are doing it
  - Good leaders inspire others in the organisation to follow, to engage with the vision, and to do what it takes to achieve the goals and objectives

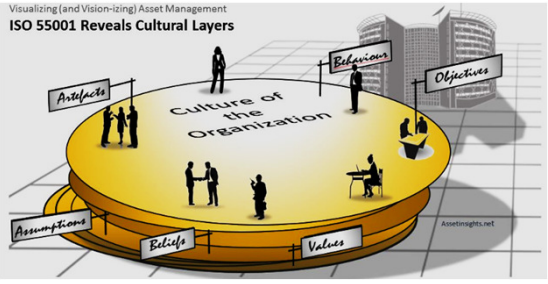
- **Leaders need to take a nurturing role in establishing an environment where great cultures can develop and should model the behaviours they want from others**
  - Being consistent and authentic, 'walking the talk', is critical in building a positive culture
  - So, too, is holding people to account when they act in a way that is inconsistent with the cultural norms
- **Creating & encouraging the right organisational culture is an important leadership task & is integral to achieving the level of integration between functions that good AM requires**
- **Sustaining cultural change requires consistent leadership behaviours, continuous communication and reinforcement**

Culture & Asset Management

©Mervyn Henderson Consulting

- **Plans are done by people and for people**
  - Planning requires an appreciation and awareness of organisational culture
  - Culture is a foundation of good AM, and a key ingredient of its success, or failure
  - Culture refers to long-lived set of values, beliefs, attitudes and assumptions which affect behaviour and performance over the long term
    - 'The way things are done around here'
    - The concealed elements include the underlying values and assumptions shaping the organisation
  - Some of the visible elements of an organisation's culture are its artefacts (such as systems and procedures) & the behaviours of its staff
- **An organisation with a strong AM culture views AM as a shared responsibility crossing departmental boundaries – the 'whole of organisation' approach**

- **A strong AM culture also recognises**
  - The importance of the customer at the beginning of the AM business cycle
  - The significance of asset stewardship as an AM imperative
  - Continuous improvement as a core AM function
  - Innovation, which is needed in order to challenge the status quo, seeking better ways of achieving the goals



©Assetinsights.net

77

SARF better roads

South African Road Federation

77

What is a good AM culture?

©Mervyn Henderson Consulting

- **A good AM culture exhibits the following characteristics**
  - Customer focused
  - Stewardship of assets and resources
  - High level of motivation
  - Desire to learn and improve
  - Innovation
  - Proactive
  - Teamwork, and good understanding of one another's roles

> *'Leadership, emotions, culture and behaviours are invisible and intangible. Yet these are essential to an organisation…neither is an organisation merely a collection of assets and their plans and processes. Without the right leadership, culture & behaviours, an organisation cannot produce its desired outcomes, just as without the right soil, nutrient, environment and gardeners a tree cannot produce its fruit.'*
>
> Living Asset Management, Lafria, J & Hardwick, J, Engineers Media, 2013

78

SARF better roads

South African Road Federation

78

Managing culture

©Mervyn Henderson Consulting

- Managing cultural change represents one of the biggest challenges for the AM team
- It takes time as people become more familiar with the concepts & more experienced in working together on common goals & problems
- Shifting an organisational culture is a process and requires learning & adapting to derive new meaning
- Creating an appropriate culture is integral to achieving the level of integration between functions that good AM requires
- Culture cannot simply be imposed from the top down; rather, it is an organic process that relies on, and comes from, the whole organisation
- Culture connects with business processes, people and organisational structure

- There is no single correct organisational structure or culture for AM – senior management needs to ensure that structure & culture are conducive to what they want to achieve

©Assetinsights.net

79

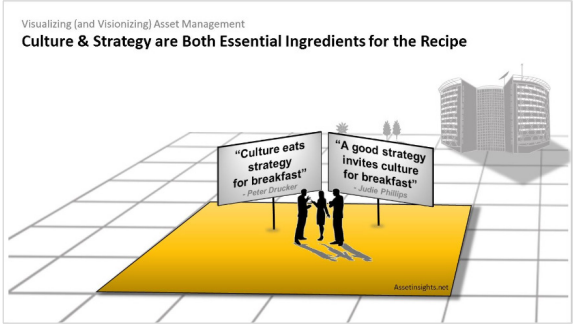
South African Road Federation

79

Managing culture

©Mervyn Henderson Consulting

- Sustaining cultural change requires consistent behaviours, especially from management, continuous communication and reinforcement
- Facilitating a culture shift can be a deliberate outcome or by-product of planning
- A management system, no matter how detailed and well implanted cannot specify, command or monitor all employee activities and actions – there is much that falls between the cracks, for which culture is the critical reference point



©Assetinsights.net

80

South African Road Federation

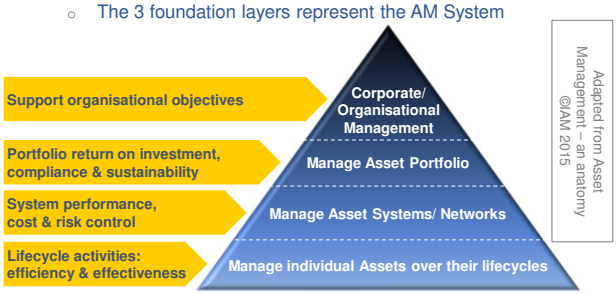
80

Value

©Mervyn Henderson Consulting

- **Value – assets exist to provide value to the organisation & its stakeholders**
  - AM does not focus on the asset itself, but on the value that the asset can provide to the organisation, which is determined by the organisation and its stakeholders, in accordance with organisational objectives, including
    - A clear statement of how AM objectives align with organisational objectives
    - The use of lifecycle management approach to realise value from assets
    - The establishment of decision-making process that reflect stakeholder needs and define value
  - Each organisation determines what constitutes value in relation to achieving its organisational objectives
    - These objectives will take account of the needs and expectations of its stakeholders, e.g. customers, regulators, employees, and local communities.
    - This requires organisations to consider intangible elements of value in their decision making, e.g. reputation, customer satisfaction or environmental responsibility

- It is important not to confuse an organisation's corporate 'values' with the customer value produced by its activities
- Although individual assets can contribute value to an organisation, it is usually when they are connected together as an asset system, e.g. a road network, that they generate value
  - Figure illustrates the contributions to value at various levels of an asset hierarchy
  - The 3 foundation layers represent the AM System



81

South African Road Federation

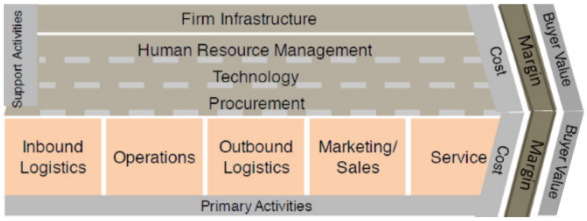
81

Value

©Mervyn Henderson Consulting

- **Two approaches to conceptualising value in an organisation are**
  - The **Value Stream**, which is a 'Lean' operations concept, focussing on customer satisfaction
  - The **Value Chain**, which is a strategic concept, focussing on competitive advantage – see figure: **Organisational Value = (Buyer & Stakeholder value) – Cost**
    - It describes how a defined set of activities combine within an organisation to create value
    - The focus of the value chain is the 'value proposition' to the customer, measured by 'cost of service' for non-profit organisations
    - Assets are aligned through the value chain to support the customer value proposition
    - The value chain allows capture of all the activities & assigns value to the assets that support each activity
    - The value chain is a tool for analysis and the management structure is an overlay which may or may not match the activities

Value Chain



- Non-profits are rated on the following factors
  - **Financial Health**: revenue growth, reserves, working capital ratio
  - **Programme Expenses**: administrative, fundraising, programme delivery
  - **Accountability and Transparency**: independent board, control of assets, audited financials
- Ratings show governments
  - How efficiently an authority will use its resources today
  - How well it has sustained its programmes & services over time
  - Their level of commitment to being accountable and transparent

82

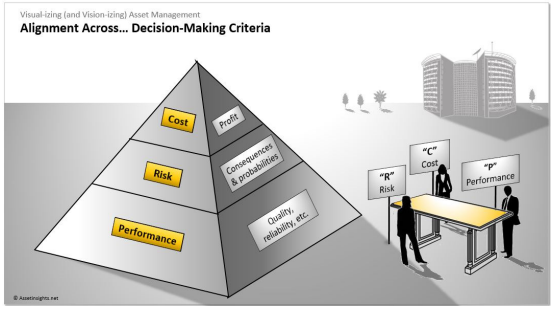
South African Road Federation

82

Alignment of AM with organisational direction

©Mervyn Henderson Consulting

- **Alignment translates the organisational objectives into AM policy, strategy & objectives which cascade down into technical & financial decisions, plans & activities**
- **With effective leadership & a strong cross-organisational AM culture, aligning AM with the agency's goals & objectives becomes easier**
  - It is not a simple one-way process – aligning AM involves many parts of the organisation & it depends on two equally important and parallel sets of activities
    - Leadership must set the tone for the agency by creating a culture that supports AM and defines specific goals and communicates with people – both inside the agency to ensure alignment, support and understanding, and also with external stakeholders and decision-makers to develop understanding, support and accountability



©Assetinsights.net

83

South African Road Federation

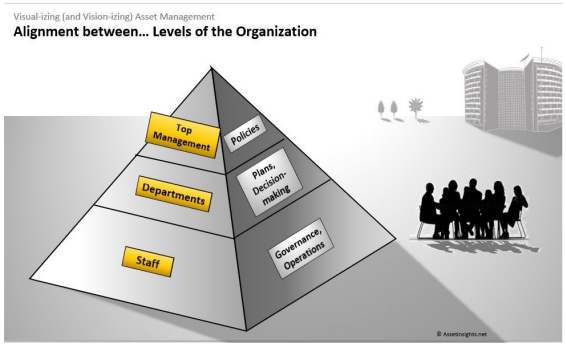
83

Alignment of AM with organisational direction

©Mervyn Henderson Consulting

- Professional staff must support leadership efforts with robust information, analysis and implementation; simply put, leadership has to lead the effort & others have to support it
- It requires that senior management decisions, strategies and plans take account of bottom-up, fact-based realities, i.e. asset capabilities, performance, opportunities and constraints
- It is important for giving staff delivering AM activities direct visibility of the purpose of their work so that they understand why it is needed, not just when and how to do it

- **Alignment is an advantage in prioritisation and coordination and helps to stimulate creativity and innovation**
  - Staff who understand what & why it is important can identify new & better ways of achieving their goals



©Assetinsights.net

84

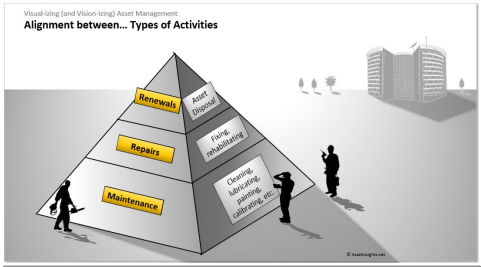
South African Road Federation

84

Alignment of AM with organisational direction

©Mervyn Henderson Consulting

- **Alignment includes**
  - The implementation of risk-based, information-driven, planning and decision-making processes and activities that transform organisational objectives into AM plans
  - The integration of the AM processes with the functional management processes of the organisation, e.g. finance, HR, information systems, logistics and operations
  - The specification, design and implementation of a supporting AM system
- **A strong asset management culture – coupled with the right structure, well-designed business processes & robust goals and performance measures – can be very effective in aligning an organisation & improving its performance**



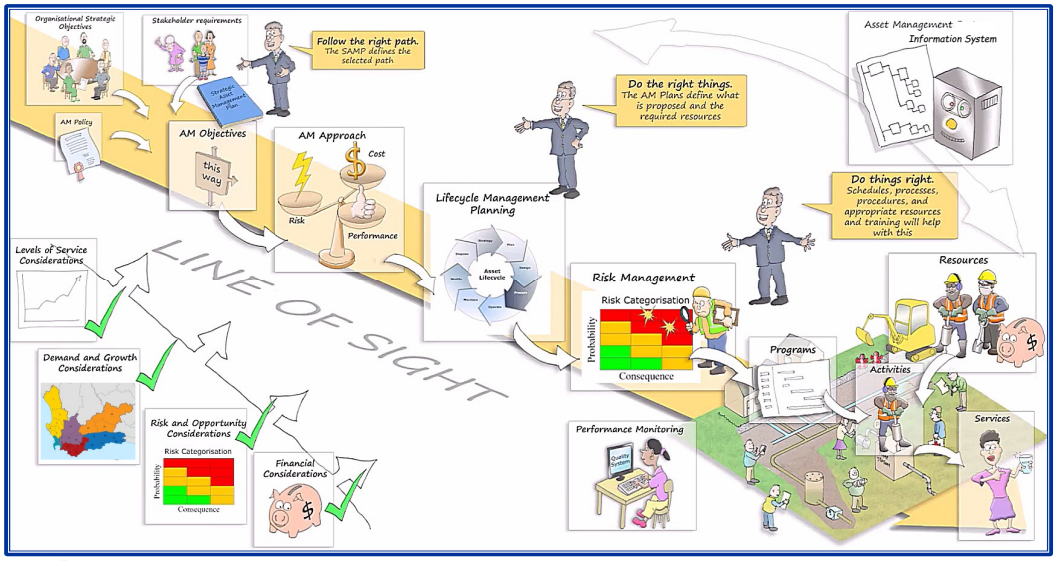
85

South African Road Federation

85

Asset Management System & Alignment

©Mervyn Henderson Consulting



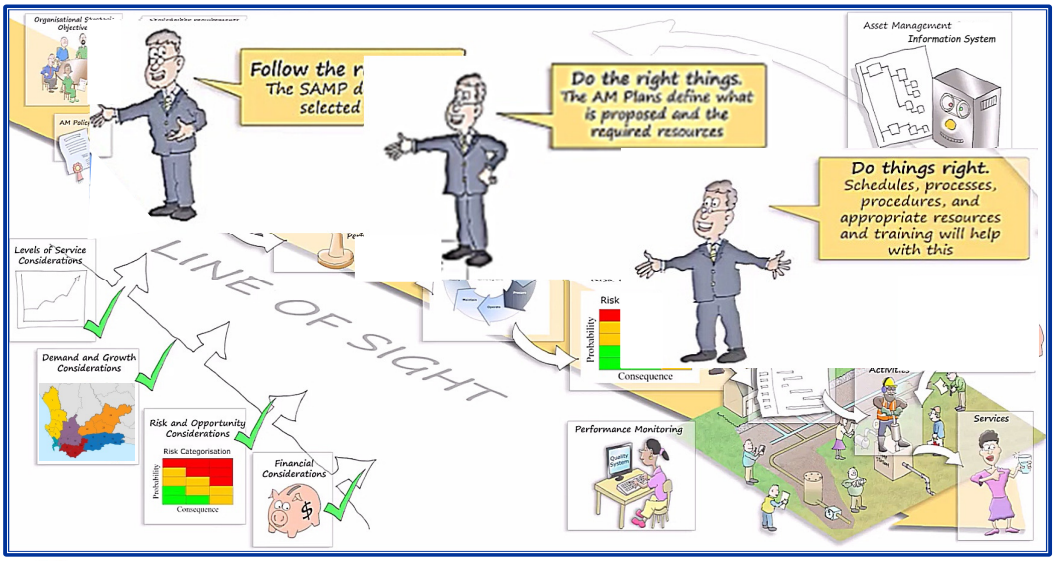
86

South African Road Federation

86

Asset Management System & Alignment

©Mervyn Henderson Consulting



87

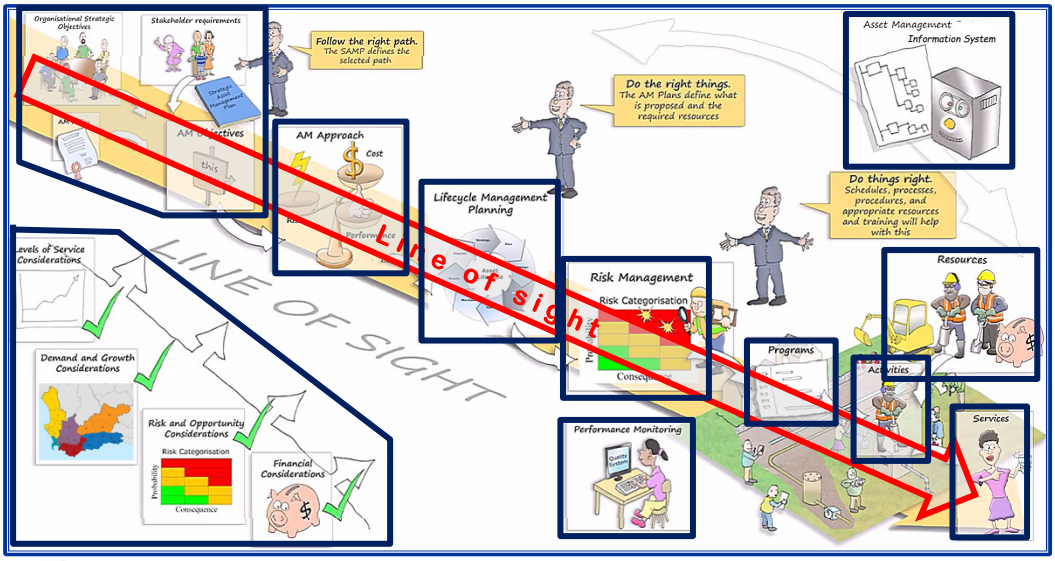
SARF better roads

South African Road Federation

87

Asset Management System & Alignment

©Mervyn Henderson Consulting



88

SARF better roads

South African Road Federation

88

Aligning AM with organisational objectives

©Mervyn Henderson Consulting

- **A strong AM culture – coupled with the right structure, well-designed business processes and robust goals and performance measures – can be very effective in aligning an organisation and improving its performance**
  - The key steps in aligning AM with organisational objectives are presented in the table

Steps	Description
Establish the right organisational structure	• A structure that supports achievement of the AM objectives • Describe roles, responsibilities and competency requirements
Integrate AM in the agency's business processes	• AM business processes – levels of service, demand, programme development • Include financial, human resources, risk, quality, etc.
Develop a clear 'hierarchy' of goals, objectives and performance measures	• From agency-wide to operational delivery • Provides a means of aligning different functional areas • Provides a clear basis for communication and accountability

Alignment of AM with Financial Management

©Mervyn Henderson Consulting

- **The need for alignment of technical and financial management resides in the simple fact that the technical management of assets cannot be optimised without linkage to the financial management system**
- **Likewise, the objectives of long term financial planning and the distribution of funding cannot be effectively achieved without linkage to operation and performance data from the AM system**
- **Alignment is a functional condition that allows access and visibility to information needed by operational experts and top management so they can base their decisions on knowledge that supports effective decision making**
- **Whatever the intent or motivation, unbalanced and misaligned approaches to managing assets have financial consequences**
  - Not having visibility to the consequence of those decisions is a fundamental problem
  - The impact of the problem is measured in billions of avoidable cost
- **ISO 55010 – Guidance on the alignment of financial and non-financial functions in AM**
  - The specification helps all functions in an organisation to better align financial and non-financial issues coherently by providing guidance to bridge current gaps between the financial and non-financial worlds
  - This can encourage the breakdown of silos and improve cooperation, making better use of every department's expertise in achieving the organisational objectives as effectively and efficiently as possible.

Assurance

©Mervyn Henderson Consulting

- **AM gives assurance that assets will fulfil their required purpose**
- **The need for assurance arises from the need to effectively govern an organisation**
- **It is the combination of monitoring & auditing of processes & outcomes to confirm the assets, systems & processes are operating as intended, & essential to provided assurance that**
  - Assets will fulfil their required purpose
  - AM activities will be delivered & AM objectives achieved consistently and sustainably

- **Assurance applies to assets, AM & the AM system – as defined later – including**
  - Developing and implementing processes that connect the required purposes and performance of the assets to the organisational objectives
  - Implementing processes for assurance of capability across all lifecycle stages
  - Implementing processes for monitoring and continual improvement
  - Providing the necessary resources and competent personnel for demonstration of assurance, by undertaking AM activities & operating the AM system
- **An assurance framework includes**
  - Policies, plans, business processes & information systems to give assurance that AM activities will be delivered
  - Competent resources to monitor & demonstrate assurance to the appropriate levels of management

91

SARF better roads

South African Road Federation

91

Change management

©Mervyn Henderson Consulting

- **Given the wide range of external and internal challenges, or because of a gap analysis or assessment of AM practice organisations face ongoing drivers for change**
  - Internal strategic reviews, organisational restructuring, external events, or changes imposed on an agency all involve change management
  - Effective AM change cannot be left to chance – it is unlikely to succeed if efforts are inconsistent with the wider organisational direction and the AM objectives
  - A formal change management process should be followed whenever significant change is being considered
  - PIARC (Evaluating the transformation of Transport Administrations, 2019R21EN) provides a useful Framework of Change Management (section 5)
- **Aspects to consider in planning for change ►►**

Strong change leadership	Challenge 'business as usual' & 'appreciative enquiry' describe the outcomes & benefits to be obtained
Plan for change management	'What is the readiness for change?' 'Is education needed?' Develop a communication plan, consider the risks & how they can be mitigated; there will be barriers & setbacks along the way
Consider why the change may fail	E.g. poor communication, 'nothing in it' perception, complacency
Communicate the change	Ensure the message is clear, relevant, has integrity, is two-way
Gain commitment by raising awareness	Involving key players, provide resources, model behaviours & working hard with the unwilling
Monitor progress & reward success	Track progress, & set achievement goals, success is shared & rewarded

92

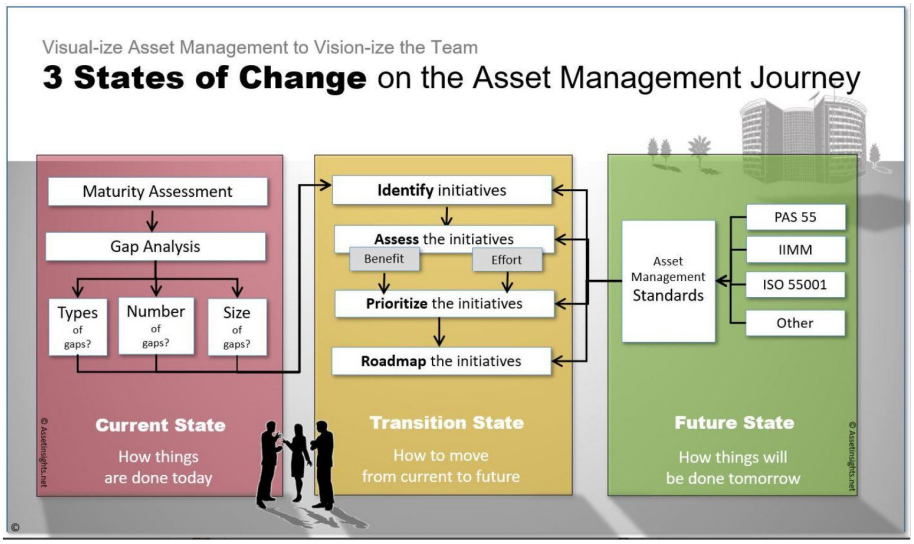
SARF better roads

South African Road Federation

92

States of change

©Mervyn Henderson Consulting



©Assetinsights.net

93

South African Road Federation

93

Understanding the Strategic Context

©Mervyn Henderson Consulting

- **Creating strategy**
  - The previous section linked leadership with AM culture, the alignment of goals, and change management. In determining the AM objectives, and how an agency should respond, the internal and external contexts and challenges need to be assessed and understood
  - Creating the broader definition of organisational strategy, of which the AM strategy is a part, and deciding what is to be done, is an important leadership function as it helps to define clear direction
  - Questions to ask could include:
    - Which contexts, internal or external, are likely to be the most significant, in the short, medium or longer term?
    - What are the possible impacts and how should the agency respond?
    - Which contexts are changing rapidly, slowly or not at all?
    - What is expected by governments, funders, stakeholders and customers?

- Steps to create & implement an AM strategy
  1. Ask the right questions – to understand the context and challenges to be addressed
  2. Determine the strategy – how will the gaps between 'current' and 'desired' states be filled
  3. Identify key success factors – how do we get there? What will it look like? How will we know?
  4. Share the strategy – make sure it is communicated and understood
- With an understanding of context and the challenges facing the organisation, leaders need to determine the appropriate strategy and prioritise the responses
- Organisation strategy should be
  - Supported by, and aligned with, the AM policy, objectives and strategy
  - Informed by an assessment of current practice and an understanding of the appropriate level of AM maturity that the road agency aspires to
  - Creating different time horizons for action, with increasing flexibility and adaptability in the longer term

94

South African Road Federation

94

Understanding the Strategic Context

©Mervyn Henderson Consulting

- **Strategic context *continued***
  - Other external issues to consider include
    - Social, cultural, political, legal, regulatory, financial, technological, economic, commercial and natural environment issues, and whether they are local, regional, national or international, including
      - social changes
      - macro-economic factors such as growth and development
      - concerns about emissions to land, air or water, and noise issues
      - sustainability and resilience
      - availability of suitable resources
      - affordability of the services provided
    - Key drivers and trends having impacts on the objectives of the organisation
    - Growth and future demand, including the location, timing and type of growth, population growth and densities, demographics, and the changing demand from the population
    - Relationships with external stakeholders and customers, including their perceptions, values, and changing service expectations
    - Funding changes, e.g., the future balance between government funding, loans, public private partnership (PPP) investment, and revenue from customers

95

South African Road Federation

95

Understanding the Strategic Context

©Mervyn Henderson Consulting

- **Strategic context *continued***
- **Legislative, Mandatory and Government Policy Requirements concerning AM**
  - Road authorities are regulated through a range of Acts, Statutes & Legislative Instruments
  - In South African, the ones relevant to AM are
    - The Government-wide Immovable Asset Management Policy was approved by Cabinet on 17 August 2005
    - The Government Immovable Asset Management Act No. 19 of 2007
    - The Framework for Infrastructure Delivery & Procurement, Treasury, 2019
- **Standards**
  - National Immovable Asset Maintenance Management, Department of Public Works & CIDB, 2015

96

South African Road Federation

96

Understanding the Strategic Context

©Mervyn Henderson Consulting

- **Strategic context *continued***
- **Internal Business Focus/ Internal Context**
  - ISO 55002 Clause 4.1.2 suggests a range of issues to consider, including
    - Organisation policies, objectives and strategies
    - Corporate direction and structure: e.g., governance, organisational structure, roles, accountabilities, authorities and internal linkages
    - How AM is integrated within the organisation, and AM planning & project management procedures
    - Financial issues, e.g., constraints on expenditure, corporate expectations of maintenance optimisation, budget development and approval procedures
    - Capabilities: resources, staff knowledge & competencies
    - Information systems, information flow and decision-making processes
    - Relationships with internal stakeholders
    - Organisation culture
    - Standards, guidelines and models
    - Contractual relationships
    - Risk management plans
    - AM practices, systems, plans and processes
    - Condition and performance of the assets
    - Past asset failure data including incidents
    - Ability of the AM system to achieve intended outcomes
    - Self-assessments, audits, external reviews

Understanding the Strategic Context

©Mervyn Henderson Consulting

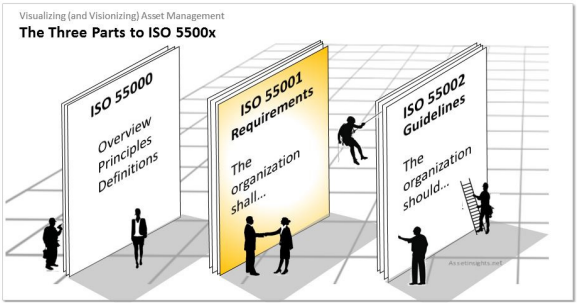
- **Creating strategy *continued***
  - In developing effective strategy, there are various key success factors, such as
    - The strategy is fully understood and shared by the organisation
    - It allows flexibility so that the direction of the organisation can be adapted to changing circumstances
    - It results from the varied input of a diverse group of thinkers – it helps to avoid Groupthink!
    - It follows a thorough analysis of both the external environment and the internal capabilities of the organisation
    - An effective strategy identifies areas of differentiation
  - For more on strategy and Groupthink, refer to http://www.strategybydesign.org/strategic-thinking-overview

- **Strategic context**
  - The IIMM (Section 1) and ISO 55001 (Clause 4.1.2) provide useful guidance on the external and internal factors to consider when analysing the contexts within which the agency must operate
  - PIARC (Evaluating the transformation of Transport Administrations, 2019R21EN) provides useful guidance on the external drivers (section 3.3)
  - Some of the challenges facing transport agencies were described in the 'Overview of AM'

Introducing ISO 55000/1/2 & SANS 55000/1/2

©Mervyn Henderson Consulting

- **The ISO Standards were published in 2014 and effectively supersede PAS 55:2008**
- **ISO 55000: Asset management – Overview, principles and terminology (2014) Ed. 1**
  - SANS 55000: Asset management – Overview, principles and terminology (2015) Ed. 1
  - Identical to ISO 55000
  - Principles and definitions
- **ISO 55001: Asset management – Management systems – Requirements (2014) Ed. 1**
  - SANS 55001: Asset management – Management systems – Requirements (2015) Ed. 1
  - Identical to ISO 55001
  - The 'shall' statements that specify the system
- **ISO 55002: Asset management – Management systems – Guidelines for application of ISO 55001 (2018) Ed. 2**
  - SANS 55002: Asset management – Management systems – Guidelines for application of ISO 55001 (2020) Ed. 2
  - Identical to ISO 55002



©Assetinsights.net

SANS/ ISO 55001

©Mervyn Henderson Consulting

- **SANS/ ISO 55001 is the most important of the 3 documents, defining the requirements for organisations considering certification or alignment**
  - Important ISO 55001 principles
    - It has an explicit focus on the activities needed to deliver sustainable outputs valued by customers and funding providers at the lowest whole-of-life-cost, as opposed to prioritising work predominantly according to asset condition, thus enabling the achievement of AM objectives
    - It integrates across boundaries between organisational functions and asset disciplines, including customer services, human resources, finance, and information technology, and where relevant, between infrastructure managers and contracting organisations
    - It emphasises
      - Evidence-based decision-making,
      - Optimising maintenance and renewal interventions based on the knowledge of how assets degrade and the risk of their failure

Licensed exclusively to SABS
Copying and network storage prohibited

ISBN 978-0-626-38393-3

SANS 55001:2015
Edition 1
ISO 55001:2014
Edition 1

SOUTH AFRICAN NATIONAL STANDARD

Asset management — Management systems — Requirements

This national standard is the identical implementation of ISO 55001:2014, and is adopted with the permission of the International Organization for Standardization.

WARNING
This document references other documents normatively.

Published by the South African Bureau of Standards
1 Dr Lategan Road Groenkloof ✉ Private Bag X191 Pretoria 0001
Tel: +27 12 428 7911 Fax: +27 12 344 1568
www.sabs.co.za
© SABS

SABS

SANS/ ISO 55001

©Mervyn Henderson Consulting

- **Like other ISO standards, such as ISO 9001 & ISO 14001, ISO 55001 takes a 'management systems' approach which involves the systematic control of AM activities, directed by policy and objectives and influenced through effective leadership**
- **ISO 55001 recognises that AM activity is conducted as part of an overall business activity, and that not all AM activities are necessarily controlled by the AM system**
  - An agency can be selective on which assets are to be included within the AM system
  - While important to achieving AM objectives, activities relating to leadership, culture, motivation and behaviour are typically managed outside the AM system

Licensed exclusively to SABS.
Copying and network storage prohibited.

ISBN 978-0-626-38392-3

SANS 55001:2015
Edition 1
ISO 55001:2014
Edition 1

SOUTH AFRICAN NATIONAL STANDARD

Asset management — Management systems — Requirements

This national standard is the identical implementation of ISO 55001:2014, and is adopted with the permission of the International Organization for Standardization.

WARNING
This document references other documents normatively.

Published by the South African Bureau of Standards
1 Dr Lategan Road Groenkloof Private Bag X191 Pretoria 0001
Tel: +27 12 428 7911 Fax: +27 12 344 1568
www.sabs.co.za
© SABS

SABS

101

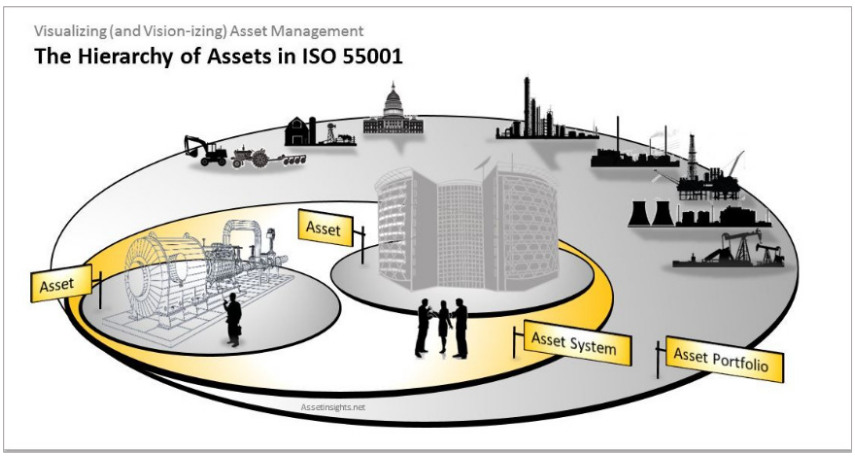
South African Road Federation

101

The hierarchy of assets in ISO 55001

©Mervyn Henderson Consulting

- **ISO 55001 contemplates a hierarchy of assets**
  - The detailed classification scheme and appropriate granularity is determined by the organisation's objectives and the nature of the assets in its portfolio



102

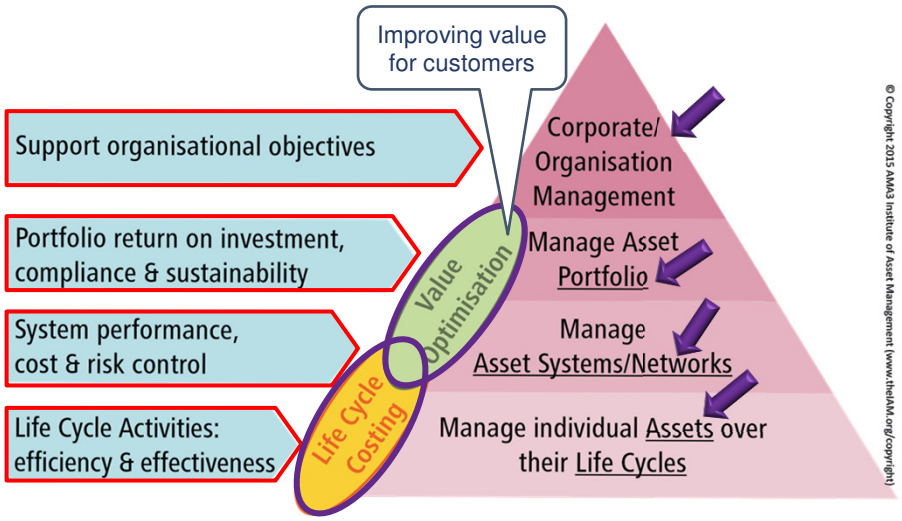
South African Road Federation

102

Hierarchy of assets

©Mervyn Henderson Consulting

- **Hierarchy of assets within an integrated management system**



103

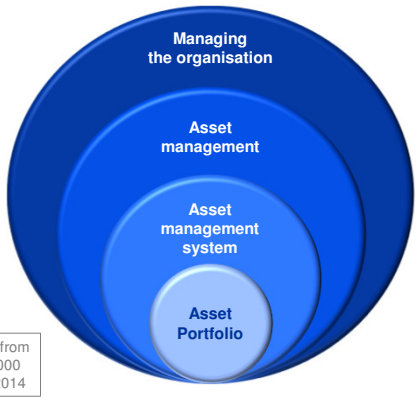
South African Road Federation

103

AM Relationships in ISO 5500x

©Mervyn Henderson Consulting

- **Managing the organisation – see figure**
  - This covers a wider set of business activities than AM, including financial management, human resource management and the provision of leadership direction



Adapted from ISO 55000 © ISO, 2014

- **Asset management**
  - All of the activities and business processes that together contribute to the achievement of AM objectives to provide road services to customers
- **Asset management system – a set of interrelated & interacting elements within the organisation**
  - Includes policies, plans, business processes and information systems integrated to give assurance that the AM activities will be delivered as intended
  - Provides a means for coordinating contributions from and interaction between different functions, both within the organisation and with its key suppliers
- **Asset portfolio**
  - Specific assets that are controlled through the AM system

104

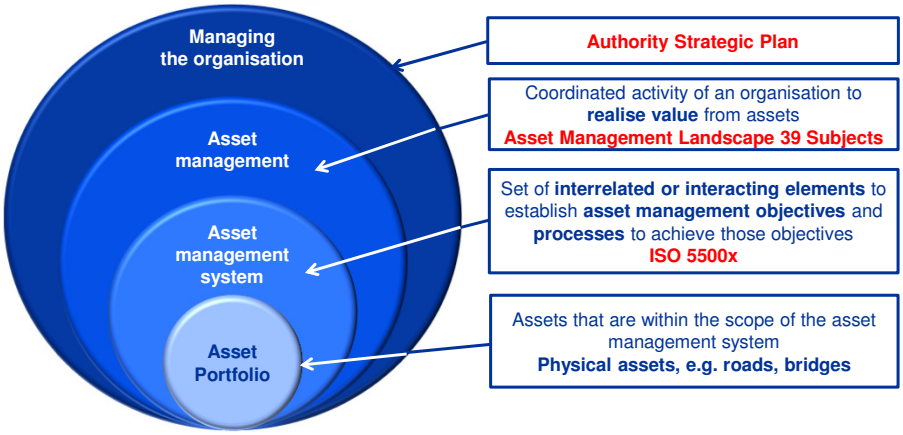
South African Road Federation

104

AM Relationships & documents

©Mervyn Henderson Consulting

- The documents relevant to each part are shown in **red**



Adapted from ISO 55000 © ISO, 2014

105

South African Road Federation

105

Typical benefits of ISO 55001 alignment

©Mervyn Henderson Consulting

Benefit	Examples
Improved financial performance	• Improving the return on investment and reducing cost, while preserving asset value and without sacrificing the short- or long-term realisation of organisational objectives
Informed asset investment decisions	• Using a consistent, documented, balanced-scorecard approach involving cost/benefit analysis on the lifecycle costs of both asset and non-asset solutions, including demand management • Having improved decision tools which consider costs and benefits of alternative solutions, prioritisation of investments and interventions. • Enabling the organisation to improve its decision-making and effectively balance costs, risk, opportunities and performance
Better managed risk	• Reducing risk exposure through application of a structured risk mitigation framework for assessing, quantifying and mitigating risks related to AM and service delivery • Reducing financial losses, improving health and safety, good will and reputation, minimising environment and social impact, can result in reduce liabilities such as insurance premiums, fines and penalties

106

South African Road Federation

106

Typical benefits of ISO 55001 alignment

©Mervyn Henderson Consulting

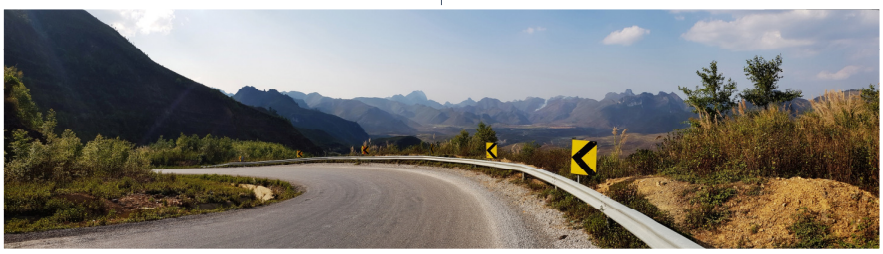
Benefit	Examples
Improved services & outputs	• Improving understanding of asset capabilities and their limitations in delivering or meeting service requirements • Assuring the performance of an asset can lead to improved services or products that consistently meet or exceed the expectations of customer and stakeholders
Demonstrated social responsibility	• Improving an organisation's ability to, for example, reduce emissions, conserve resources and adapt to climate change, enables it to demonstrate socially responsible and ethical practices and stewardship
Demonstrated compliance	• Transparently conforming with legal, statutory & regulatory requirements, & adhering to industry 'best appropriate practice' in AM standards, policies & processes
Enhanced reputation	• Gaining and enjoying an enhanced reputation by having the confidence of legal, statutory & regulatory authorities & the satisfaction of informed customers & stakeholders
Improved organisational sustainability	• Effectively managing short- and long-term assets maintenance and renewal requirements over the long term, including their expenditures and performance
Improved service efficiency & effectiveness	• Concentrating on understanding customer and stakeholder needs and desires. • Reviewing and improving processes, procedures and asset performance

Relevance of ISO 55001 to a road/ transport agency

©Mervyn Henderson Consulting

- **Why ISO 55001?**
  - Road & transport agencies need to consider is whether to align with, or become certified to, the ISO 55001 Asset Management Standard
- **A road or transport agency needs to understand what having an AM system means in practice**

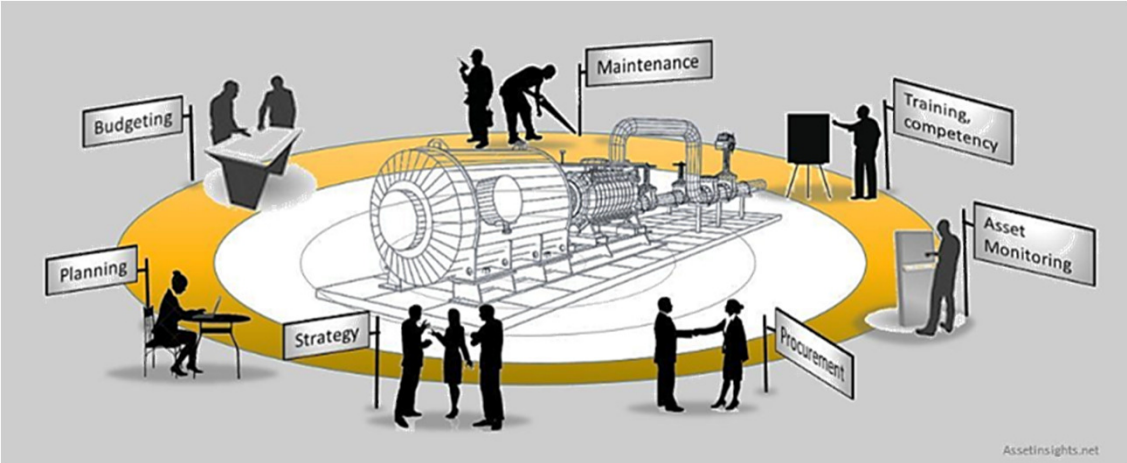
- **Questions to be answered include**
  - What management processes need to be developed, or if they already exist, should they be documented?
  - What other management systems that could be used as a basis for the AM system already exist?
    - Organisations that are already certified to another ISO Standard, or have adopted a quality management systems approach, are likely to have documentation which can easily be modified for AM purposes



ISO 55001 integration of activities

©Mervyn Henderson Consulting

- **ISO 55001 includes many concepts that traverse multiple areas**
  - This reflects that fact that AM requires the integration of numerous activities in order to optimise value



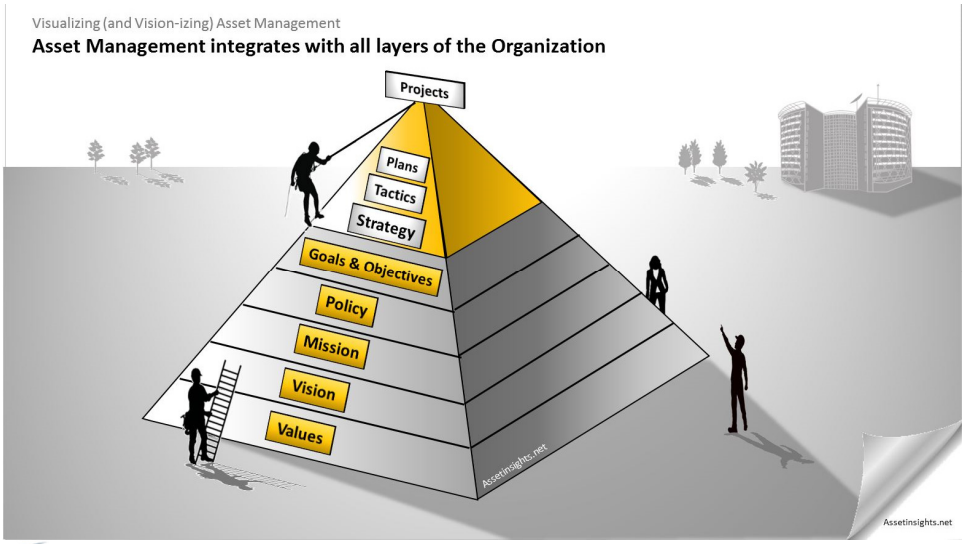
109

South African Road Federation

109

AM integration

©Mervyn Henderson Consulting



110

South African Road Federation

110

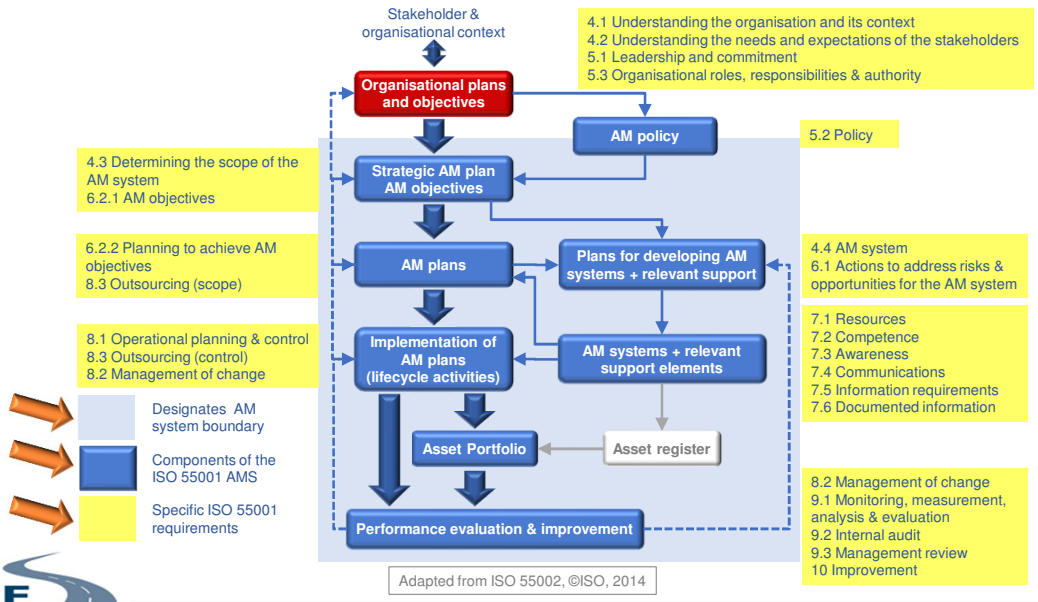
ISO 55001 AM system

©Mervyn Henderson Consulting

- **ISO 55001 AM system (AMS) – a 'set of interrelated or interacting elements to establish AM policy, AM objectives & processes to achieve those objectives' & all aspects of organisational performance & delivery in relation to AM, including**
  - **AM policy** – a statement of high level organisational commitment
  - **AM objectives** – a description of what AM is to achieve
  - **Strategic AM plan** (SAMP) or AM strategy – a high level document essentially describing how AM will be conducted
  - **AM plans** – documents which describe practices, tactics and long-term financial projections
    - These plans will typically follow the guidance provided in the International Infrastructure Management Manual
- **The AMS is <u>not software</u> but can include software if required to establish policy and objectives**
  - Think of the AMS as the system that helps the organisation determine what it wants to do and how it should do it
- **The AMS provides the structure by which to direct, coordinate & control AM activities & achieve an agency's vision & goals**
  - The relationship between the key elements of the AM system and the clauses in ISO 55001 is shown in the process diagram in the next slide

Relationship between key elements of an AM system & related clauses in ISO 55001

©Mervyn Henderson Consulting



Adapted from ISO 55002, ©ISO, 2014

SANS/ ISO 55001 Elements & the Plan-Do-Check-Act model

©Mervyn Henderson Consulting

- The Plan-Do-Check-Act (PDSA) approach for management systems illustrates how the ISO 55001 clauses align with the PDCA model
- Other approaches to management systems are also possible that do not follow the PDCA model, e.g.
  - Lean
  - Six Sigma

Adapted from Asset Management – an anatomy ©IAM, 2015

113

South African Road Federation

113

What should an AM System contain?

©Mervyn Henderson Consulting

- The AMS needs to contain the primary elements shown in figure 'Relationship between key elements of an AM system & related clauses in ISO 55001'
- ISO 55001 has specific requirements which an agency needs to consider, which can usually be demonstrated in two ways
  - Documentary evidence showing that the agency has suitable business processes and practices in place
  - Evidence that these processes are being followed
- Communication and awareness are particular areas to focus on, as these can be key issues, or barriers, within large organisations

114

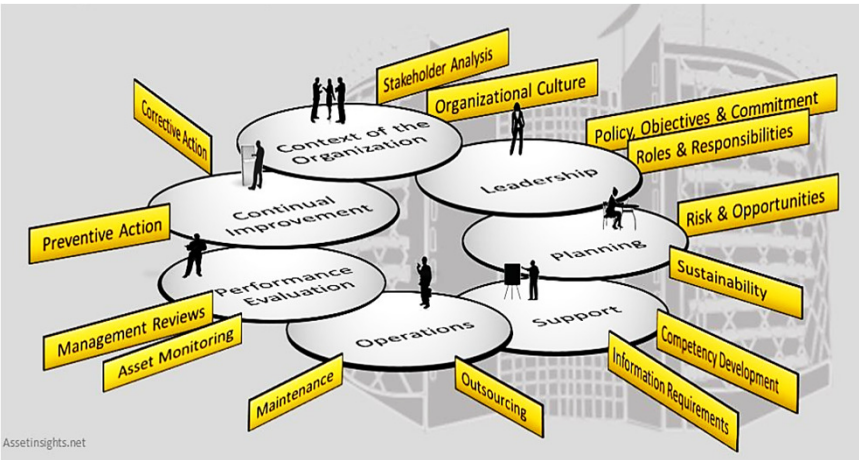
South African Road Federation

114

What should the AM System contain?

©Mervyn Henderson Consulting

- For each requirement, from ISO 55001 Clause 4 (Context), through to Clause 10 (Improvement), the way in which each is interpreted from a road agency perspective is illustrated in the tables that follow



©Assetinsights.net

115

South African Road Federation

115

ISO 55001 Organisational context requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 4 Subsection	Specific requirements and relevance to a road agency
Understanding the organisation and its context	• The issues that could affect achievement of the AM objectives and the outcomes of the AM system need to be identified • Both internal and external contexts are often described in an agency's strategic plans, annual reports, AM plans and other documents • External context may include growth, economic development, social trends and environmental issues relating to transport • AM objectives aligned with the organisation's higher-level objectives should address these issues
Understanding the needs and expectations of stakeholders relevant to the AM system	• Stakeholders need to be identified and their requirements in financial and non-financial terms understood & decision-making criteria need to be identified • Stakeholders may include transport system funders, government and interest groups, while customers are typically users of the transport system • Stakeholders' and customers' needs and expectations are generally described in AM plans, and are identified through market research or consultation processes • The AM system should include reference to measurement of the levels of service delivered by the assets, and their comparison with expectations

116

South African Road Federation

116

ISO 55001 Organisational context requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 4 Subsection	Specific requirements and relevance to a road agency
Determining the scope of the AM system	• The boundaries of the AM system within the organisation need to be defined, and the asset portfolios it includes made explicit • The scope is expected to cover all activities associated with the life-cycle of the assets • There will typically be interactions with other management systems & processes within the organisation
An AM system	• The approach to establishing, implementing, maintaining and improving the AM system needs to be clearly stated • This includes integration of AM processes, activities and data with other functions, and the development of a SAMP or AM strategy that documents the role of the AM system in supporting achievement of the AM objective

117

South African Road Federation

117

ISO 55001 Leadership requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 5 Subsection	Specific requirements and relevance to a road agency
Leadership and commitment	• The organisation needs to demonstrate commitment to AM and leadership by top management • This can be achieved through a range of methods, including visible support and provision of resources through to actions and clearly articulated written statements to all people within the organisation
Policy	• An AM policy must provide a framework for establishing AM objectives, and should include commitments to satisfying applicable requirements and to continual improvement • While agencies will typically have a number of policies that are relevant, it is important for there to be a single high level overarching statement
Organisational roles, responsibilities and authorities	• The organisation needs to demonstrate that the responsibilities and authorities for relevant AM roles are assigned and communicated by top management • This is typically achieved through a clear organisational structure with well-defined roles and responsibilities described in job descriptions

118

South African Road Federation

118

ISO 55001 Planning requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 6 Subsection	Specific requirements and relevance to a road agency
Actions to address risks and opportunities	• When describing the risks and opportunities in relation to achieving the AM objectives an organisation needs to consider external and internal issues and the needs and expectations of stakeholders • The causes, effects and likelihoods of adverse events occurring need to be understood so risks can be managed to an acceptable level, with an audit trail for the management of identified risks • An organisation needs to ensure that the AM system achieves its objectives, prevents or reduces undesirable effects, identifies opportunities, and achieves continual improvement • For a road agency, risk and safety management processes must be included here
Objectives and planning to achieve them	• AM plans are the mechanism for demonstrating how the AM objectives will be achieved utilising road assets • Plans to achieve the AM objectives must be established, documented and maintained, aligning the plans with the AM policy and SAMP and taking into account relevant requirements external to the AM system • AM plans need to cover all road services and assets defined within the scope of the AM system

ISO 55001 Support requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 7 Subsection	Specific requirements and relevance to a road agency
Resources	• Determine and provide sufficient resources for the establishment, implementation, maintenance and continual improvement of the AM system, for meeting the AM objectives, and for implementing the activities described in AM plans • Whether the activity is carried out in-house or by consultants and contractors, this typically involves identifying or mapping the resource needs for each AM function. Where there is private sector involvement, ensure that the appropriate resources will be available to the agency where and when required. Resource needs may be human and non-human
Competence	• Determine the competence levels required for AM throughout the organisation, not just for 'AM specialists', and ensure that the education, training or experience of people carrying out work that could affect the performance of the assets, AM or AM system reflects the competence levels required. This includes processes for making sure that external competences and capabilities are appropriate to the tasks required
Communication	• Determine the need for internal and external communication relevant to the assets, AM and the AM system and deliver those levels of communication • The need should cover the information requirements of stakeholders and information required and provided during consultation processes, such as on road projects

ISO 55001 Support requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 7 Subsection	Specific requirements and relevance to a road agency
Awareness	• Ensure that people carrying out work under the organisation's control, who can affect the achievement or otherwise of the AM objectives, are aware of: – the AM policy – their contribution to AM system effectiveness and the benefits of improved AM performance – the risks and opportunities relating to their work activities – the implications of not conforming to the AM system • This grouping includes staff, contractors and consultants carrying out any activity under the AM system or on the assets themselves
Information requirements	• Information requirements to support the achievement of AM objectives need to be described, including – specifying, implementing and maintaining processes for managing the information – ensuring alignment of financial and non-financial terminology, and consistency and traceability of asset and financial data • While road agencies typically hold large volumes of asset data, for which processes are documented, it is important to note that information requirements cover a much greater range across the AM cycle

121

South African Road Federation

121

ISO 55001 Support requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 7 Subsection	Specific requirements and relevance to a road agency
Documented information	• Information that must be controlled under normal ISO processes is subject to specific requirements and is known as 'documented information'. • This includes legal and regulatory requirements as well as some external documents. • Road agencies must ensure that this information is available and suitable for use where and when needed, and is adequately protected

122

South African Road Federation

122

ISO 55001 Operation of the AM System requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 8 Subsection	Specific requirements and relevance to a road agency
Operational planning and control	• Plan, implement and control the processes established to: meet the requirements, implement the actions associated with the identified risks and opportunities, implement the AM plans, and implement corrective and preventive actions • This covers the operational planning and control processes for both AM and the AM system • While this should include the operational management of road assets, it is much wider than that. It includes establishing criteria, implementing process control, maintaining documentation, and managing operational risk across all activity associated with the AM system
Management of change	• Ensure that the risks associated with any planned change that may affect achievement of the AM objectives are managed in accordance with the provisions of Clause 6 (Planning) • Control planned changes, review unintended consequences & take action to mitigate adverse effects • Change may be needed to improve AM maturity, or procurement or structural change in the agency
Outsourcing of AM activities	• Assess the risks of and control any outsourced activities or processes that could effect on achievement of the AM objectives or performance of the assets • Document how the activities will be controlled and integrated into the AM system – all outsourced activities must meet all of the same requirements as those applying internally. This applies particularly to physical works contracts, such as network maintenance, capital works and professional services, all being part of the AM cycle

ISO 55001 Performance evaluation requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 9 Subsection	Specific requirements and relevance to a road agency
Monitoring, measurement, analysis and evaluation	• Determine what needs to be monitored and measured, including how, when and where. Control and maintain documented evidence • This covers the performance of the agency in carrying out AM activity, the performance of the assets and the effectiveness of the AM system in achieving the AM objectives • An agency should establish a hierarchy of performance measures to cover all of these attributes
Internal audit	• Define audit criteria and their scope, plan, establish and maintain an internal audit programme • The purpose of internal audits is to test conformance, implementation and maintenance of the AM system • This may lead to the identification of changes or improvements • Note that this does not replace the regular external ISO audit processes to assess whether the agency can continue to be ISO 55001 certified • This could be linked to other audit procedures, such as safety audit
Management review	• Plan and carry out regular top-management reviews of the AM system to ensure its continuing suitability, adequacy and effectiveness. Identify opportunities for continual improvement and retain documented evidence of the audits and the opportunities

ISO 55001 Improvement requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 10 Subsection	Specific requirements and relevance to a road agency
Non-conformity and corrective action	• Specify requirements for responding to any non-conformity or incident and taking action to control and correct it. This includes criteria to address: – the possibility of future occurrences – implementation of actions – review of effectiveness of actions • The requirements also include procedures for managing activities such as reactive maintenance, emergency responses, etc. on road networks
Preventive and predictive action	• Establish processes to address the root causes of asset failures and AM system failures. These causes may include: – sources of information – identification of potential failures – recording changes in processes – updating am plans – documenting actions • The requirements include procedures for managing activities such as planned maintenance, condition monitoring, predictive modelling, etc., on road networks

ISO 55001 Improvement requirements

©Mervyn Henderson Consulting

ISO 55001 Cl 10 Subsection	Specific requirements and relevance to a road agency
Continual improvement	• Continually improve the suitability, adequacy and effectiveness of AM and the AM system • This includes processes such as gap analyses and maturity level assessments, and the establishment and monitoring of continuous improvement action plans • These activities are typically already carried out by most agencies. An important point is that continuous improvement of the AM system is also required

Photo by bert brrr on Unsplash

What does an ISO 55000 AM system look like?

©Mervyn Henderson Consulting

- **An ISO 55000 AM system is a holistic programme for directing and controlling all aspects of physical AM**
  - It unites organisational goals and structure with process, data, technology, and auditing tools to create an effective operation
- **Process is the foundation for AM and ISO 55000 is all about process**
- **It brings together the whole organisation**
  - An ISO 55000 AM system spans multiple business functions, including project management, maintenance, operations, storerooms, procurement, and accounting
  - It lays out clear responsibilities, procedures, and goals for the whole operation
  - By doing so, it breaks down silos and gets the whole organisation working together to accomplish AM objectives
- **It encompasses the whole asset lifecycle**
  - An ISO 55000 AM system governs the whole lifecycle of physical assets – from planning and acquisition to decommission and disposal
  - Because of this long-term approach, an ISO 55000 AMS is an exceptional tool for reducing total cost of ownership & increasing the return on assets

Lifecycle of physical assets

127

South African Road Federation

127

What does an ISO 55000 AM system look like?

©Mervyn Henderson Consulting

- **The AMS aligns the whole operation from executives to technicians**
  - An ISO 55000 AM system establishes an executive mandate for how the organisation's assets will be managed
  - It then works out exactly what this mandate means in terms of specific objectives, processes, and performance measures
  - This top-down approach makes AM a team player in helping the organisation deliver on its business goals

AM top-down approach

Adapted from SwainSmith, Inc. https://swainsmith.com/iso-55000-iiot-and-eam-solving-the-asset-management-puzzle/

128

South African Road Federation

128

What does an ISO 55000 AM system look like?

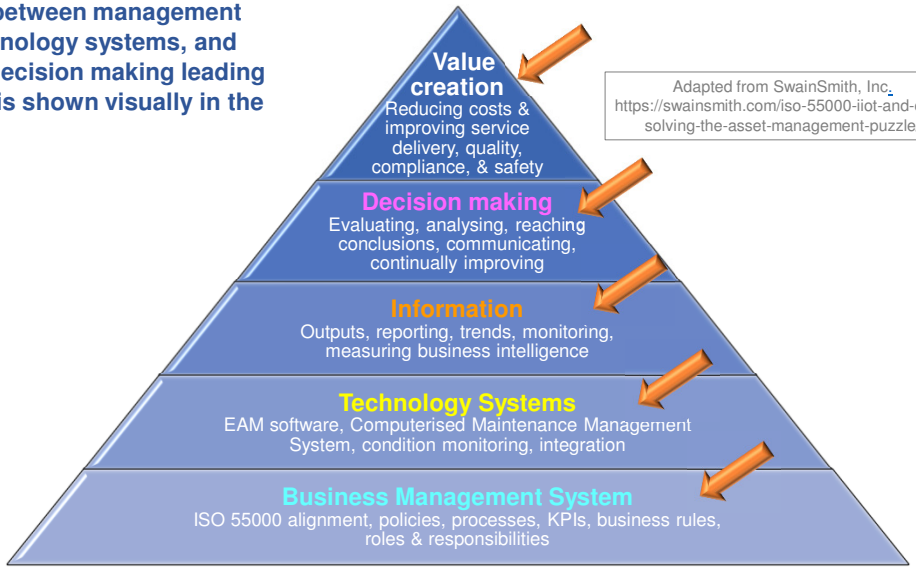
©Mervyn Henderson Consulting

- **Bringing in technology**
  - Once the foundation of AM is laid, it's time to become more efficient and bring in information systems that collect, monitor, store, analyse, and report AM data
  - There are two layers of information technology, i.e.
    - An upper layer of 'Enterprise' AM software system, which is the main repository for AM data
    - A lower layer that consists of monitoring devices and critical supporting applications that connect to the 'Enterprise' AM system to share data
- **Putting together the pieces: ISO 55000 and technology**
  - ISO 55000 AM systems and technology systems perform different but complementary functions
    - They target the same objective but address it from two different directions
- **The key is that AM systems and technology systems come together, integrate, and work in a unified manner**
  - Management systems bring the **process** and technology systems bring the tool set to execute it
  - AM systems and asset technology systems are better together than apart
  - Process creates data & technology systems deliver it – you need both to achieve success
  - Working together, the whole becomes greater than the sum of the parts

What does an ISO 55000 AM system look like?

©Mervyn Henderson Consulting

- **The relationship between management systems and technology systems, and information and decision making leading to value creation is shown visually in the pyramid graphic**



Adapted from SwainSmith, Inc. https://swainsmith.com/iso-55000-iiot-and-eam-solving-the-asset-management-puzzle/

What does an ISO 55000 AM system look like?

©Mervyn Henderson Consulting

- **To have long-term and sustainable value creation you need both management systems and technology systems, but which comes 1st ?**
- **Process rules the roost – it identifies who does what, and when, where, and why**
  - Technology and EAM should be implemented to support that, not to define it – technology is only as good as the process driving it
- **As the graphic indicates, business management systems come first**
  - Technology should be a product of the process, not the other way around
  - When technology systems get in front of management systems, you're in for trouble – the wrong captain is driving the boat
  - Implementing a technology system without fully defining your management system (business processes) will leave you operating without direction
- **Configuring software as you go is a potentially risky and very costly endeavour**
  - Once the AM system is in place, then bring in technology systems to streamline it
  - Technology is a requirement for success – but only after you have fully defined how you are going to conduct business
  - Management systems make you effective, while technology systems make you efficient
- **Effective and efficient AM is what the organisation is after!**

131

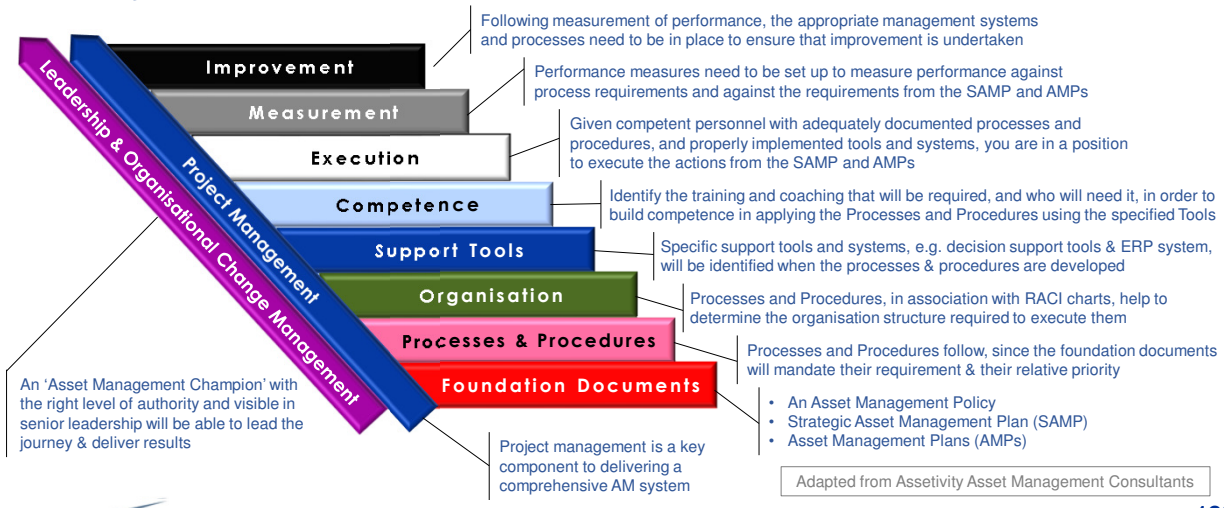
South African Road Federation

131

Steps to developing an AM System

©Mervyn Henderson Consulting

- **Set the foundation first – the figure shows a logical sequence of how the building blocks of an AM System can be established**



Adapted from Assetivity Asset Management Consultants

132

South African Road Federation

132

ISO 55001 AM system plans

©Mervyn Henderson Consulting

- **Plans by time frame**
  - **Strategic Plan** – This plan takes a long-range view of the needs of the organisation, typically looking forward 20-30 years into the future. Strategic plans try to give a "big picture" view of things
  - **Tactical Plan** – This plan occupies a position somewhere between the strategic plan and the operational plan and consider a 3-year, 5-year or 10-year window into the future
  - **Operational Plan** – This plan is focused on one single fiscal year or calendar year
- **Functional plans – several are identified in the process diagram**
  - **Risk Management Plan** – provides a register of all the different types of risks facing the organisation, their likelihood and their impact if they occur. The plan develops a series of treatments to address each risk
  - **Safety Plan** – identifies all the potential safety hazards on the site, in and around the buildings that are owned and/or operated by the organisation. The safety plan is closely tied to the risk management plan
  - **Sustainability Plan** – identifies
    - How the organisation will find the optimal balance across the triple bottom line of people (community), planet (environment) and profit (financial viability) and across the triad of risk, cost and performance
    - It identifies the types of inevitable trade-offs that the organisation may sometimes need to make in order to meets its objectives
  - **Change Management Plan** – identifies
    - The gaps in the organisation's existing processes and how the organisation will implement changes over time
    - The five milestones an individual must achieve for change to be successful: awareness, desire, knowledge, ability, reinforcement

133

SARF better roads

South African Road Federation

133

ISO 55001 AM system plans

©Mervyn Henderson Consulting

- **Functional plans *continued***
  - **Resourcing Plan** – identifies the number of staff and type of staff that are required to meet the organisation's objectives. It also considers the appropriate balance between internal resources (staff) and external resources (such as contractors)
  - **Expenditure Plan** – identifies the timing of CAPEX and OPEX
  - **Maintenance Plan** – identifies all the organisation's physical assets and the maintenance tasks that are required to ensure the ongoing performance of the assets
  - **Capital Plan** – identifies the lifespans of the different assets and the forecasted replacement costs at the end of their useful life. This information is presented in the form of cash flow table that enables the organisation to make informed decisions on how much money should be set aside each fiscal year in preparation for future projects
  - **Information & Technology Plan** – identifies the types of information that the organisation needs to collect in order to achieve its objectives, the requirements for storage of information, hardware and the use of different software applications to empower staff
  - **Stakeholder Plan** – identifies the different types of stakeholders (both internal and external) that have an interest in and an influence over the organisation. It identifies the resources and activities that are necessary to manage positive relations with the different stakeholders
  - **Communications Plan** – processes and procedures to interact with stakeholders to ensure alignment with stakeholder needs, requirements, perceptions, and improve the quality of decision making, reduce conflict, etc.

134

SARF better roads

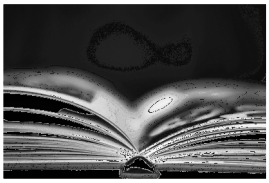
South African Road Federation

134

Alignment or Certification to ISO 55001?

©Mervyn Henderson Consulting

- **The benefits described may be realised by aligning the organisation with ISO 55001**
- **Before making a decision on whether or not to become certified to ISO 55001, an agency should consider the options, including**
  - Limited certification – for a particular asset group/portfolio/sub-network
  - Alignment without certification
  - Partial alignment – for a particular asset group/ portfolio/ sub-network or particular requirements considered important to the agency
  - Taking no action



- **Whether or not an agency should seek certification is a matter for an individual agency to determine. This will depend on factors, such as**
  - Stakeholder expectations, including customers, road user groups, statutory bodies (e.g. state governments), asset owners, funders or investors
  - Costs and benefits associated with the certification process, both initial and on-going costs to maintain certification

135

South African Road Federation

135

Features of AM which differentiate it from other management systems

©Mervyn Henderson Consulting

- **Approach to decision making**
  - Competent, consistent, optimal decision-making is a vital element underpinning successful AM
  - In making AM decisions, it is important to find the right compromise between competing interests, such as asset utilisation/ performance vs operating expenditures, or short-term benefits vs long-term sustainability
    - The approach applied should be proportionate
  - AM decisions vary greatly in complexity and criticality, so its inappropriate to apply the same level of sophistication to all decisions
    - Simple, non-critical decisions can & should be made with common sense
    - Higher impact decisions with multiple influences, options, timings or inter-dependencies require systematic, multi-disciplined & auditable decision-making processes
  - AM also involves organisations choosing & using appropriate combination of tools & techniques, e.g., Lean, 6-Sigma, Total Productive Maintenance, Reliability Centred Maintenance, to support decision-making & improve AM activities
    - This also includes Operational Excellence, which builds on continuous improvement methodologies, such as Lean and 6-Sigma, bringing a workplace focus on problem solving, teamwork & leadership to continually improve activities to meet customer needs
    - The term 'optimising' is often used in relation to AM decision-making
      - It describes the process of establishing the best value compromise between a set of competing factors, in order to support AM decision-making
      - This can range from a subjective, quantitative judgement to more sophisticated techniques that can demonstrate that the best value is being obtained

136

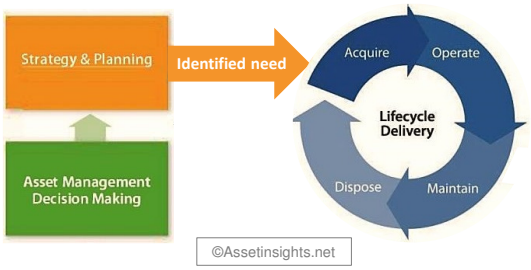
South African Road Federation

136

Whole of asset lifecycle activities

©Mervyn Henderson Consulting

- **Lifecycle activities**
  - Assets usually contribute value in a systems context
  - The lifecycle includes all aspects of managing assets from the initial concept through to disposal as shown in the diagram
    - **Identify the need** – emanates from strategy & planning
    - **Acquire** – covers everything that goes into designing and procuring an asset. Proper application of these activities ensures that the asset is fit for purpose
    - **Operate** – normally the bulk of the lifecycle for an asset during which it provides the function for which it was designed
    - **Maintain** – maintenance, refurbishment and potential upgrade to meet any change in condition or operational requirement. This phase can be decades, even centuries
    - **Dispose** – this is often the most overlooked phase



- The concept of the lifecycle can become more challenging where more complex systems are considered
- AM requires integration of activities across the whole lifecycle, not just consideration of individual lifecycle stages
  - The focus on integration particularly affects the design phase, which can determine as much as 80% of the total lifecycle costs and a large proportion of its environmental and social impact

137

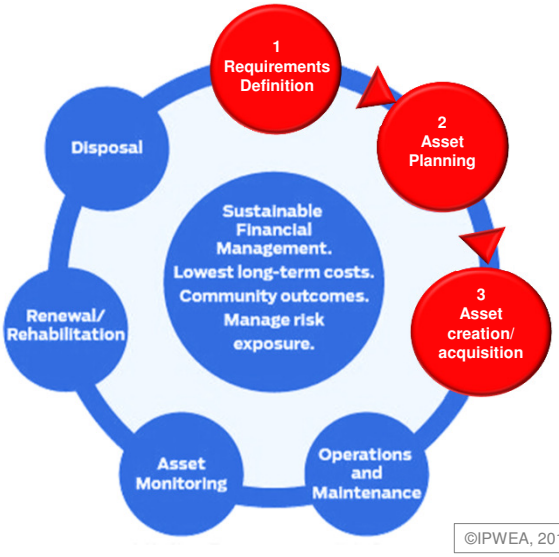
South African Road Federation

137

Expanded view on Asset Lifecycle Activities

©Mervyn Henderson Consulting

- **Requirements definition**
  - The need for the service provided by the assets is defined by an analysis of
    - The organisation's strategic/ business goals
    - The customer's level of service requirements, both now and in the future
    - Legislative and regulatory requirements
- **Asset planning**
  - Involves confirming the service required from the customer and ensuring the most effective solution is used – asset-based, demand management, or a combination
- **Asset creation/ acquisition**
  - The provision of, improvement to, an asset where the outlay can reasonably be expected to provided benefits beyond the year of outlay



©IPWEA, 2011

138

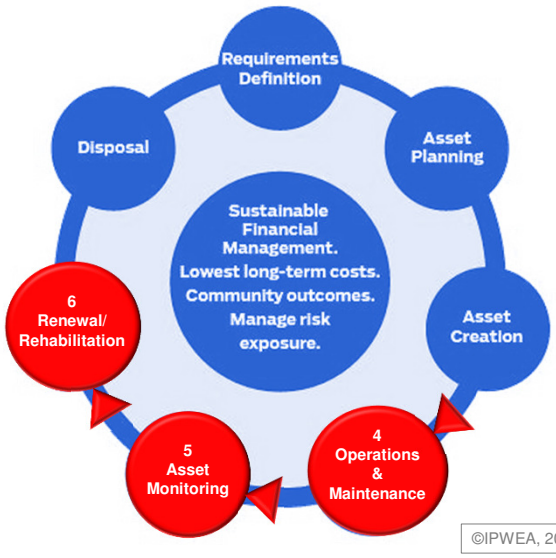
South African Road Federation

138

Expanded view on Asset Lifecycle Activities

©Mervyn Henderson Consulting

- **Asset operations and maintenance**
  - Relates to day-to-day running and upkeep of assets
  - Costs are particularly significant for dynamic/short-lived assets
- **Monitoring asset condition/ performance**
  - Performance relates to the ability of the asset to meet target LoS
  - Condition reflects the physical state of the asset
  - Condition & performance information drives future programmes
- **Asset rehabilitation/renewal**
  - Required to restore the asset to its required functional condition and performance



©IPWEA, 2011

139

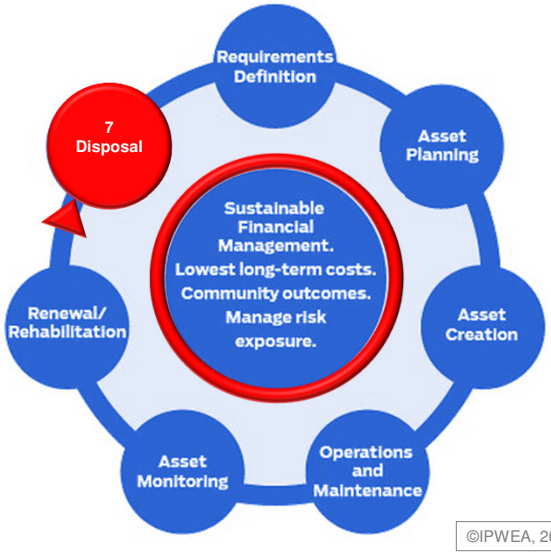
South African Road Federation

139

Expanded view on Asset Lifecycle Activities

©Mervyn Henderson Consulting

- **Asset disposal**
  - When the service is no longer required or is uneconomical compared with other methods
- **Financial management**
  - Requires the recognition of all lifecycle costs associated with asset ownership and supports cost-effective decision-making



©IPWEA, 2011

140

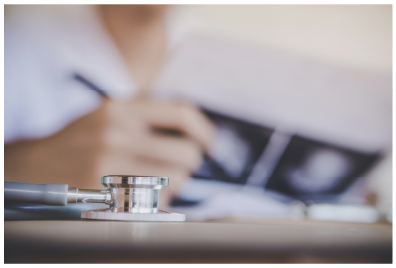
South African Road Federation

140

Background to AM Framework

©Mervyn Henderson Consulting

- **It is good practice to establish an overall organisational AM framework that connects to all levels of the organisation**
  - This should range from governance through to operational levels, including contract providers
- **This framework should tie the organisation's strategic direction to what is expected through the AM policy**
- **Business components, such as the AM system and its attendant parts (policy, strategy, plans, business processes, accountability and reporting mechanisms) support the implementation of AM and help to ensure alignment and good governance**
- **Good governance of AM means**
  - Ensuring that the organisation's service delivery objectives and obligations are being met prudently, effectively and efficiently.
  - The scope and principles of AM must be well defined, with clear accountabilities specified at all levels
- **AM should be one of the primary focal points for corporate governance or elected members of a Council, as appropriate**



141

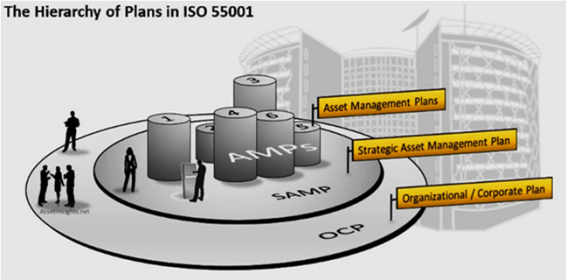
South African Road Federation

141

AM Framework Artefacts

©Mervyn Henderson Consulting

- **An AM framework typically includes the ISO 55001 artefacts – policy, objectives, strategic AM plan, AM plans (lifecycle plans)**
- **These drive the implementation of AM and ensure its alignment with the organisation's strategic objectives**
- **A good AM framework sets, directs &, where appropriate, controls and monitors all the components of the AM system to ensure they work together, firmly linking the organisation's strategic & AM objectives and practices, procedures, processes & systems**
- **It does this by**
  - Linking organisational strategic objectives with the policies and objectives needed to deliver them
  - Linking organisational strategic objectives with the levels of service that the assets should deliver
  - Guiding priorities, the work required on the assets to achieve those objectives, and the finances needed to support that work
- **The framework is not the sole driver of an organisation: it is part of a wider hierarchy of plans**
  - The clearer and more consistent this hierarchy is the greater the probability will be of the organisational objectives being delivered in the most cost-effective manner



©Assetinsights.net

142

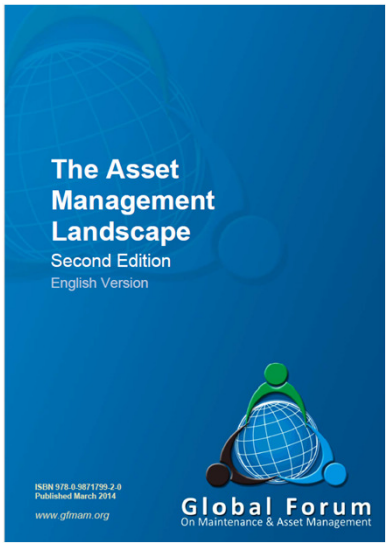
South African Road Federation

142

GFMAM Asset Management Landscape Subjects

©Mervyn Henderson Consulting

- **The Asset Management Landscape is a publication of the Global Forum on Maintenance & Asset Management**
  - The core of AM is the Asset Management Fundamentals described in the 39 AM Subjects
  - **Subject Group Strategy and Planning**: Subjects in the yellow highlights indicate ISO 55001 artifacts are derived from these subjects relevant to this course
    - Asset Management Policy
    - Asset Management Strategy & Objectives
    - Asset Management Planning
    - Demand Analysis
  - **Subject Group AM Decision-Making**: Subjects
    - Capital Investment Decision-Making
    - Operations & Maintenance Decision-Making
    - Lifecycle Value Realisation
    - Resourcing Strategy
    - Shutdowns & Outage Strategy



143

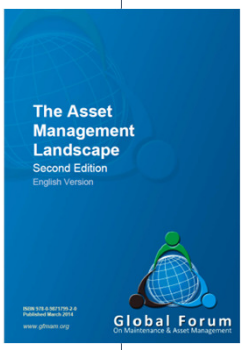
South African Road Federation

143

GFMAM Asset Management Landscape Subjects

©Mervyn Henderson Consulting

- **Subject Group Lifecycle Delivery**: Subjects
  - Technical Standards & Legislation
  - Asset Creation & Acquisition
  - Systems Engineering
  - Configuration Management
  - Maintenance Delivery
  - Reliability Engineering
  - Asset Operations
  - Resource Management
  - Shutdown & Outage Management
  - Fault & Incident Response
  - Asset Decommissioning & Disposal
- **Asset Information**: Subjects
  - Asset Information Strategy
  - Asset Information Standards
  - Asset Information Systems
  - Data & Information Management



- **Subject Group Organisation & People**: Subjects
  - Procurement & Supply Chain Management
  - Asset Management Leadership
  - Organisational Structure
  - Competence Management
- **Subject Group Risk & Review**: Subjects
  - Risk Assessment & Management
  - Contingency Planning & Resilience Analysis
  - Sustainable Development
  - Management of Change
  - Assets Performance & Health Monitoring
  - Asset Management System Monitoring
  - Management Review, Audit and Assurance
  - Asset Costing & Valuation
  - Stakeholder Engagement

144

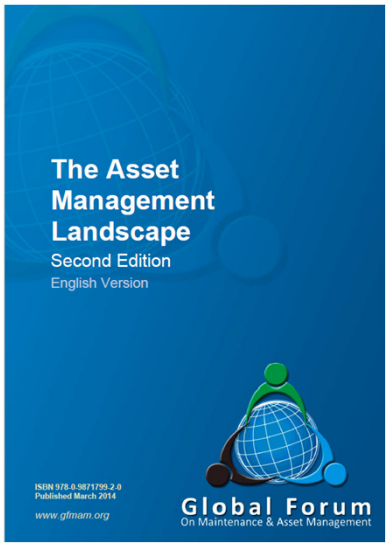
South African Road Federation

144

GFMAM Asset Management Landscape Subjects

©Mervyn Henderson Consulting

- **For each Subject Group 'The AM Landscape' provides**
  - Definition
  - Context
  - Artifacts
  - Related Subjects
  - Relevant Standards – e.g. clauses in ISO 55001 and other ISO standards



145

South African Road Federation

145

AM Framework

©Mervyn Henderson Consulting

- **Plan hierarchy and AM framework**

Adapted from IPWEA, 2015

146

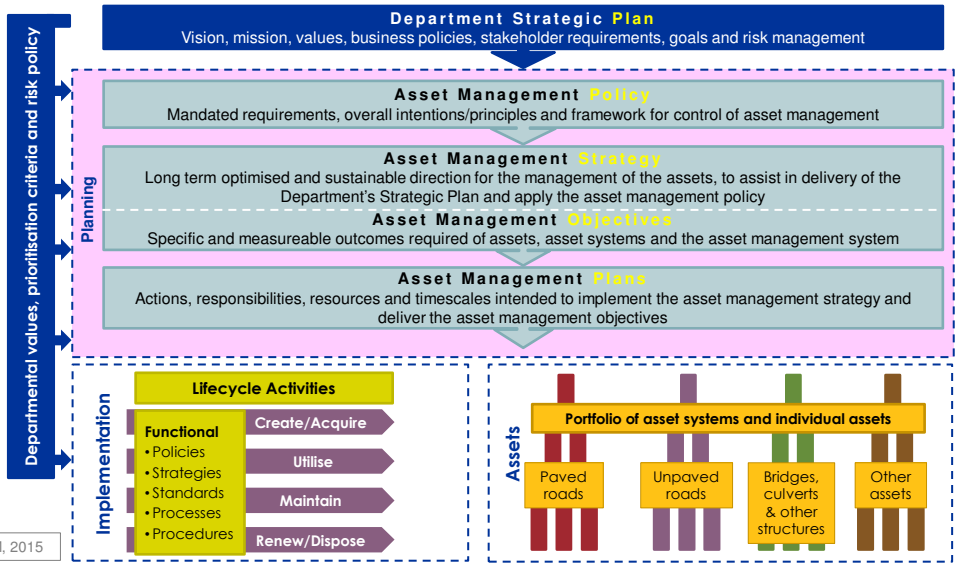
South African Road Federation

146

Planning & implementation elements of an AM system

©Mervyn Henderson Consulting

- The integration of planning and implementation elements of an AM system and illustrates the 'line of sight' of the strategic plan through to the AM plans for implementation of lifecycle activities on the asset systems and individual assets



Adapted from ©IAM, 2015

147

South African Road Federation

147

AM Policy

©Mervyn Henderson Consulting

- **AM policy is the cornerstone of an organisation's approach to AM**
- **Purpose of AM Policy**
  - To outline broadly the principles & requirements—the rules of engagement—for undertaking all AM activities across the organisation in a structured & co-ordinated way consistent with the organisation's strategic plan
  - To provide direction to development & implementation of the AM Strategy and setting AM Objectives, and it should provide clear direction on the appropriate focus and levels of maturity expected
- **It works at two main levels**
  - It provides direction for the development of strategies & objectives & provides asset managers with statements of the organisation's requirements & management's expectations with respect to the outcomes
  - It requires senior management to consider its role in AM, recognise that it is an issue that affects the whole organisation, and to manage those effects
- **The policy should be a short, clear, concise, and easy-to-read document that describes the principles adopted in applying AM to achieve the agency's strategic objectives**
- **It should state the high-level principles by which the organisation manages its assets and sets out the intentions and direction of the organisation, as formally expressed by its top management**
- **It should be formally agreed and signed by an appropriate executive officer and approved at the governance level, thereby demonstrating the organisation's commitment to AM**

148

South African Road Federation

148

ISO 55001 AM Policy requirements

©Mervyn Henderson Consulting

- **ISO55001 requires top management to establish an AM policy that**
  - Is appropriate to the purpose of the organisation
  - Provides a framework for setting objectives
  - Includes a commitment to satisfy applicable requirements
  - Includes a commitment to continual improvement of the system
- **ISO55001 requires that the AM policy be**
  - Consistent with the organisational plan
  - Consistent with other relevant organisational policies
  - Appropriate to the nature and scale of the organisation's assets and operations
  - Available as documented information
  - Communicated within the organisation
  - Available to stakeholders, as appropriate
  - Implemented & periodically reviewed & updated
- **Typical content of an AM policy**
  - Organisational context and the importance of AM
  - Overall vision, mission, strategic goals, plans, objectives and policies
  - Supporting vision and goals
  - Mandatory requirements, laws, legislation & regulations
  - Policies underpinning the strategic goals
  - Principles guiding activities in achieving the objectives
  - Resources and responsibilities, including organisational structure
  - Integration into the organisation's business practices and processes
  - Reporting on performance
  - Audit, review and updating procedures for the policy

149

SARF better roads

South African Road Federation

149

Good AM Policy

©Mervyn Henderson Consulting

- **A good AM policy may also cover or refer to**
  - A commitment to abide by the principles of good or best practice in pursuing the achievement of the objectives
  - Decision-making criteria, including evaluation methodology spanning lifecycle costs, benefits, and asset risks
  - A commitment to continual improvement of the system
- **There is no right answer as to what should be contained in a policy document compared to the strategy document – they may well be in the same document**
- **The important point is to ensure that all requirements are robustly addressed and that it is shared widely within the organisation**
- **The policy should be reviewed regularly so that it remains relevant to the changing business environment of the organisation**
- **Examples of AM Policy**
  - Department of Transport and Main Roads, Queensland at https://www.tmr.qld.gov.au/-/media/busind/techstdpubs/Asset-management/TIAM-Policy/TIAMPolicy.pdf?la=en
  - City of Sydney, Australia at https://www.cityofsydney.nsw.gov.au/policies/asset-management-policy
  - Scottish Trunk Road Network Asset Management Policy at https://www.transport.gov.scot/publication/scottish-trunk-road-network-asset-management-policy/
  - NSW Treasury Asset Management Policy for the NSW Public Sector at https://www.treasury.nsw.gov.au/finance-resource/asset-management-policy

150

SARF better roads

South African Road Federation

150

Example of a concise AM Policy of Highways England

©Mervyn Henderson Consulting

1 page: Top part

highways england

Highways England
Asset Management Policy

Highways England's asset management approach aligns our asset related activities to deliver the vision defined in the Department for Transport's Road Investment Strategy. This Asset Management Policy supports the new governance structure and associated ways of working within Highways England. We will periodically review and update it to remain aligned with the strategic business objectives.

The Asset Management Policy links with our three imperatives as well as the Strategic Business and Delivery Plans. It defines the principles by which we will develop our asset management capability - ensuring we understand the asset needs and develop effective solutions. We will successfully deliver these to drive the required service and value from our assets, meeting or exceeding customer expectations.

The scope of this Policy covers the management of the strategic road network and other assets owned by Highways England for the purposes of operating, managing and improving that network. The principles outlined below have been established in line with industry leading practices and are consistent with the requirements of the asset management standard ISO55000 as well as applicable laws, legislation and regulation.

Our Three Imperatives

Safety	Customer Service	Delivery
making the roads safer for everyone	improving the experience of road users	strengthening our capability to deliver the Government's five-year road investment plan

151

South African Road Federation

151

Example of a concise AM Policy from Highways England

©Mervyn Henderson Consulting

1 page: Bottom part

Our Asset Management Principles

Strategy and Planning
We will establish and continuously improve an asset management system linking our strategic business objectives to our everyday asset management activities.

Asset Information
Having determined the right asset information first, we will collect, collate, control and circulate that information at the right time informing the right asset management decision-making.

Decision Making
We will base our decision-making on the health and performance of our assets, measured throughout their lifecycle and informing our future asset management activities.

Lifecycle Delivery
We will utilise technology, tools and processes as enablers for the effective and efficient utilisation of our assets.

Risk and Review
We will embed a risk-based framework to deliver a resilient and reliable asset operational portfolio.

Organisation and People
We will recruit, train and retain the right staff to deliver a capable organisation.

"On behalf of Highways England, I endorse this Asset Management Policy. I believe a strong asset management capability is fundamental to our business. It will help us to deliver our commitments and improve our safety, efficiency and reputation. We need to go beyond just satisfying our licence requirements. Proactive and high capability asset management will help save lives, save money and bring a better understanding of our assets to our staff."

Jim O'Sullivan,
Chief Executive

For further information please contact the Asset Management inbox: AssetManagementProgramme@highwaysengland.co.uk

Issue date: May 2017

152

South African Road Federation

152

AM Objectives

©Mervyn Henderson Consulting

- **AM objectives define what the organisation intends to achieve from its AM activities & by when**
- **ISO 55001 very clearly places the objectives at the centre**
  - They are a key element in the strategy and are usually incorporated in, & published with it
  - The organisation must retain documented information on the objectives, which should be established and updated as part of the SAMP
- **The objectives are set within the framework provided by and developed in the policy**
- **The objectives describe what the organisation intends to achieve with the particular assets within its planning horizon**
- **AM objectives are neither statements of the organisation's commitment to the services provided nor its long-term strategy, but are the goals of long-term strategies**
- **Considerations in developing AM objectives**
  - The purpose of the assets—what services are to be delivered to roads customers?
  - What is the current and future intended performance of the network?
  - What are the key risks and risk management processes, including the risk of service failure(s) and the consequences of such failure(s)?
  - What performance areas will be used for mapping to the objectives & monitoring their achievement/ progress?
  - The alignment and consistency with the other organisational objectives
  - The maturity of the organisation should be considered & include those objectives that can be used to encourage improvement

153

SARF better roads

South African Road Federation

153

AM Objectives

©Mervyn Henderson Consulting

- **AM Objectives are normally developed alongside the strategy & are equally applicable to plans**
  - They should be **SMART** – Specific, Measurable, Achievable, Relevant, Time-related – milestones that set out **what** must be delivered and by **when**
  - Objectives may also be in organisational business plans and can be used to measure the success of the strategy or plan
  - Objectives within a strategy will enable specific AM plans ('lifecycle plans') to be developed

154

SARF better roads

South African Road Federation

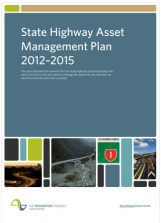
154

Case Study: Developing AM Objectives at NZTA

©Mervyn Henderson Consulting

- **Every three years the New Zealand government produces a Government Policy Statement on Land Transport (GPS)**
  - It sets out its priorities for expenditure from the National Land Transport Fund over the next ten years.
  - All road agencies receiving funds, NZTA and territorial local agencies, must recognise these priorities and align their land transport strategies and AM plans with the intent of the GPS
  - With a strategic focus on economic growth and productivity, road safety and value for money, the draft GPS 2018 defines a number of national land transport objectives; such as
    - 'a land transport system that is resilient',
    - 'a land transport system that is a Safe System, increasingly free of death and serious injury', and
    - 'a land transport system that delivers the right infrastructure and services to the right level at the best cost'

- NZTA's role gives effect to the GPS, with its Investment and Revenue Strategy providing the framework and the 2016–2017 Statement of Performance Expectations (SPE) providing strategic input to defining NZTA's strategy, desired outcomes, goals and objectives
- These goals and objectives are cascaded from the SPE to service targets and investment proposals, which to date have been documented in the State Highway Asset Management Plan (SHAMP), in future becoming the State Highway Investment Proposal (SHIP)



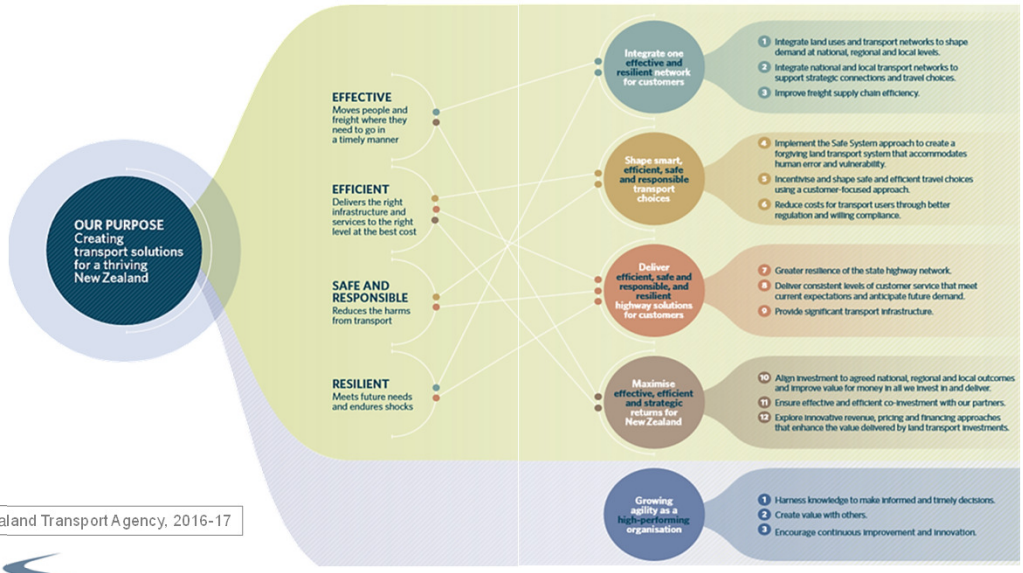
155

South African Road Federation

155

©Mervyn Henderson Consulting

OUR STRATEGY



New Zealand Transport Agency, 2016-17

156

South African Road Federation

156

Case Study: Developing AM Objectives at NZTA

©Mervyn Henderson Consulting

- **Key performance measures relating to the objectives in the 2015–2018 SHAMP**
  - Efficiency in maintenance and operations
  - Better utilisation of existing capacity
  - Improved reliability
  - Reduced travel time
  - Reduction in deaths and serious injuries
  - Reduction in collective risk
- **These measures are aligned with the higher-level GPS objectives**
- **Levels of service provide another perspective of alignment with the GPS**
- **The Maintenance & Operations programme is linked to the customer-led One Network Road Classification (ONRC) levels of service, to be achieved at least cost**

SHAMP PERFORMANCE MEASURES

SHAMP KPI	Performance measure
Efficiency in maintenance & operations	ONRC performance measures
	$/lane km (by classification)
Better utilisation of existing capacity	Total HPMV network added (km)
	Network productivity in Auckland, Wellington & Christchurch
Improved reliability	Number of journeys impacted by an unplanned event(s)
	The variability of state highway travel times on key journeys
Reduced travel time	NPV of travel time and VOC savings by classification
Reduction in deaths and serious injuries	No. of serious and fatal crashes on state highway network each year as part of a five year trend
	NPV of safety savings
Reduction in Collective Risk	Annualised state highway serious and fatal crashes per km by classification and risk rating

New Zealand Transport Agency, 2015-2018 State Highways AMP

157

South African Road Federation

157

AM Strategy or Plan?

©Mervyn Henderson Consulting

- **Different names for the same thing?**
  - PAS 55 – AM Strategy
  - SANS/ ISO 55000 – AM Plan
- **Strategy or Plan?**
  - By convention, strategy describes the required activities for the long term approach based on uncertain knowledge and supported by available evidence, rationale and modelling
  - More detailed plans are derived from the strategy & would be aligned to it & are then used for the controlled delivery of the agreed activities
  - In some organisations the strategy document is fully developed down to the detail required to deliver activities, blurring the boundary between strategy and plan, making it difficult to draw a line between them
  - Each organisation should design its own approach to suit the nature and context of the assets managed
  - Irrespective of terminology & design choice, it is important that those within the organisation and their stakeholders have an unambiguous and common understanding of how strategy and plans are developed and documented
- **ISO 55000 defines an AM strategy/ SAMP as**
  - 'Documented information that specifies
    - how organisational objectives are to be converted into AM objectives,
    - the approach for developing AM plans, and
    - the role of the AM system in supporting the achievement of the objectives'

158

South African Road Federation

158

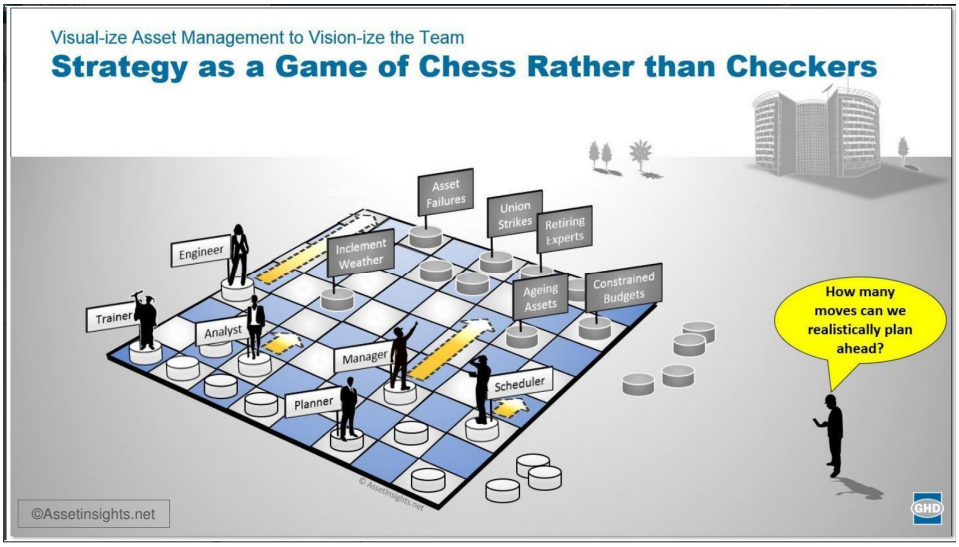
AM Strategy

©Mervyn Henderson Consulting

- **AM Strategy is a stakeholder facing statement describing the strategic approach**
  - It is a high level plan—single or multiple documents—for converting the AM Policy into specific AM objectives & the coordinating mechanism for ensuring that activities carried out on physical assets are aligned to optimally achieve the organisational strategic plan
- **Purpose of AM Strategy/Strategies**
  - Describe the strategic context & medium to long term organisational requirements of assets taking account of cost, performance and risk
  - Communicate clear rationale & objectives internally &/or externally providing line of sight between asset related organisational strategic objectives & AM objectives and plans
  - Provide internal stakeholders with direction, alignment & prioritisation for developing the long term management of the assets and their supply chain
  - Demonstrate due diligence to external stakeholders, increasing confidence & supporting the case for investment
  - Continue the line of sight from organisational strategy through AM Policy and pass it down to AM Plans
- **Expectations of an AM strategy**
  - Identifies the principles by which greater efficiency & value-for-money can be achieved
  - Describes the social & economic benefits of investing in road infrastructure
  - Sets clear directions, providing links with other relevant documents, corporate objectives, business planning, risk management & transport objectives
  - Provides direction for AM plans
  - Describes the structures, roles & responsibilities necessary to establish the AM system & to operate it effectively

AM Strategy

©Mervyn Henderson Consulting



AM Strategy

©Mervyn Henderson Consulting

- **The AM Strategy**
  - Considers both capital & revenue work programmes
  - Normally has a time horizon well beyond detailed AM Plans
  - Should be regularly reviewed and updated as improved information becomes available and in response to changes
  - Should describe the long term approach to developing AM capabilities, i.e. improving the process by which the AM and asset systems are managed
    - AM capability strategy may be recorded separately from other strategies for e.g. asset investment, etc.
- **Commonly, there are multiple asset specific strategies by, e.g. asset type, operational function, service provision geography, location or interconnection**
- **Scope of the strategy should reflect the context of the organisation & consider key elements**
  - Define the key stakeholders
  - Clear statement of intent through strategic objectives
    - Set out the relevant requirements, objectives & organisational commitments
    - Describe the strategic context within which strategic requirements have been drawn, e.g. predictive modelling, asset condition, risk management, legal & regulatory obligations
    - Demonstrate the asset contribution (value) against organisational objectives
  - Scope of AM Strategy
  - Resource and organisational capacity
  - Risk
  - Gap definition
  - Scenarios
  - Asset approach
  - AM approach
  - Implementation and monitoring
  - Continual improvement opportunities

161

SARF better roads

South African Road Federation

161

AM Strategy – Good practice

©Mervyn Henderson Consulting

- **Line of sight/ alignment**
  - To be effective the AM Strategy must provide the clear line of sight between organisational strategic plan, AM Policy, plans & the organisational processes & activities
  - The (vertical) line of sight provides the consistency between all levels
  - AM Strategy must set out how the assets contribute to organisational objectives
- **Ownership, Authorisation & Communication**
  - Involve the correct stakeholders & incorporate the authorisation of Senior Management
  - A clear owner should be accountable for development
  - AM Strategy should be endorsed and supported by the whole Senior Management Team/ Board
- **Length and Style**
  - Ensure communication & presentation of the AM Strategy is appropriate for the organisation & engages the relevant stakeholders
- **Continual development & improvement**
  - The AM Strategy must remain relevant and continue to drive improvements in organisational performance
  - Strategy should not be changing constantly, but it should be reviewed to take account of changing strategic context and organisational priorities
- **Development of AM Capabilities**
  - The AM system should be subject to continual improvement of processes, information systems, modelling tools, and resources utilised to develop and deliver the asset strategy & plans
  - The development programme for the AM System needs to be generated alongside that for the physical assets and similarly linked to delivering the AM objectives
    - The programme may be published within the AM Strategy or separately

162

SARF better roads

South African Road Federation

162

AM Strategy & draft TMH 22 Template

©Mervyn Henderson Consulting

- **ISO 55001 requirements for the SAMP are included in TMH 22 Appendix J-10, Guide and format for preparation of a Road Asset Management Plan (RAMP) (template 2013)**
  - It provides the format to be used by South African road authorities for preparing their annual RAMPs
  - It is based on a template made available by the Department of Transport
- **TMH 22 template for a RAMP**

Executive Summary

Section 1: Introduction

1.1 Statement

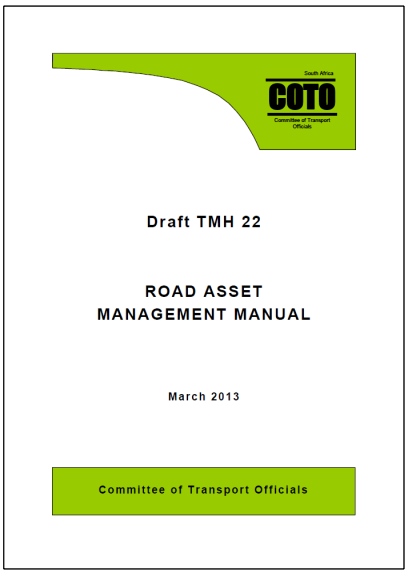
1.2 Background

1.3 Goals and Objectives of the RAMP

1.4 RAMP Framework

1.5 Planning Approach and Methodology

Section 2: Road Network



163

Draft TMH 22 template *continued*

©Mervyn Henderson Consulting

Section 3: Level of Service

Section 4: Situational Analysis (current asset condition and performance)

4.1 Inventory Data

4.2 Usage of the Assets

4.3 Engineering Condition of the Assets

4.4 Functional Condition of the Assets

4.5 Comparative Conditions

4.6 Vehicle Operating Costs & Excess User Costs

4.7 Asset Valuation

4.8 Remaining Useful Lives of Assets

4.9 Risks

4.10 Trend Analysis

4.11 Performance Gap Analysis (Problem Statements)

4.12 Summarising of Indices / Determining Composite Indices

Section 5: Demand or Need Determination

5.1 Need Determination for Current Assets

5.2 Demand for new assets

Section 6: Asset Management (multi-year tactical plans based on an approved budget)

Section 7: Financial Summary

Section 8: Organisational and Support Plan Structure

Section 9: Plan Improvement and Monitoring

Section 10: Job Creation and Skills Development

Section 11: SWOT Analysis

Section 12: References and Appendices

Appendix B: Declaration

164

AM 'Lifecycle' Plans

©Mervyn Henderson Consulting

- **AM 'Lifecycle' Plans (AM Plans) may be contained in a single document or a family of documents or a formalised AM system, depending on the scale of the business**
- **AM Plans specify the activities, resources & timescales required for an individual asset, or a grouping of assets, to achieve the organisation's objectives**
  - AM Plans are developed from AM Strategy & Objectives & must remain aligned to enable efficient & effective delivery
- **ISO 55001**
  - States that the organisation shall establish, document and maintain AM plan(s) to achieve the objectives
  - Requires that an organisation AM planning is integrated with other activities—financial, human resources & support functions
  - Requires that the plans take into account relevant requirements coming from outside the system
- **AM Plans describe in detail the activities which are carried out on the assets during their lifecycle ('lifecycle plans') and need to**
  - Have adequate detail to enable delivery of specific solutions for achieving the AM objectives, including customer benefits
  - Be aligned with financial requirements
  - Enable monitoring and management of delivery
  - Include the planning of capital investment, operations and maintenance requirements
  - Be optimised and prioritised
  - Include the costs, remaining risks and predicted improvement resulting from the plan, such as the forecast performance return in terms of key performance indicators and objectives
- **Time horizons for the AM Plan should be aligned with the needs of the assets, often leading to long time horizons for some asset replacement programmes**

165

SARF better roads

South African Road Federation

165

AM Plans

©Mervyn Henderson Consulting

- **Good AM plans should help an agency to**
  - Meet its goals and objectives in a way that best serves its customers
  - Communicate with customers and other parties on different funding scenarios and impacts on service levels and risk
  - Develop detailed objectives and performance measures for its assets
  - Provide direction to its operating plans & business plans
- **ISO 55001 Clause 6.2.2 describes the minimum contents of a plan, by linking how to achieve the objectives to determining & documenting the following**
  - The method and criteria for decision-making & prioritising the activities & resources needed
  - The processes and methods to be employed in managing its assets over their lifecycles
  - What will be done?
  - What resources will be required?
  - Who will be responsible?
  - When it will be completed?
  - How the results will be evaluated?
  - The appropriate time horizons for the plans
  - The financial & non-financial implications of the plans
  - The review period
  - Actions to address risks and opportunities associated with managing the assets, taking into account how these risks and opportunities can change with time, by establishing processes for the
    - Identification of risks and opportunities
    - Assessment of risks and opportunities – determining the significance of assets in achieving the objectives
    - Implementation of the appropriate treatment and the monitoring of risks and opportunities
  - Ensure that the related risks are considered in the organisation's risk management approach, including contingency planning

166

SARF better roads

South African Road Federation

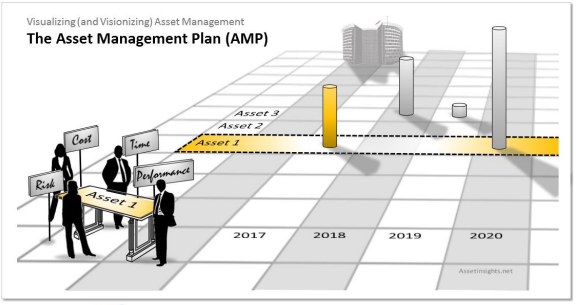
166

AM Plans

©Mervyn Henderson Consulting

- **It is important to note that the production of plans is not the purpose of AM**
- **Rather, the plans are an important tool for coordinating, managing and uniting the wide range of individual activities to identify all organisational requirements and the steps to take to achieve them**

©Assetinsights.net



- **Example AM Plan content**
  - Introduction
    - Goal & purpose, scope, audience, definitions, planning process overview, treatments & activities, process timing & accountability, assumptions & constraints
  - 20 year vision, performance measures, targets, key performance indicators
  - Data
  - Demand, gap & budget analysis, prioritisation
  - Validation, final prioritisation, packaging & scheduling
  - Sourcing of materials
  - Risk management
  - Delivery of works
  - Project & programme performance review
  - Work element performance review
  - Interventions and other issues
  - Appendices

167

SARF better roads

South African Road Federation

167

The Organisational AM improvement Journey

©Mervyn Henderson Consulting

- **What does it feel like to be on the Asset Management journey?**
  - Video produced by the Institute of Asset Management, UK shows the AM journey to creating value with implications for
    - Connecting the value derived from assets with the objectives & purpose of the organisation
    - The type of decision-making required – moving from reactive decision-making to optimised decision-making
    - Developing consensus and common terminology around cost, performance and risk
    - Organisational structure – moving away from silos (de-siloing)
    - Building a culture of continuous improvement
    - Visible and consistent leadership

The IAM | The Big Picture - The Journey – YouTube at *https://www.youtube.com/watch?v=Zp62O373q3c*

© 2014 the Institute of Asset Management

168

SARF better roads

South African Road Federation

168

What can we take from this video?

©Mervyn Henderson Consulting

- **Reactive decision making is a consequence of**
  - Lack of engagement of senior management?
  - Silos (tribes) talking past each other?
  - A pecking order?
  - Decisions not made from the perspective of the overall system?

169

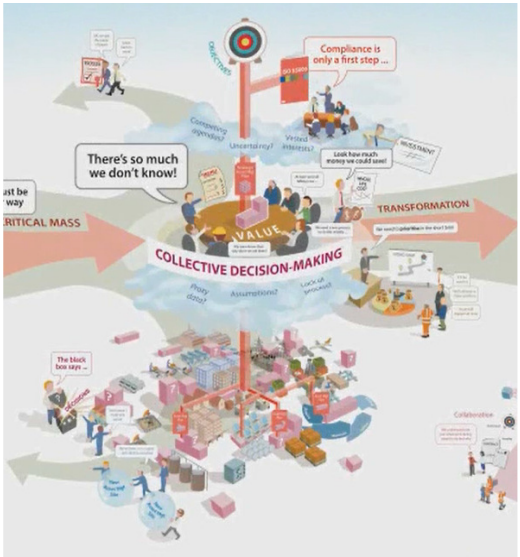
South African Road Federation

169

What can we take from this video?

©Mervyn Henderson Consulting

- **Impetus for change comes from the top down or the bottom up?**
- **Breaking down barriers?**
- **Certification?**
- **ISO 55000 only a start?**
- **Collective decision-making started?**
- **How much is missing?**
- **What's getting in the way?**
- **Processes are not implemented?**
- **Blame games?**
- **New AM silos?**
- **Having a system promotes quick wins?**
- **Teams working together to get optimal AM decisions?**



170

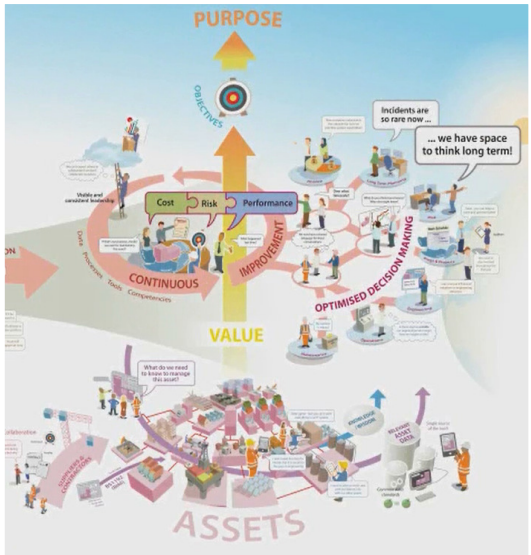
South African Road Federation

170

What can we take from this video?

©Mervyn Henderson Consulting

- Are leaders walking the talk?
- Is there continuous improvement?
- Is everyone is playing their part?
- Is there a framework for integrated decision-making?
- Are organisations very fluid?
- What does it feel like?
- Is there greater innovation?
- Are the right conversations taking place?



171

South African Road Federation

171

Organisational AM improvement journey

©Mervyn Henderson Consulting

- **AM Maturity**
  - The intention of the AM improvement process is to establish permanent, repeatable processes for continuously improving practices, procedures, tools and activities so that organisations can achieve their desired maturity goals in a planned and timely way and maintain that position or advance to a different level if desired
  - There are many reasons why the appropriate level of practice varies between and within organisations, e.g.
    - Varying levels of skills, knowledge, experience, political and physical environment, and resources
    - Some aspects, such as consultation with customers over levels of service, may be new to an agency
    - The characteristics of different transport networks vary considerably, city, town, and rural networks
  - Maturity implies certain requirements for systems integration, information architecture, data structure, system selection and development, and data quality

- **Maturity concept**
  - The concept of maturity is therefore important in determining the current and desired future state of AM practice. With the publishing of ISO 55001, two distinct but parallel approaches are available in assessing maturity
    - The 1st approach addresses the 'AM system' and identifies the business processes and key documents needed for good management
      - The IAM self-assessment process for ISO 55001
      - IPWEA's (2017) ISO 55001 AM maturity assessment tool
    - The 2nd approach addresses the practices that should follow the AM cycle, or 'how the activities are conducted'
      - The IAM model, which uses 39 AM subjects
      - Gap analysis tools based on the principles in the IIMM
      - IPWEA's maturity assessment tool based on the National Asset Management Assessment Framework
      - AASHTO Transportation Asset Management maturity model
  - The level of maturity required will depend on the scale and type of assets the organisation manages and the complete business context

172

South African Road Federation

172

Organisational AM improvement journey

©Mervyn Henderson Consulting

- **Maturity concept *continued***
  - For every road agency aiming to improve its AM practice, the maturity scale provides an indication of progress towards that improvement
  - It also simplifies discussion of some aspects of AM, allowing management, corporate governance and other decisions to be set out in relatively self-explanatory terms
  - The concept of maturity helps understand that
    - The appropriate level of AM practice is not always the most advanced
    - All areas of practice may not need to be developed to the same levels of excellence to
      - Meet the needs of the organisation, or
      - Provide the required services at the lowest lifecycle costs

- **Maturity assessment**
  - There is a variety of maturity assessment scales in use throughout the world
  - Many have a nominal 5-point scale including 'innocence' as an initial 'Level Zero'
  - The ultimate best practice score is typically 100% in quantitative scales
  - IAM maturity scale for ISO 55001

Maturity Level	Description
0	Innocent
1	Aware
2	Developing
3	Competent - Conformance with ISO 55001
4	Optimising
5	Excellent

173

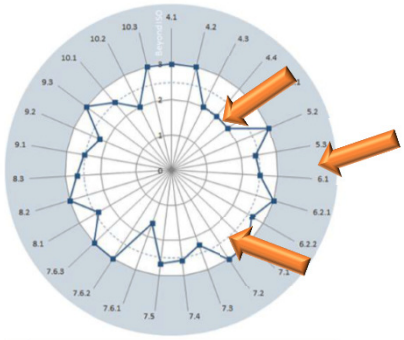
South African Road Federation

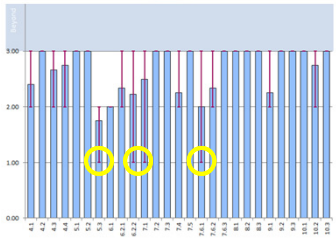
173

Organisational AM improvement journey

©Mervyn Henderson Consulting

- **Assessment for ISO 55001:2014**
  - The average score for each clause of ISO 55001:2014 is shown on the Radar Chart against the five-point maturity scale
  - The maturity Levels 4 and 5 are combined into 'beyond' and indicated by the blue band
  - A dotted line has been entered at a score of 2,5 as the assessors may wish to use their discretion as to conformance if the average score is between 2,5 & 3
  - Within any element, a significant deficiency or weakness may be masked in the Radar Chart by other questions that have scored highly
  - The Bar Chart is included to display the average score per clause in 'blue' and the score range in 'red'.
    - This enables the assessor to easily tell whether a poor score has been masked due to the calculation of average scores





© IAM, 2015

174

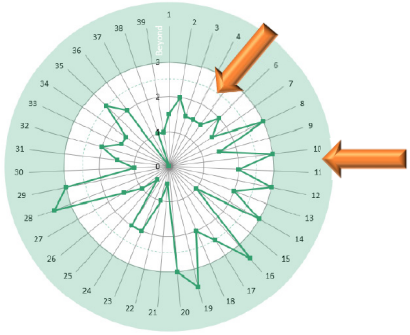
South African Road Federation

174

Organisational AM improvement journey

©Mervyn Henderson Consulting

- **Assessment for the AM Landscape**
  - The average score for each subject is shown on the Radar Chart against the 5-point maturity scale and maturity Levels 4 and 5 are combined into 'beyond'. This is indicated by the green band
  - A dotted line has been entered at a score of 2,5. This is to allow the assessor the ability to use their discretion as to conformance if the average score is between 2,5 and 3
  - Within any element, a significant deficiency or weakness may be masked in the Radar Chart by other questions that have scored highly. Similarly, if the two areas on either side are scored 0 then the middle one will also appear as 0
  - The Bar Chart is included to display the average score per clause in 'green' and the score range in 'red'
    - This enables the assessor to easily tell whether a poor score has been masked due to the calculation of average scores



© IAM, 2015

175

South African Road Federation

175

Case study: Organisation Review of AM Practices – RMS

©Mervyn Henderson Consulting

- **Roads & Maritime Services (RMS) AM review**
  - RMS embarked on a significant AM improvement journey involving a strategy that included
    - An AM transformation programme involving cultural change
    - A staged approach to the consolidation of existing systems
    - An organisation-wide systems implementation
  - An important step was to ensure a clear, high level, shared understanding of business processes within RMS. RMS decided to carry out an independent whole-of-organisation review using the IAM competency framework and maturity assessment tool
  - Some of the benefits from this process have been
    - Profile of AM raised
    - Senior executive buy-in
    - A clear AM strategy, versus an asset maintenance strategy
    - An informed direction for future effort in AM
    - Increased openness & communication within RMS
    - Reduction of risk in relation to future systems implementation through a clearer view of business needs
    - Identification of anticipated financial savings
  - The output of the maturity assessment was correlated with the requirements of ISO 55001 to obtain a picture of how RMS compared against the Standard
  - Documents produced included
    - Current status as assessed by the review
    - A description of desired future status, an important 'stake in the ground' which required wider buy-in
    - An implementation plan, setting out actions and timelines
  - Important to getting the programme off to a good start, a key part of the plan was establishing a governance structure, setting out a programme and allocating resources to it. Governance arrangements included
    - An Executive Management Team sponsor and
    - A Steering Committee involving key stakeholders
  - Key outcomes so far have included
    - Internal stakeholder engagement and education were critical in helping to achieve wider buy-in
    - Ownership & commitment by the Exec. Management Team
    - Significant change was expected – effective change management is critical to the success of the programme

176

South African Road Federation

176

Achieving effective AM

©Mervyn Henderson Consulting

- **Determining the right level of maturity for an organisation is an important early step in determining and implementing the appropriate improvement paths, and in ensuring the appropriate levels of skill are available throughout the organisation**
  - Effective AM is an organisation-wide process of continuous improvement and not an independent specialist activity undertaken only by engineers or practitioners
    - Its strategic direction & the goals it seeks to deliver are elements of corporate policy, so approaches to AM improvement should be policy driven
  - The implementation and improvement of AM can be thought of as an organisational change project, with a starting point followed by a continuous series of objectives over multi-year time scales

177

SARF better roads

South African Road Federation

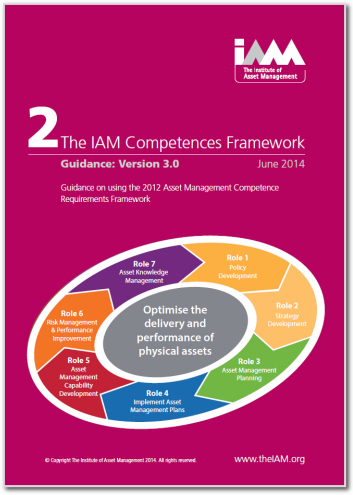
177

The Individual AM Journey

©Mervyn Henderson Consulting

- **Challenges for individuals considering their own AM journey include determining**
  - What competences they need to develop
  - Finding the training and learning materials they require to achieve this
- **The Institute of Asset Management Competences Framework provides a good starting point to understand the competences required for generic AM roles (www.theIAM.org)**
  - The key purpose of the framework for people working in AM is: '*To optimise the delivery and performance of physical assets*'
  - The key roles are shown in the table below (colours relate to IAM Concept Model, which is dealt with later)

Key Roles	
1	Policy development
2	Strategy development
3	Asset management planning
4	Implement asset management plans
5	Asset management capability development
6	Risk management and performance improvement
7	Asset knowledge management



©The Institute of Asset Management 2014

178

SARF better roads

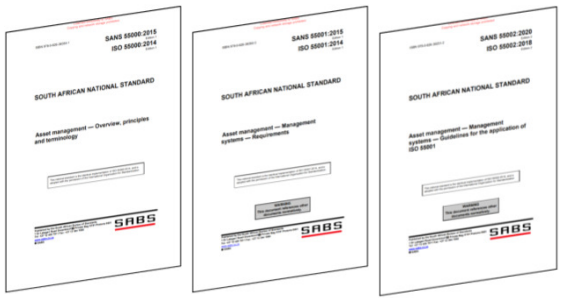
South African Road Federation

178

The Individual AM Journey

©Mervyn Henderson Consulting

- **Once individuals have established the competences they wish to develop, they can proceed to**
  - AM training courses
  - Publications and on-line resources, such as SANS/ ISO 55000/1/2
  - AM conferences
  - Working on projects which will enable development of AM knowledge in specific areas



179

South African Road Federation

179

Planning for improvement

©Mervyn Henderson Consulting

- **Improvement Plan**
  - An improvement plan should be based on a long-term goal, i.e. a target level of maturity, supported by self-assessment and gap analysis to define the starting point and reasonable expectations, in terms of time and finance, as to what can be accomplished in achieving intermediate goals
    - It is also important never to overlook the small, work-based improvements identified on a day-to-day basis by practitioners, especially when preparing plans and asset valuations
  - Self-assessment provides a high-level view of the organisation's current position and organisational perspective
  - A detailed gap analysis extends the self-assessment into individual business processes as maturity develops
    - This helps to provide insights into detailed practices that need to be improved to meet the agreed goals
  - Benefits of a gap analysis include
    - It builds consensus among the organisation's managers
    - It assists the organisation to identify strengths, weaknesses, constraints and opportunities for improvement
    - It recognises and prioritises critical areas that need short-term attention
    - It provides robust, auditable & substantially repeatable foundations for the development of an improvement

180

South African Road Federation

180

Performance Management Framework

©Mervyn Henderson Consulting

- **'Performance' is defined in various ways, all of which are relevant, e.g. ISO 55001 (Clause 3 Terms and Definitions) defines 'performance' as a measurable result, one which can relate to the management of activities, processes, products, services, & systems or organisations**
- **The performance framework for AM provides bi-directional 'line of sight' between high-level and operational goals, objectives, needs, activities and actions**
- **While objectives and goals cascade down, performance measures enable upward reporting and aggregation of results**
- **The importance of performance management was recently recognised by law in the United States: MAP-21 – 'Moving Ahead for Progress in the 21st Century'**

- **Principles & Drivers of performance-based AM**
  - Every organisation has a reason to exist, whether by legislation, to carry out a legislative function, or to meet a perceived need by delivering services or products & seeking payment from customers or users
    - These reasons are usually highlighted in a mission statement, strategic objectives, strategic outcomes or organisational outcomes
  - Key points to note include
    - Being able to measure performance against outcomes and objectives is a critical business activity for any organisation, and asset management is no exception
    - Understanding performance is important in demonstrating that the organisation is delivering the agreed levels of service
    - The measurement processes should be practical, reliable and cost-effective
    - Service delivery performance should be monitored at both the organisation and asset levels

181

SARF better roads

South African Road Federation

181

Performance from an ISO 55001 perspective

©Mervyn Henderson Consulting

- **ISO 55001 refers to three dimensions – performance of the**
  - Organisation in carrying out its activities
  - AM system in delivering the objectives
  - Assets in delivering the levels of service agreed with customers
- **The Standard is clear in terms of requiring a performance-based approach which recognises the organisation's purpose and objectives**
- **Clauses 4.1, 4.4 and 6.2.1 require that:**
  - The organisation shall determine external and internal issues that are relevant to its purpose and that affect its ability to achieve the intended outcome(s) of its asset management system.
  - The objectives included in the SAMP, shall be aligned to, and consistent with, the organisational objectives
  - The organisation shall establish, implement, maintain and continually improve an AM system, including the processes needed and their interactions in supporting achievement of the organisation's AM objectives
- **As ISO 55001 is a Standard focussed on requirements, it does not specifically detail the means of managing AM or its performance**

182

SARF better roads

South African Road Federation

182

ISO 55000 Statements on performance

©Mervyn Henderson Consulting

- **Clause 2.5.3.7 Performance evaluation**
  - *'The organisation should evaluate the performance of its assets, its AM and its AM system. Performance measures can be direct, indirect, financial or non-financial.*
  - *Performance should be evaluated against whether the objectives have been achieved, and if not, why not. Where applicable, any opportunities that arose from having exceeded the objectives should also be examined, as well as any failure to realise them. The adequacy of the decision-making process should be carefully examined.*
  - *The performance of the AM system should be evaluated against any objectives set specifically for the system itself (either when it was established or following previous evaluations).*
  - *The primary purpose of evaluating the system should be to determine whether it is effective and efficient in supporting the organisation's AM. Periodic audits should be used to evaluate the performance of the system; these must be complemented by self-assessments.*
  - *The results of performance evaluations should be used as inputs into management reviews.'*
- **The role of the AM objectives is apparent – a key principle of performance management is to measure delivery of organisational and AM objectives**

183

South African Road Federation

183

Performance management

©Mervyn Henderson Consulting

- **Performance management is a systematic and cyclical process of**
  - Identifying objectives
  - Collating transparent information on the achievement, or otherwise, of these objectives
  - Reporting this information in ways that are meaningful to the intended audience
  - Using the information to manage and improve the organisation's delivery of services to its customers, such as improving resilience and making sound asset investment decisions
- **Alignment**
  - A key part of the performance management framework is alignment of the agency's goals and objectives with the levels of service being delivered to customers and road users, and to cascade these to the operational management of work programme delivery
  - The organisation's AM policy is the starting point for good AM; and is aligned with the organisation's vision and higher level goals.
    - In many respects, an agency's published goals and objectives can be taken as high-level directions from the governance/top management level to the agency's management and staff

184

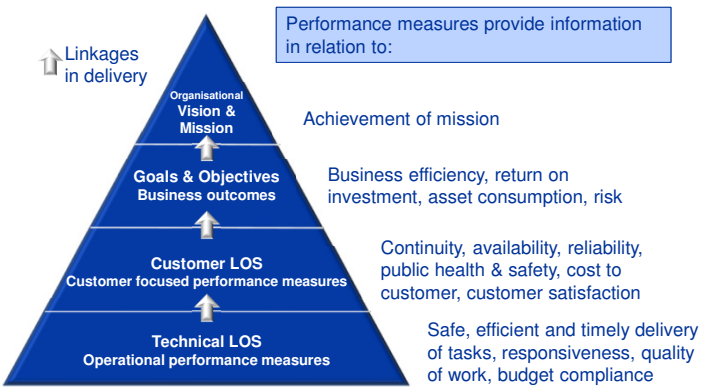
South African Road Federation

184

Performance management – line of sight

©Mervyn Henderson Consulting

- The figure illustrates this 'line of sight' alignment - hierarchy of performance measures between the top level (achievement of mission) and the middle (customer levels of service) and lower (technical levels of service) levels ►►►
- Performance information should be aggregated upwards, providing summary information at higher levels for governance level and public reporting
- As the shape suggests, there will typically be many more performance measures at the lower levels, given the number of activities and sub-activities being managed



© Austroads, 2018

185

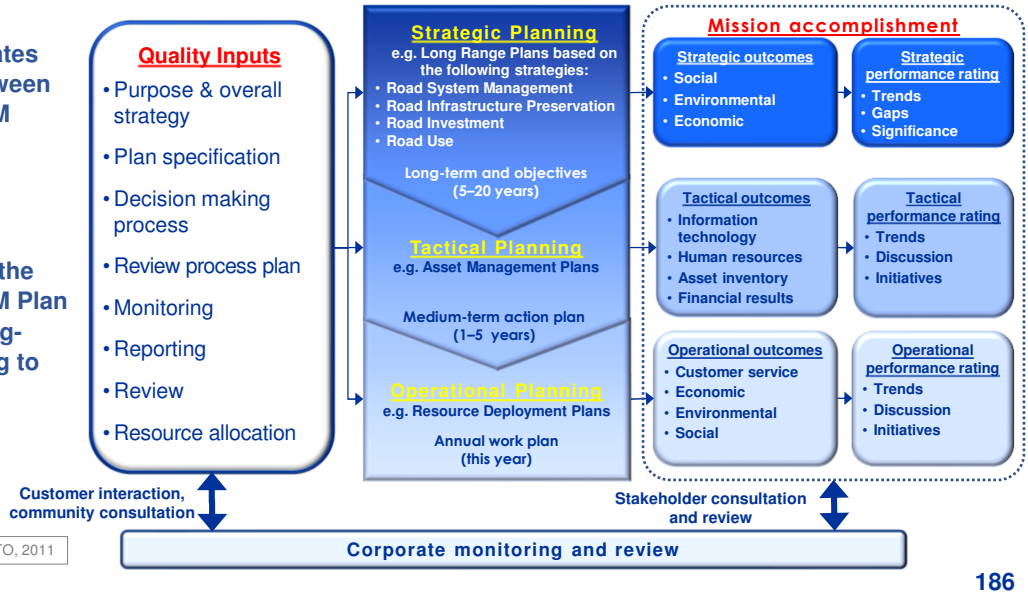
South African Road Federation

185

Linking AM Plans to Strategic Plan Outcomes

©Mervyn Henderson Consulting

- The AASHTO figure illustrates linkages between enterprise AM objectives & outcomes of specific AM practice
- Emphasises the role of the AM Plan in linking long-term planning to operational delivery



Adapted from AASHTO, 2011

186

South African Road Federation

186

Performance measures

©Mervyn Henderson Consulting

- **A linked hierarchy of performance measures, covers**
  - **Vision or mission**: how the agency knows whether, and to what degree, it is successful in delivering on its mission effectively and efficiently
  - **Goals and objectives**: has the agency achieved key business outcomes, such as ROI and managed risk?
  - **Customer levels of service**: describe road user expectations and needs such as safety and availability
  - **Technical levels of service**: the operational aspects such as responsiveness, timeliness and cost-efficiency of works carried out
  - Performance measures should help answer questions such as how good was the work and how good was our procurement of the work?
  - Typically, performance measures are reported to the level above to provide information and to support decision-making at that level

- At management reporting levels, they are often referred to as Key Performance Indicators (KPI), reflecting their importance to the business, e.g., did the agency perform across multiple dimensions, such as finance, procurement, and people?
- There is a progression of maturity in organisations as they develop and use performance measures, both for internal purposes and public reporting, as described in AASHTO (2011) and shown in the table in the next slide
- It is important to note that all of the performance measures relating to AM described above are part of an organisation's AM system, as defined in ISO 55001

AASHTO Maturity levels relating to AM performance measures

©Mervyn Henderson Consulting

Basic	Improved	State of the Art
• Performance understood in engineering terms: asset condition, work output • Measures are a mix of quantitative and qualitative indicators • Track customer comments and complaints	• Add economic and customer-oriented level of service considerations to the definition of asset performance • May supplement consideration of customer-oriented outcomes with customer surveys • Increased use of quantitative measures, establishment of target values, and application of predictive models to evaluate investment options against targets	• Performance measures fully integrated into business and decision processes – used as the basis for accountability reporting internally and externally • Performance measures used for policy development, trade-off analysis, and resource allocation • Communication becomes a focus – presenting performance measures in various forms for different audiences – reports, trend lines, dashboards, maps, etc.

© AASHTO, 2011

Outcomes and Objectives

©Mervyn Henderson Consulting

- **It is important to distinguish between outcomes and objectives**
  - 'Outcomes' are descriptive statements of a desired future state or a result, which are articulated elements of vision, often described in terms of 'key result areas' or 'key customer areas'
    - Outcomes may relate to aspects such as safety, efficiency, resilience, reliability, mobility and value
    - They are an important starting point for a performance management framework
  - 'Objectives', as defined in ISO 55001 Clause 3.1.12, reflect the results or outcomes to be achieved and are often tied to time and resources; they can be strategic, tactical or operational
  - Objectives can relate to different disciplines, such as finance, health and safety, environment, and AM
  - There is a close relationship between an 'objective' and a 'performance measure', with an objective being a means of linking an outcome to a performance target
- Higher order objectives should consider societal and whole of government outcomes and desires
  - To reflect community and stakeholder values, AM objectives need to resonate with community needs; they need to cover attributes that are important to road users and stakeholders

189

South African Road Federation

189

Reporting of the performance of an organisation

©Mervyn Henderson Consulting

- **Public reporting of performance information**
  - Traditionally, public reporting of agency performance has mostly focussed on financial statements and achievement of work programmes
  - With the development of AM, this has changed and is continuing to evolve
    - Many organisations now report publicly about the state of their asset portfolios to demonstrate that they are good stewards of those assets
  - Reporting should include performance information covering the desired outcomes, objectives and customer levels of service, with technical and operational levels of service typically being managed and reported internally
  - Different levels of performance information are relevant at different levels in an organisation, its key stakeholders and among its customers, and it is important to ensure that reporting at these levels is well linked and they do not 'stand-alone'
  - It is important for consistency and robustness that all public reporting be coordinated
  - Good reporting must encompass the whole performance, good and bad, allowing readers to assess the asset performance, AM performance, financial and non-financial performance and the effectiveness of AM practices
    - Well-designed charts are good tools for presenting both current data and historical data, allowing both current performance and trends to be seen
- **Alignment with investment evaluation**
  - Agency reporting is important for aligning future investment priorities with what the public actually needs and expects of the transport network
  - Evaluation of investment options should address how well the programme & the projects within the programme deliver against the organisation's goals & objectives
  - Evaluation should address the key performance attributes which are the subject of KPI reporting, including safety, reliability, resilience, etc.

190

South African Road Federation

190

ISO 55001 reporting requirements & Benchmarking

©Mervyn Henderson Consulting

- **ISO 55001 Clause 9.1 states that**
  - *'The organisation shall evaluate and report on the following:*
    - *Asset performance*
    - *Asset management performance, including financial and non-financial performance*
    - *Effectiveness of the asset management system.*
  - *The organisation shall evaluate and report on the effectiveness of the processes for managing risks and opportunities.*
  - *The organisation shall ensure that it's monitoring and measurement enables it to meet the requirements of ISO 55001 Clause 4.2'* (the stakeholder requirements for recording financial and non-financial information relevant to AM, & for reporting on it both internally & externally)
- **Benchmarking**
  - Benchmarking is the practice of using quantitative measures to compare performance with peer organisations
    - It can be a powerful tool in finding out how well they are doing in terms of improving performance
  - Benchmarking performance provides a means of sharing best practices and a method of self-evaluation
  - Comparing important performance measures across agencies can motivate an organisation; such a comparison demonstrates what is possible by presenting what an agency's peers have been able to achieve and, to some degree, how it is achieved
- **National performance indicators**
  - The Department of Transport collects data from each province, metro and SANRAL. However, no national performance indicators are currently available for AM

Scope of AM

©Mervyn Henderson Consulting

- **Overview**
  - This section is important for those seeking to understand the business processes and enablers of effective practice, but not to a high level of detail
  - It provides an overview of the AM process, linking the business processes and enablers to decision-making
  - Gain a better understanding of
    - How to decide on the scope of the asset portfolio in relation to ISO 55001
    - The fundamental building blocks which comprise an AM framework
    - How the various processes and enablers of the AM cycle are connected
  - Case Study

Topics

- **Scope of ISO 55001**
- **Core elements of an AM process**
- **AM concept models/ frameworks, and enablers**
- **The Asset Management Framework in SA**
- **Steps in the AM process for roads - a strategic model**
- **Define objectives**
- **Formation of asset strategies**
- **Understand what is expected of the assets & their future behaviour**
- **Develop investment programmes**
- **Implement Works Programme**
- **Audit**
- **Reviews**

Scope of ISO 55001

©Mervyn Henderson Consulting

- **For organisations pursuing certification or alignment with ISO 55001 one of the first steps is to define the scope**
- **ISO 55001 Clause 4.3 requires an organisation to**
  - 'determine the boundaries and applicability of the asset management system to establish its scope' & to
  - 'define the asset portfolio covered by the scope of the asset management system'.
  - In practice, this means deciding whether all assets are to be covered or just particular groups of assets
    - ISO 55001 is not restricted to road infrastructural assets – an asset may be anything that has potential or actual value to the agency
    - The value may be tangible or intangible, financial or non-financial
    - Assets may be managed as a group or individually (depending on needs), and grouped according to asset type, asset system or asset portfolio. For example, a road agency might consider groupings such as
      - Assets of significant financial worth – such as pavements and bridges
      - Assets which deliver significant benefits to customers – such as signage, road information, lighting and traffic controls
      - Assets which provide services to different customer groups – such as freight users, pedestrians and cyclists
      - Assets which are used indirectly by the agency in delivering services – such as fleets, computer systems and administration buildings
    - Any combination of these, or other groupings, may define the 'scope of the asset portfolio' for the purposes of ISO 55001 & for the implementation of AM generally

193

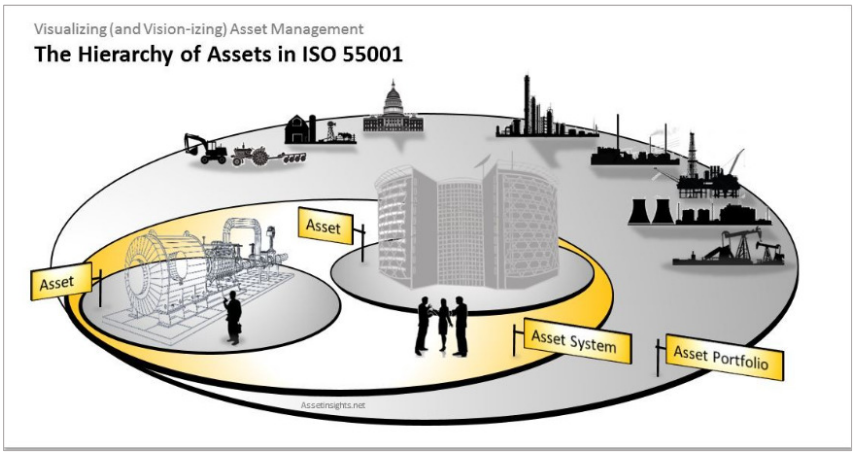
South African Road Federation

193

The hierarchy of assets in SANS/ ISO 55001

©Mervyn Henderson Consulting

- **ISO 55001 contemplates a hierarchy of assets**
  - The detailed classification scheme and appropriate granularity is determined by the organisation's objectives and the nature of the assets in its portfolio



194

South African Road Federation

194

Core elements of AM process

©Mervyn Henderson Consulting

- **The three core elements summarise the overall AM process**

Core elements of AM process

©Mervyn Henderson Consulting

- **Organisational strategic direction**
  - Direction, strategic plans and objectives of an agency are influenced and shaped by external factors, such as legislation, Government policy, customer expectations, investors, funders, and commercial issues. In turn, these shape how AM will be directed and implemented within the organisation
- **Cycle of AM business processes**
  - The cycle of the AM business processes should always commerce from a customer-centric view
  - These customers are many and varied
    - Road users such as pedestrians, cyclists, car drivers, freight vehicle operators
    - The industries and communities these customers serve or are connected to
  - Asset managers have to decide on the levels of service for these customers and forecast future expectations of the service
  - The assets needed to provide the services, their condition, performance and risk characteristics all need to be described and categorised
  - Tools and techniques are used to carry out analysis and to optimise and prioritise work programmes
  - These are funded through budgetary processes, typically as operations, maintenance, rehabilitation, replacement and capital works programmes, until asset disposal occurs at the end of the life-cycle
- **Supporting enabler functions**
  - The cycle cannot be completed efficiently and effectively without supporting resources and functions, i.e. people, information systems, procurement and delivery mechanisms, and processes for continuous improvement

Background to AM Framework

©Mervyn Henderson Consulting

- **It is good practice to establish an overall organisational AM framework that connects to all levels of the organisation**
  - This should range from governance through to operational levels, including contract providers
- **This framework should tie the organisation's strategic direction to what is expected by the AM policy**
- **Business components, such as the AM system and its attendant parts (policy, strategy, plans, business processes, accountability and reporting mechanisms) support the implementation of AM and help to ensure alignment and good governance**
- **Good governance of AM means**
  - Ensuring that the organisation's service delivery objectives and obligations are being met prudently, effectively and efficiently
  - The scope and principles of AM must be well defined, with clear accountabilities specified at all levels
- **AM should be one of the primary focal points for corporate governance or elected members of a Council, as appropriate**

197

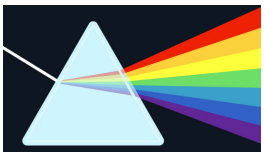
South African Road Federation

197

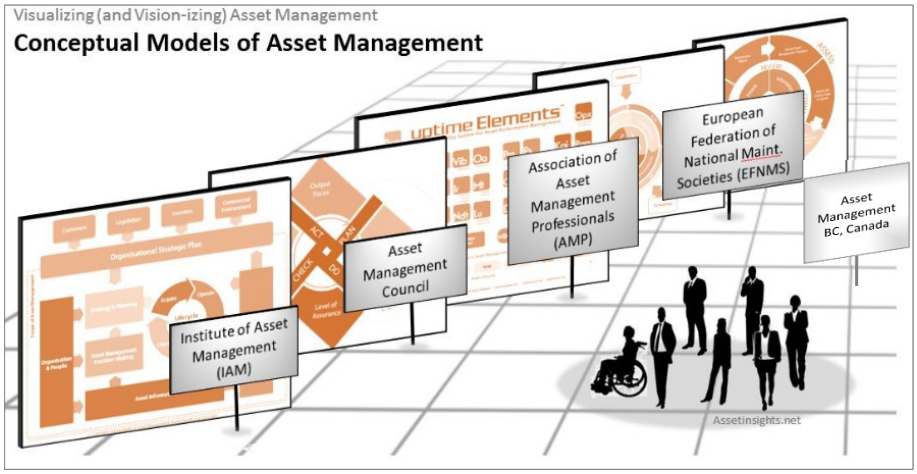
AM Concept Models/ Frameworks

©Mervyn Henderson Consulting

- **Many views of AM processes**
  - Each view has its own strengths and provides different insights



Adapted from Assetinsights ©Assetinsights.net



198

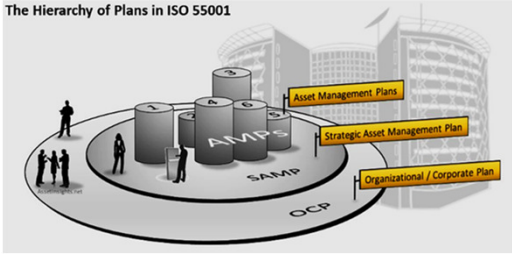
South African Road Federation

198

AM Framework Artefacts

©Mervyn Henderson Consulting

- **An AM framework typically includes the ISO 55001 artefacts – policy, objectives, strategic AM plan, AM plans (lifecycle plans)**
- **These drive the implementation of AM and ensure its alignment with the organisation's strategic objectives**
- **A good AM framework sets, directs, and where appropriate, controls and monitors all the components of the AM system to ensure they work together, firmly linking the organisation's strategic and AM objectives and practices, procedures, processes & systems**
- **It does this by**
  - Linking organisational strategic objectives with the policies and objectives needed to deliver them
  - Linking organisational strategic objectives with the levels of service that the assets should deliver
  - Guiding priorities, the work required on the assets to achieve those objectives, and the finances needed to support that work
- **The framework is not the sole driver of an organisation and it is part of a wider hierarchy of plans**
  - The clearer and more consistent this hierarchy is the greater the probability will be of the organisational objectives being delivered in the most cost-effective manner



©Assetinsights.net

AM Framework

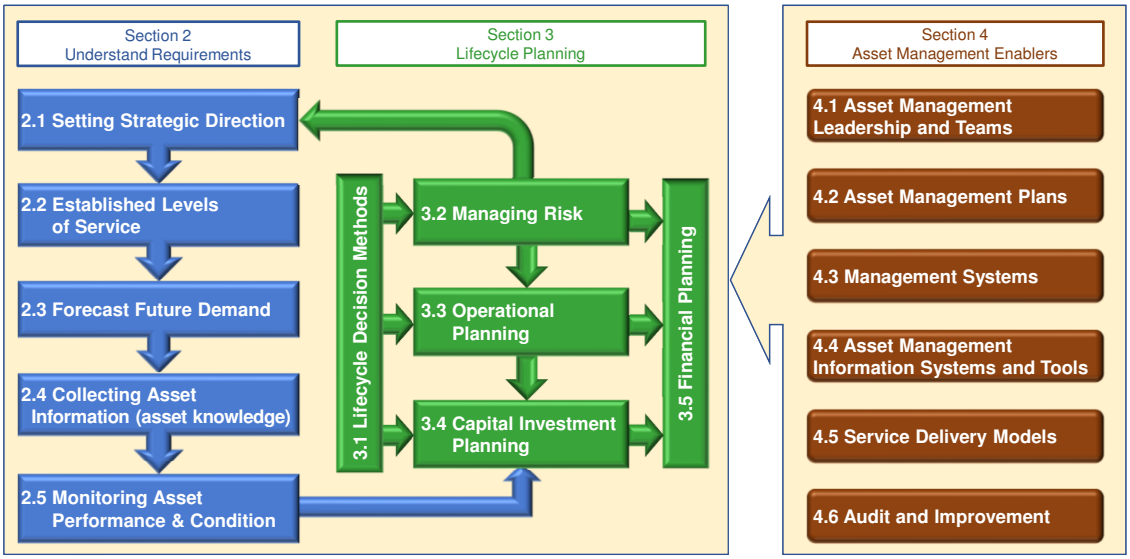
©Mervyn Henderson Consulting

- **Plan hierarchy and AM framework**

Adapted from IPWEA, 2015

IIMM Asset Management Process (2015)

©Mervyn Henderson Consulting



201

SARF better roads

South African Road Federation

201

IAM AM concept model (2016)

©Mervyn Henderson Consulting

- **The IAM concept model has many similarities to the IIMM, but the arrangement of the 'boxes' and activities are structured differently, and some are not explicitly described in the IIMM**
  - It was developed to align with The Asset Management Landscape (Global Forum on Maintenance and Asset Management 2014)

Group 1 - Strategy & Planning

1. Asset Management Policy
2. Asset Management Strategy & Objectives
3. Demand Analysis
4. Strategic Planning
5. Asset Management Planning

Group 2 - Asset Management Decision-Making

6. Capital Investment Decision-Making
7. Operations & Maintenance Decision-Making
8. Lifecycle Value Realisation
9. Resourcing Strategy
10. Shutdowns & Outage Strategy

Group 3 - Life Cycle Delivery

11. Technical Standards & Legislation
12. Asset Creation & Acquisition
13. Systems Engineering
14. Configuration Management
15. Maintenance Delivery
16. Reliability Engineering
17. Asset Operations
18. Resource Management
19. Shutdown & Outage Management
20. Fault & Incident Response
21. Asset Decommissioning & Disposal

Group 4 - Asset Information

22. Asset Information Strategy
23. Asset Information Standards
24. Asset Information Systems
25. Data & Information Management

Group 5 - Organisation & People

26. Procurement & Supply Chain Management
27. Asset Management Leadership
28. Organisational Structure
29. Organisational Culture
30. Competence Management

Group 6 - Risk & Review

31. Risk Assessment & Management
32. Contingency Planning & Resilience Analysis
33. Sustainable Development
34. Management of Change
35. Asset Performance & Health Monitoring
36. Asset Management System Monitoring
37. Management Review, Audit & Assurance
38. Asset Costing & Valuation
39. Stakeholder Engagement

© Copyright 2015 AMA3 Institute of Asset Management (www.theIAM.org/copyright)

202

SARF better roads

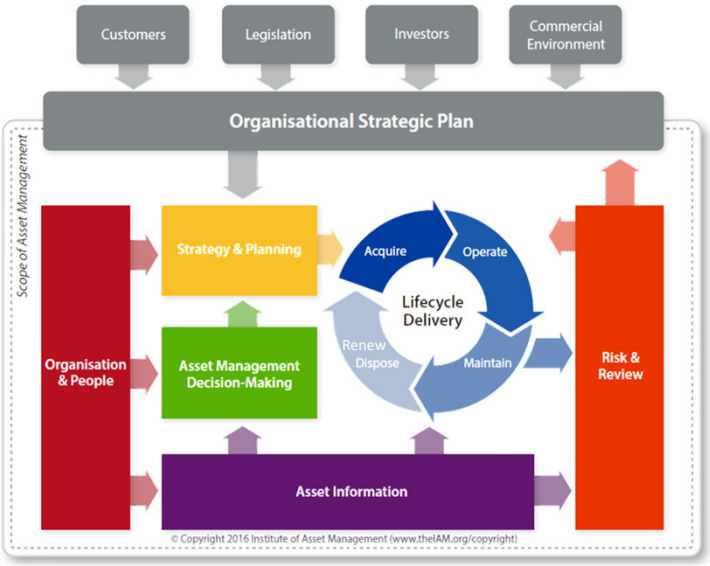
South African Road Federation

202

IAM AM concept model (2016)

©Mervyn Henderson Consulting

- **Subject groups**
  - The Organisational Strategic Plan feeds into Strategy & planning
  - Asset Information - enabler
  - Organisation & people - enabler
  - AM decision-making
  - Lifecycle delivery, which includes the processes of
    - acquisition
    - operation
    - maintenance
    - disposal of assets
  - Risk and review



203

South African Road Federation

203

Asset Management Landscape 39 Subject Groups

©Mervyn Henderson Consulting

Group 1 – Strategy & Planning
1. Asset Management Policy
2. Asset Management Strategy & Objectives
3. Demand Analysis
4. Strategic Planning
5. Asset Management Planning

Refer to '*The Asset Management Landscape*' for the definition of each subject https://gfmam.org/

Group 2 – AM Decision Making
6. Capital Investment Decision-Making
7. Operations & Maintenance Decision-Making
8. Life-Cycle Value Realisation
9. Resourcing Strategy
10. Shutdown & Outage Strategy

Group 3 – Life Cycle Delivery
11. Technical Standards & Legislation
12. Asset Creation & Acquisition
13. Systems Engineering
14. Configuration Management
15. Maintenance Delivery
16. Reliability Engineering
17. Asset Operations
18. Resource Management
19. Shutdown & Outage Management
20. Fault & Incident Response
21. Asset Decommissioning & Disposal

Group 4 – Asset Information
22. Asset Information Strategy
23. Asset Information Standards
24. Asset Information Systems
25. Data & Information Management

Group 5 – Organisation & People
26. Procurement & Supply Chain Management
27. AM Leadership
28. Organisational Structure
29. Organisational Culture
30. Competence Management

Group 6 – Risk & Review
31. Risk Assessment & Management
32. Contingency Planning & Resilience Analysis
33. Sustainable Development
34. Management of Change
35. Asset Performance & Health Monitoring
36. AM System Monitoring
37. Management Review, Audit & Assurance
38. Asset Costing & Valuation
39. Stakeholder Engagement

Adapted from © IAM 2015

204

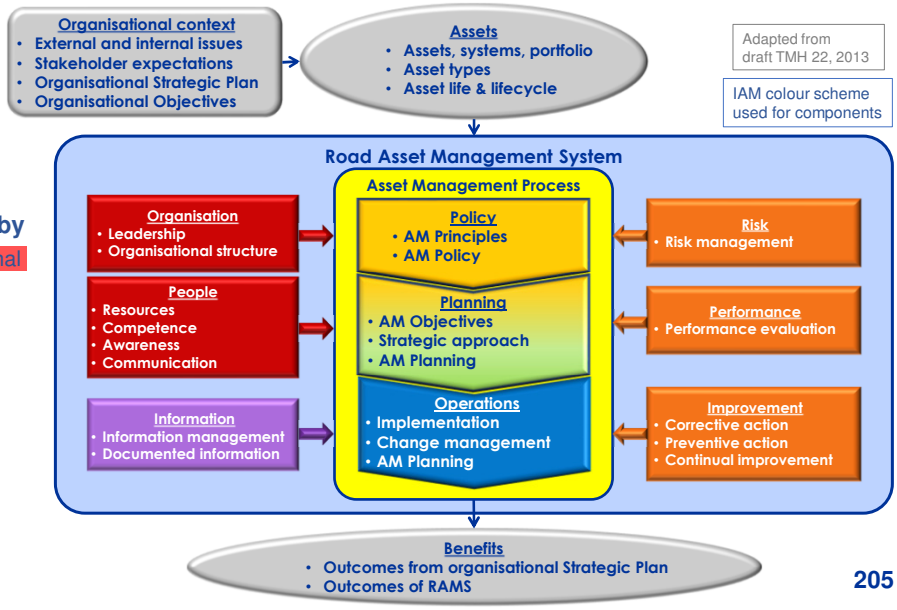
South African Road Federation

204

South African elements of a Road AM System (TMH 22)

©Mervyn Henderson Consulting

- Organisational context
- Assets
- AM processes
  - Policy formulation
  - Planning
  - Operations
- AM processes enabled by
  - Leadership & organisational structure
  - People
  - Information
- AM processes are influenced by
  - Risk management
  - Performance evaluation
  - Improvement actions
- Benefits derived



205

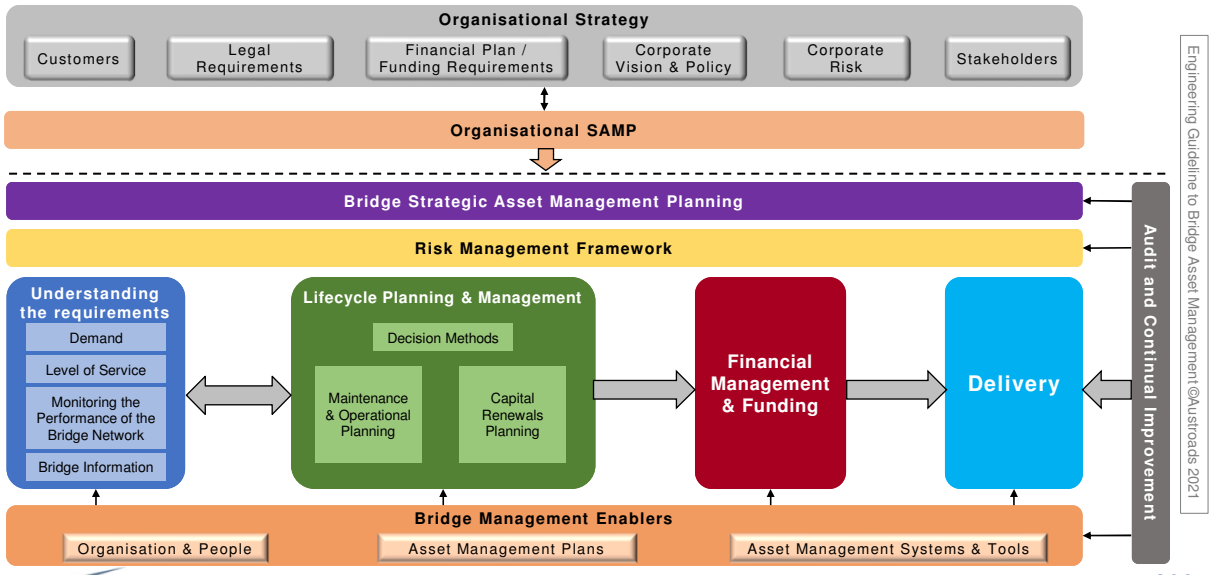
SARF better roads

South African Road Federation

205

Bridge Asset Management Framework

©Mervyn Henderson Consulting



206

SARF better roads

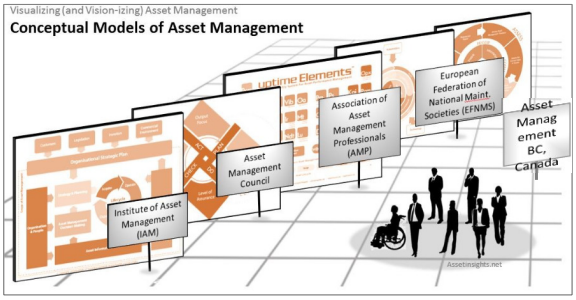
South African Road Federation

206

Some observations on the frameworks/ models

©Mervyn Henderson Consulting

- Each framework/ model helps to provide a basis for understanding AM
- The frameworks/ models vary widely in their formulation
- The content of the frameworks/ models has a lot in common but the emphasis varies
- Some frameworks/ models depict the concept whereas others show the business process and relationships between components in more detail



Adapted from Assetinghts ©Assetinsights.net

207

South African Road Federation

207

AM enablers

©Mervyn Henderson Consulting

- AM is an organisation-wide business process that needs to be supported by cross-organisational boundary 'enablers'
  - AM efforts are more likely to fail if these are ineffective or not present
- Leadership and teams
  - Important features of an 'AM capable' organisation include
    - Senior management commitment
    - Strong, highly visible AM leadership
    - Well-defined, clear structure and role definition which encompass all functions
    - Well-defined capability and competence needs that are matched by training and development provision
    - Effective coordination, collaboration and cooperation within the agency

- Ways in which an organisation can structure roles and responsibilities
  - In large organisations, it may be appropriate to provide clear separation between strategic and operational levels but with strong linkages to all departments or teams with a role
  - In smaller organisations, roles may be combined in single positions or teams, however, this often blurs responsibilities and leads to a short term, problem-solving focus rather than a strategic long-term approach
    - The urgent often takes precedence over the important

208

South African Road Federation

208

AM enablers

©Mervyn Henderson Consulting

- **Asset Management Plans**
  - AM plans bring all elements of lifecycle AM together into a coherent & coordinated form
  - They are important in 'telling the story' about the service, the assets involved & the costs associated with providing satisfactory & sustainable services on an ongoing basis
  - AM plans are also important requirements of ISO 55001

- **Management Systems**
  - Different management systems can be used by agencies, of which ISO 55001 is but one
  - These systems are typically developed to describe how business processes are to be followed and maintained
  - There are other formal management systems, such as quality management, environmental management and risk management
  - A **Technology Management System** has become a very important enabler as technology developments support all 6 subject groups in terms of innovation, efficiency and effectiveness

209

South African Road Federation

209

AM enablers

©Mervyn Henderson Consulting

- **Information Systems & Analysis tools**
  - AM information systems and analysis tools are used to capture & interpret data, enabling the agency to monitor assets, gather intelligence & make optimal decisions
  - An AM information system (AIMS) is 'a combination of processes, data, software and hardware applied to provide the essential outputs for effective AM, such as reduced risk & optimum infrastructure investment'
  - Two primary functions, which may be contained in one system or across multiple applications requiring integration or interfacing are
    - Databases that store and report data relating to the assets
    - 'Intelligence' applications that analyse and transform raw data, creating information & knowledge which is used in developing asset strategies and making decisions

- **Service Delivery Models**
  - Decision-making should consider the best means of procurement and retirement of physical works and professional services to deliver the programmes, whether using external or in-house resources and, if external, the contractual means
  - Mechanisms may include service level agreements or a range of different contract forms. The two primary objectives are to
    - Embed robust, effective & efficient processes for determining how activities should be procured & managed
    - Ensure that appropriate resources and contract methodologies are used to deliver the required levels of service, on time, at the lowest lifecycle costs, at an appropriate level of risk

210

South African Road Federation

210

AM enablers

©Mervyn Henderson Consulting

- **Audit**
  - An organisation's processes for auditing the effectiveness of its AM processes and AM system
  - It describes policies & processes for internal assurance processes, audit policies & procedures, internal & third party findings, & corrective actions & use of external benchmarking
- **Improvement**
  - A continuous improvement in culture is a very important contributor to
    - Enhancing and maintaining maturity levels
    - Growing commitment throughout the agency
    - Meeting the requirements of ISO55001
    - Meeting the requirements of other relevant management systems

- Continuous improvement should address data, processes and systems using audits, status assessments and gap analyses, together with human resource capability and competence needs analyses
- Agencies can use the maturity assessment tools in either the IIMM, IAM or other appropriate frameworks to assess the current state and identify change management initiatives
- The continuous improvement cycle typically includes the key steps in the AM process for roads
- An improvement plan includes lists of actions which should be documented in AM plans, defining financial costs, resources required & the timelines for implementing the actions

211

South African Road Federation

211

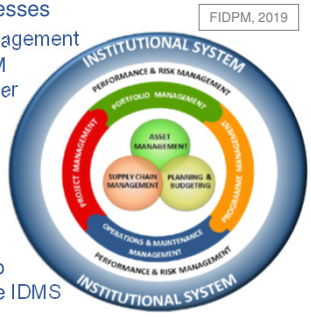
The Asset Management Framework in SA

©Mervyn Henderson Consulting

- **South African Treasury guidelines**
  - The Framework for Infrastructure Delivery & Procurement (FIDPM) prescribes minimum requirements for implementation of the Infrastructure Delivery Management System (IDMS) through the FIDPM for all departments, constitutional institutions and public entities at national & provincial levels and took effect on 1 October 2019
    - https://cdn.ymaws.com/www.safcec.org.za/resource/resmgr/construction_legislation/fipdm/fipdm_2019.pdf
    - The Framework for Infrastructure Delivery comprises
      - Portfolio, Programme, Operations & Maintenance processes
      - Gateway reviews
    - Framework for Infrastructure Procurement comprises
      - Infrastructure procurement requirements and gates
      - Procurement documentation
    - The FIDPM specifies the allocation of clear responsibilities for performing activities and making decisions at control points, stages & procurement gates

- The IDMS Diagram shown below depicts the structure & relationships between the different elements of the IDMS
- The inner interconnected circles represent the core legislative requirements of the IDMS, namely, asset management, planning and budgeting, and supply chain management
- Infrastructure Delivery Management (IDM) comprises portfolio, programme, operations, maintenance and project management processes
  - Performance & risk management are integrated in the IDM processes, while the outer circle represents the institutional system that provides organisations with guidance on a generic approach towards building an institutional system to effectively implement the IDMS

FIDPM, 2019



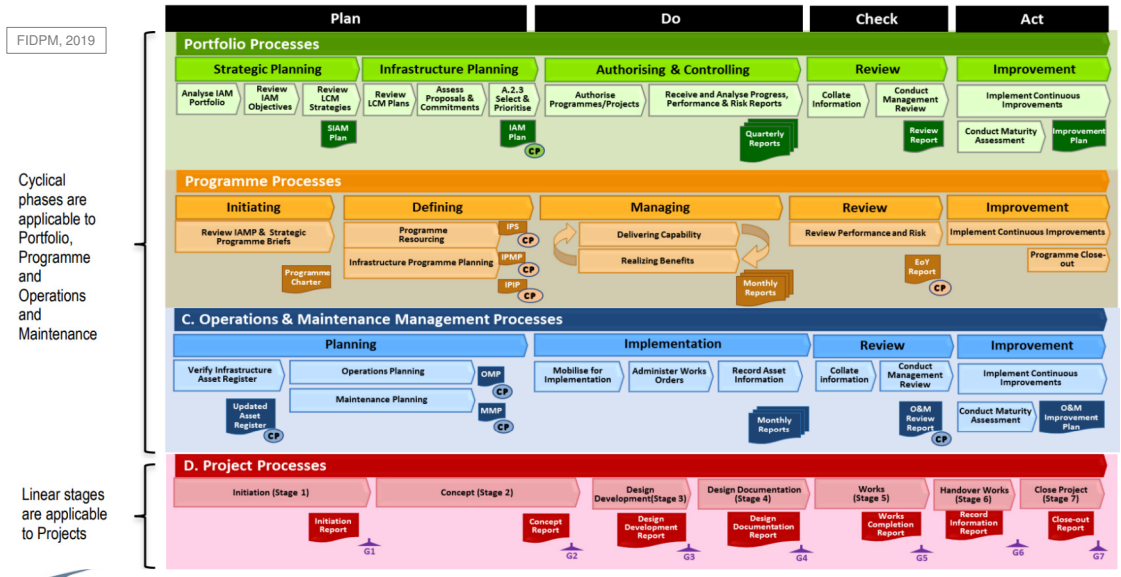
212

South African Road Federation

212

Infrastructure Delivery Management Process diagram

©Mervyn Henderson Consulting



The Asset Management Framework in SA

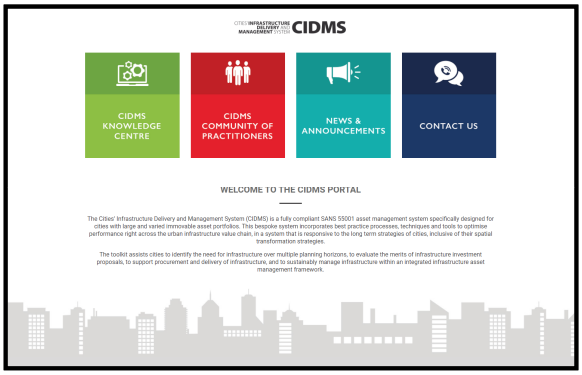
©Mervyn Henderson Consulting

- **South African Treasury guidelines *continued***
  - The Cities Infrastructure Delivery Management Toolkit (CIDMT) was created in 2018 (https://cidms.co.za/)
    - The CIDMS comprises all key elements dictated by ISO 55001, including strategy and planning, asset information, decision-making, capability development, lifecycle delivery, and risk and performance management
    - The CIDMS Toolkit creates a common AM dictionary for officials, and aligns the paradigms and methodologies of engineers, urban planners, finance practitioners and other relevant stakeholders within and across cities
    - It presents scalable best practice techniques, multiple new innovations, and a platform for leveraging further innovations across the cities
    - Some of these include asset data models, spatially-based customer profiling, demand analysis and future allocation techniques, a spatially-based capital development cost premium atlas, aligning the AM risk management system with the broader corporate risk management framework, advances in investment planning, and a fit-for-purpose programme delivery system
    - The Toolkit not only presents systems, processes and techniques, it also showcases case studies of advances in best practice AM in several South African cities
  - CIDMS was initially to be piloted in the larger cities of eThekwini, Johannesburg and Cape Town, and then rolled out to the remainder of metros

The Asset Management Framework in SA

©Mervyn Henderson Consulting

- **South African Treasury guidelines *continued***
  - Implementation would be staggered over the course of a five-year period, with the training and the establishment of AM policy and strategy in year 1, determining consolidated 30-year lifecycle needs in year 2, the production of AM plans and project pipelines in year 3, prioritised city investment plans and infrastructure delivery plans in year 4, & consolidation, review & improvement planning in yr 5
  - The Local Government Framework Infrastructure Delivery & Procurement (LGFIDPM) provides for minimum requirements for effective governance of infrastructure delivery and procurement management and took effect on 1 July 2021
    - A scaled-down version of the CIDMS will be developed for the remainder of local government



215

South African Road Federation

215

The Cities Infrastructure Delivery & Management System

©Mervyn Henderson Consulting

Source: Urban Infrastructure Asset Management: The Cities Infrastructure Delivery and Management System Toolkit, Boshoff, L & Childs, R, SAAMA Conference 2016, Somerset West, Cape Town, 16 – 18 May 2016

216

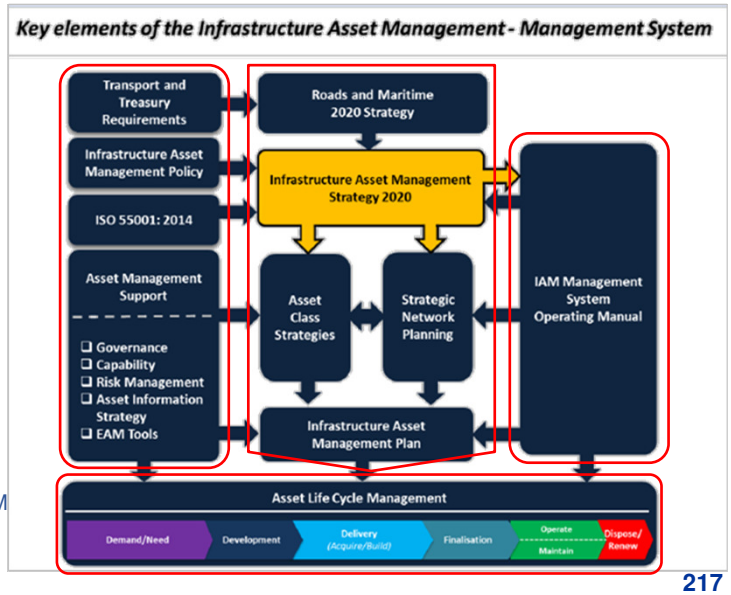
South African Road Federation

216

Case study of an AM Framework

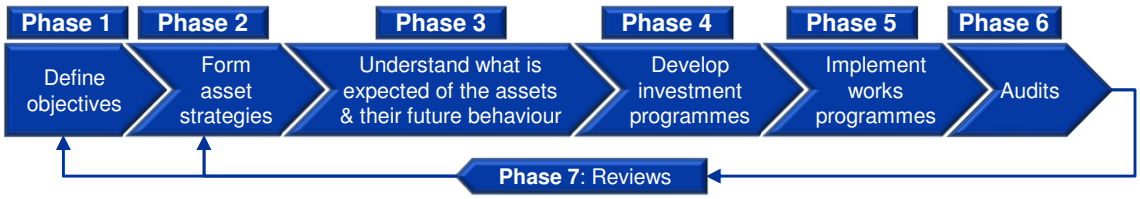
©Mervyn Henderson Consulting

- **Roads & Maritime Services, NSW**
  - The diagram provides a frame of reference designed to ensure decisions & actions are relevant to the AM process. It provides a graphic expression of the
    - Hierarchy of planning elements and decision leading provision and operation of assets
    - Directional flows of information and decisions
    - Standardised procedures, manuals and resources available and their interrelationships
    - Way these elements sit above and interact with the sequence of actions which make up the AM process
  - The diagram provides an effective way to depict the drivers of the AM system
  - It needs to be understood & accepted by senior managers & is designed to aid understanding the key drivers behind the AM how divisions are impacted, & relationships between elements of the AM system



Steps in the AM process for roads – a strategic model

©Mervyn Henderson Consulting

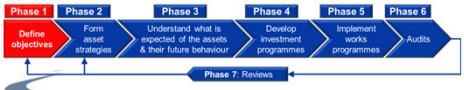


Adapted from Austroads Integrated AM Framework, ©Austroads, 2002

Phase 1: Define objectives

©Mervyn Henderson Consulting

- **Part 1: Organisation & Stakeholder Requirements**
  - Road agencies define high-level outcomes, objectives and key result areas from
    - Stated desired outcomes of government
    - Strategic or corporate planning initiatives involving key stakeholders and customer groups
    - Stakeholder needs, both internally and externally, identified during involvement or consultation with the agency or in other forums
  - A discussion on AM objectives is also covered under 'AM Objectives' & road agency requirements are also covered in 'Understanding the strategic context'
  - There are many sources of information, including demographics, statistics and economic data
  - Stakeholder consultation, should be an open and accountable process whereby individuals and groups have structured opportunities to influence decisions



- Effective stakeholder consultation helps identify potential issues, social impact, opportunities, alternatives and solutions to problems
- It is important to understand communities so that road assets can be provided that meet expectations and serve transport needs within a specific region
- Identify those outcomes and levels of service that the community is prepared to pay for
- Feedback and information needs to be provided to the community, such as budget constraints and trade-offs that may need to be made between different levels of service, exploring the impact of decisions on agency and road user costs in the longer term
- Consultation gives decision-makers the best information available and allows for the best possible decisions
- A feedback loop that enables the measure of benefits gained as a result of the outcomes achieved from previous investments should be incorporated into the planning process

Phase 1: Define objectives

©Mervyn Henderson Consulting

- **Part 2: Key Result Areas & Key Performance Indicators**
  - Key Result Areas (KRAs) are the outcomes of the stakeholder consultation process and should be integrated into the objectives of the organisation
  - Examples of KRAs are
    - Safety
    - Efficient and effective transport
    - Accessibility
    - Fit for purpose
    - Security
    - Social equity
    - Sustainability
  - A number of Key Performance Indicators (KPIs) should be set to monitor the effectiveness of the AM process towards achieving the KRAs
    - The organisation will deliver the maximum benefits to the community by satisfying the KRAs
  - The performance measures relating to AM are part of an organisation's AM system (ISO 55001), including
    - Asset condition and asset performance measures
    - Performance measures applying to the AM system and associated tools
    - Financial and non-financial performance measures, for which terminology must be aligned
- **Part 3: Public Report & Information Dissemination**
  - This is part of the information & communication process
  - The purpose of this is to inform the road agency, stakeholders, and customers of the requirements, expectations and constraints for the purpose of public relations and opportunity for comment and feedback

Phase 2: Formation of asset strategies

©Mervyn Henderson Consulting

- **ISO 55001 requirements**
  - AM plans are the mechanism for demonstrating how the AM objectives will be achieved utilising road assets
  - Plans to achieve the AM objectives must be established, documented and maintained, aligning the plans with the AM policy and SAMP and taking into account relevant requirements external to the AM system
  - AM plans need to cover all road services and assets defined within the scope of the AM system
- **Road networks should be managed in an integrated and holistic manner**
  - Deciding on the most appropriate strategic approach is a key starting point

- Agencies aligning with ISO 55001 also need to consider the relationship between the strategic AM plan (SAMP) & the Austroads model which allows for all the competing issues and demands to be coordinated and addressed together & provides a foundation for developing customer levels of service
- There are many aspects to consider, including road safety and interactions with land use
- **Part 1: Road System (Network) Management Strategy**
  - Road system management strategy (RSMS) – the overarching approach to managing all aspects relating to the road network

221

South African Road Federation

221

Phase 2: Formation of asset strategies

©Mervyn Henderson Consulting

- The Road System Management Strategy
  - Is a strategic document to demonstrate the relationship between the directions of the development of the road system and the community's expectations of economic development, social development and environmental management
  - Examines the community needs and expectations for the performance of the road system
  - Demonstrates to government & key stakeholders the synergies of targeted investments in the management and development of the road system, together with other initiatives to achieve government policy outcomes
  - Defines & presents the rationale behind fit-for-purpose performance targets & corresponding standards for the capacity, condition & use of various components of the road system
  - Focuses on establishing an over-arching hierarchy of performance-based standards for the capacity, use and condition of the various components of the road network which reflect the strategic function and level of use of different routes

- **Part 2: Other perspectives**
  - To give effect to the RSMS the following perspectives are used
    - Road investment strategy (RIS) – new capital investment strategies in assets associated with the expansion and upgrading of the asset base
    - Infrastructure preservation strategy (IPS) – strategies focussed on preserving existing assets in an optimised and cost effective manner over their lifecycle
    - Road use management strategies (RUMS) – strategies associated with the management of traffic of all forms and modes on the road network
    - Corridor management – planning for and ensuring protection of the road corridor for its intended functions

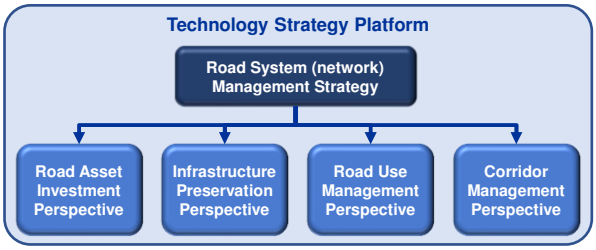
222

South African Road Federation

222

Phase 2: Formation of asset strategies

©Mervyn Henderson Consulting



- The important role of technology is not explicitly dealt with in AM manuals
  - A Technology Strategy is the platform for encouraging innovation, and driving efficiency & effectiveness throughout the Value Chain

➢ **Agencies may choose to have separately-documented strategies or perhaps combine strategies in a single document**

- The approach to aligning these strategies with ISO 55001 and the SAMP should be made explicit

223

South African Road Federation

223

Phase 2: Formation asset strategies

©Mervyn Henderson Consulting

➢ **Part 3: Asset Management Plans**

- Both the Strategic AM Plan and Lifecyle AM Plans have been covered previously
- The Asset Plans may be a single set of plans or a hierarchy of plans that are consistent with the total AM policies of the government.
- For an agency such as a local government council, a single set of plans may suffice, whereas for a provincial agency, a hierarchy of plans such as regional asset plans and individual asset plans may be required
- AM Strategies are transformed into standards defining the Level of Service
- These standards define the type and quality of road-related asset that should be provided in a given set of operational circumstances, e.g., for a given demand

- Using the standards, the current performance of an existing road-related asset can be compared with the target asset performance to identify performance gaps that are to be addressed by the Works Programme and road use policy interventions

224

South African Road Federation

224

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Clearly describing the services provided to customers & road users is an important task**
  - They should be appropriate to the agency's organisational goals and resource constraints, and consistent with the perceived needs of the community
  - Access is fundamental – it promotes productivity and is an essential catalyst to economic and social growth
- **Part 1: Level of Service Framework**
  - Level of Service is a term used to describe the quality of services provided by the asset under consideration
  - Road agencies usually define LoS in terms of the convenience of travel and safety performance of the road network
  - Depending upon various factors such as demand or importance, a higher level of service may be required for some parts of the network compared to others

- Customer-focussed level of service (CLoS) typically varies depending on the role and importance of the asset within the road system
  - They are best based on a hierarchy related to road function and overall use
  - In turn, they will directly link to technical maintenance or intervention standards and engineering design guidelines with respect to the safety, speed and comfort of travel
  - In general, heavily-trafficked roads warrant investment in a higher level of service because this increases overall transport efficiency through increased ride comfort, improved reliability and more consistent travel speeds helps reduce road user costs

225

South African Road Federation

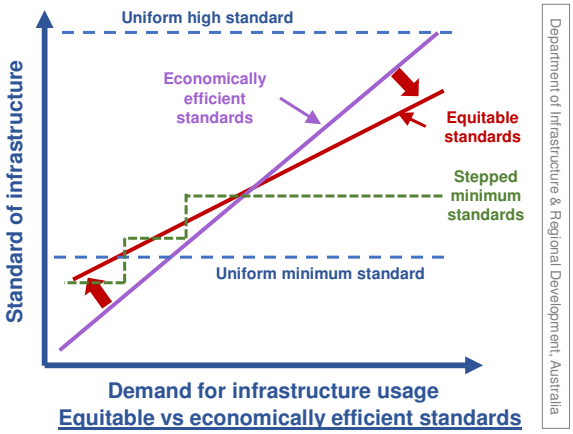
225

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Part 1: Level of Service Framework *continued***
  - Lightly-trafficked roads provide fewer investment opportunities resulting in road user savings, & therefore
    - The associated service levels are generally lower, although minimum levels of service are still important to ensure basic levels of safety and accessibility to essential services, and to minimise agency costs
    - However, traffic volumes alone should not determine investment decisions as these roads are often the 'first and/or last mile' connections
  - In practice, setting levels of service which strike a balance between being uniform across a network and economically efficient changes the slope of the line illustrated in the figure
    - The flatter the gradient of this line, the less that standards are economically efficient and the more they are uniform or equitable
    - 'Stepped minimum standards' can often achieve a comparable result forming an 'economic base case' for investment programmes

- A long term financial plan together with the use of accrual accounting for reporting and decision-making, are crucial for effectively and equitably managing service level



226

South African Road Federation

226

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Part 2: Road Asset Hierarchy**
  - To implement an AM strategy, a Level of Service Hierarchy is developed to define what class of asset is required
  - The LoS Hierarchy may be based on route function and demand or usage parameters such as traffic volumes and freight tonnage
- **Part 3: Target Road Asset Performance Standards**
  - For each LoS (or road asset class), target road asset condition and configuration requirements should be defined
  - The use of these Target Road Asset Performance Standards provides tangible measurements to determine road asset configuration and condition requirements in terms of capital investment and the upgrading of the existing road infrastructure
  - Targets for other aspects such as delineation can also be aligned to a range of LoS classes
  - In South Africa, there is a national approach to route identity described in TRH 26 South African Road Classification and Access Management Manual
    - TRH 26 does not link the hierarchical classification scheme with driving condition standards, such as roughness, width, delineation, overtaking opportunities, etc.
  - Standards may also be used to establish maintenance intervention levels.
    - For each class of road, minimum (or maximum) acceptable configuration and condition parameters may be established.
  - Standards for operational performance may also be appropriate, using parameters based on performance criteria such as safety, reliability of travel times, and congestion
  - Each road agency will determine its own sets of performance standards, based on community consultation, economic analysis, existing road standards, and budgetary expectations

227

South African Road Federation

227

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Part 4: Asset performance gap analysis steps**
  1. Determine the LoS Class required (assuming a road asset hierarchy has been developed) of each road-related asset by assessing the demand for or usage of the asset
     - Future demand from all users (e.g., motor cyclists, cars, buses and freight vehicles) for the service should estimated when planning ahead to identify the best way to meet demand
     - Demand can be met through a combination of asset solutions (such as new roads or better signs) and demand management strategies to influence demand (such as parking charges)
     - Demand forecasting requires consideration of the likely effects of
       - Changes in population (growth or decline)
       - Changes in land use (e.g. agricultural to residential)
       - Changes in consumption patterns (e.g. changes in vehicle occupancy)
     - The end results are changes in the number and/or size of the agency's assets & facilities or in the levels of service it delivers
  2. Using the Target Road Performance Standards, determine the required condition and configuration for each road asset
  3. Determine the current configuration and condition of each road asset
     - The actual current service level of an asset is usually determined by the existing state of attributes such as those describing condition and configuration
  4. Compare the actual road asset condition and configuration with the required condition and configuration (as specified in the Target Road Asset Performance Standards) to identify the gaps

228

South African Road Federation

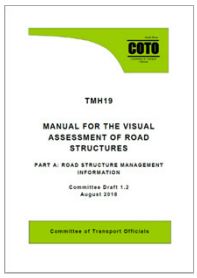
228

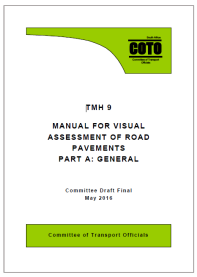
Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **When planning future lifecycle strategies and programmes, the current and future ability of the assets to respond to demand needs to be understood**
- **Asset knowledge**
  - One of the basic AM requirements is knowledge of what assets the organisation is responsible for along with key supporting information, such as inventory, asset value, age, condition, performance, criticality & risk
  - It is important that the data is stored in a way that allows the information to be assembled, reported and programmed as necessary
- **Asset condition**
  - Asset condition is a measure of the asset's physical integrity and condition information

- It is used in the development of proactive maintenance and rehabilitation programmes
- Asset condition is also critical for risk management due to its linkage to likelihood of failure
- Not all assets in a network need to have their condition monitored, recorded & understood because the assessment process is labour intensive and costly
  - The level of investment in monitoring should depend on the type, scale & criticality of the assets





229

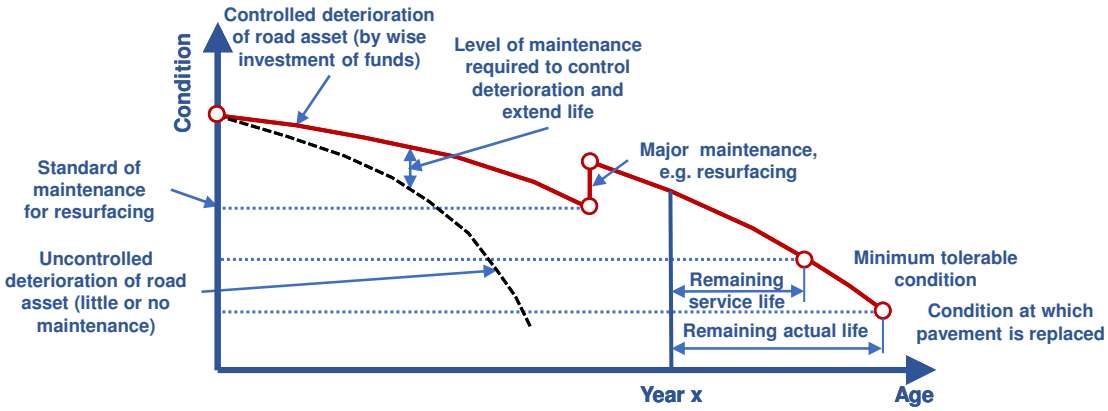
South African Road Federation

229

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **The typical condition deterioration of a pavement asset from good to poor given a planned maintenance approach, and the typical condition triggers for interventions such as resurfacing or replacement, is shown in the figure**



Guideline: low-volume sealed roads, SADC, 2003

230

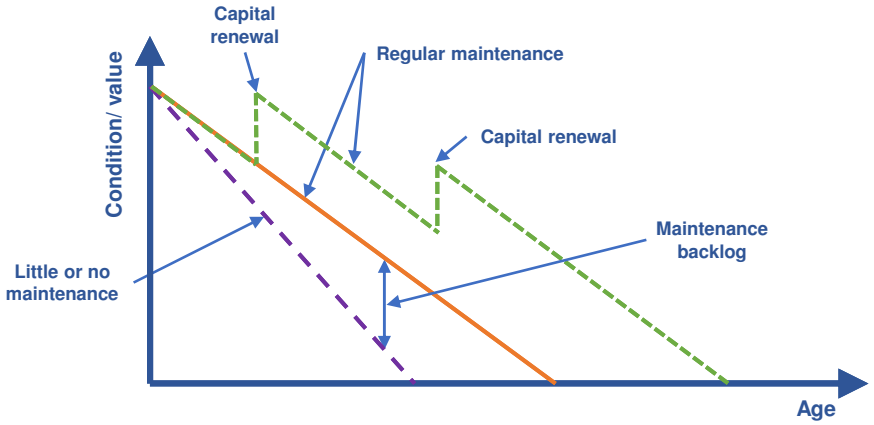
South African Road Federation

230

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **The typical condition/ value deterioration of a bridge given a planned maintenance approach and capital interventions is shown in the figure**



Engineering Guideline to Bridge Asset Management ©Austroads 2021

231

South African Road Federation

231

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Asset performance**
  - Asset performance relates to the functional performance of an asset when compared to its intended service level
  - Performance factors may relate to capacity, safety, reliability or other characteristics of a road network. Performance is not the same as condition, although the two are often linked, e.g.
    - A pavement which is very rough and in poor condition is likely to slow traffic and could pose a safety hazard
    - A road sign may be in excellent condition, but conveys a poorly-interpreted message
    - A street light might be in very poor condition but still provides an adequate level of light
  - It is important in deciding what work needs to be carried out to firstly understand whether the behaviour of the asset is affected by its physical condition or its ability to deliver the service expected of it

232

South African Road Federation

232

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Asset criticality and risk**
  - An asset exists to provide a service to all customers and road users & those assets which customers depend on the most for service continuity are the most critical, e.g. critical assets might include
    - Bridges on important routes where there are limited, if any, alternative routes
    - Computers which control city-wide traffic management systems or life-safety systems such as those used in a tunnel
  - The most critical assets are often too important to fail, given the high or extreme consequences of service loss that could occur
  - Responses, such as early intervention or proactive monitoring, need to be given priority
  - Risks affecting assets which are least important may simply be monitored or the assets repaired or replaced should they fail

- The types of risk and how such events could affect both the services and the assets need to be understood in order to determine and prioritise mitigation actions and works programmes
- Risk events can include
  - Financial risks
  - Operational risks
  - Natural hazards or disaster events
  - Physical asset failure risks

233

South African Road Federation

233

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Understanding risk**
  - Risk defined as "(Exposure to) the possibility of loss, injury, or other adverse or unwelcome circumstance; a chance or situation involving such a possibility"
    - The management of risk within AM is critical
    - Why? Because asset managers are responsible for optimising outcomes for the good of their organisation, and therefore need to make judgements about which actions best achieve the right blend of outcomes based on organisational objectives
    - To make judgements, they need to predict how their actions will impact on the future performance of the assets
    - They need to quantify both the probability of their actions (or inactions) causing a change in performance & then they need to determine the impact or consequences of that change in performance

$$Risk = Probability\ of\ failure \times Consequence\ of\ failure$$

- In the real world, we tend to focus on one solution to manage risk: either manage the probability or manage the consequences
  - These solutions often rest with different departments, different budgets or even different organisations
- The optimum reduction in risk comes when we identify where the risk is coming from and invest in and manage both the probability and the consequences accordingly
- **Correctly addressing this challenge is at the heart of AM discipline**

234

South African Road Federation

234

Phase 3: Understand what is expected of the assets & their future behaviour

©Mervyn Henderson Consulting

- **Phase 5: Community Consultation**
  - The identification of asset requirements is obviously fundamental to successful AM
  - It is important that the LoS Framework that is used as the basis for identifying asset requirements incorporates the informed view of the community
  - This is best achieved through a process of formal community consultation that continues throughout the whole AM process in the form of the information and communication sub-process

This Photo by Unknown Author is licensed under CC BY-NC-ND

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- **The purpose of Phase 4 is to identify intervention options to close the asset performance gaps**
- **These intervention options will comprise the Total Needs Programme**
- **Owing to resource constraints, only a portion of the Total Needs Programme can be funded**
  - To ensure an equitable allocation of resources and to achieve the organisation's objectives, prioritisation of the Total Needs Programme is required
  - Prioritisation and various funding scenarios should act interdependently through this and the previous phases
  - The result of prioritisation & funding scenarios will lead to the identification of the funded Works Programme

- **Part 1: Total Needs Programme**
  - The Total Needs Programme is made up of three types of projects arranged in different programmes
  - The final list of projects is created from an integrated process that combines the three programmes into a single Total Needs Programme
- **Infrastructure preservation programmes**
  - Maintenance and asset renewal need to be planned and carried out efficiently and effectively over the whole of the asset lifecycle
  - There are typically many opportunities to optimise total lifecycle costs, sustain service provision, and manage risk through prudent maintenance & renewal analysis & planning.
    - Failure to carry out maintenance activities may reduce performance, lower reliability, increase overall lifecycle costs or result in safety issues
  - Infrastructure preservation programmes typically include activities such as OPEX & CAPEX

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- OPEX
  - Routine maintenance, both planned and unplanned, or preventative, corrective and reactive, & covering the entire network portfolio of assets
  - Minor replacements which are not 'capitalised'
  - Operational costs such as electricity for street lighting, street cleaning, vegetation control, etc.
  - Emergency works, such as the response to climatic or natural disaster events
- CAPEX
  - Resurfacing
  - Pavement rehabilitation
  - Reconstruction of existing roads
  - Bridge replacement
  - Renewal programmes for other asset groups

- Infrastructure preservation projects are identified by
  - Determining the performance gap
  - Investigating intervention options
  - Defining and broadly costing phases of potential projects
  - Identifying the optimal intervention option to close the gap

➢ **Capital investment programmes**

- The objective is to ensure that the asset base is developed in a way that is appropriate to the needs of customers & addresses the agency's objectives
- Capital investment programmes include
  - Construction of new roads and highways
  - Expansion of existing road, such as adding lanes or providing grade separation to existing intersections
  - New infrastructure, such as new ITS technology, new destination signs, new structures, etc.
- Capital investment projects are identified by the same method as for preservation projects

237

South African Road Federation

237

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

➢ **Road use & corridor management programmes**

- Good strategies and programmes can mitigate risk and defer the need for asset renewals or upgrade works, ensuring that road corridors retain the functionality intended
- Managing road space, traffic and vehicle loadings is vital to capturing the most value out of the asset base
- Addressing growth in demand does not always require the construction of new assets
  - It is important that alternative solutions to construction be explored, even if only to defer CAPEX for a period
- These solutions are 'non-asset' solutions as they typically involve changes in customer or road user behaviour that have the effect of reducing demand
- The focus of demand management programmes is usually to reduce peak demand or overall average demand
  - Peak demand typically drives asset-sizing and capacity planning, while average demand influences outcomes such as long term pavement deterioration & transport energy use
- Controlling the interaction between land use & roads is important to preserving & balancing accessibility against the performance of the road
  - Busy roads with high levels of property interaction, such as strip shopping, tend to become congested quickly & should be avoided when planning new roads or improvements for through traffic efficiency

238

South African Road Federation

238

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

➢ **Part 2: Optimisation and/or Prioritisation**

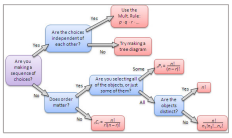
- The purpose of optimisation and/or prioritisation is to select the 'best' option to close each gap and also choose the gaps that will be filled in the final Works Programme
- In a generic sense, the option that minimises the Agency and Road User Costs, in a lifecycle context, is considered to be optimal
- An optimisation and/or prioritisation model is required to aid in the ranking of capital and maintenance projects to enable the optimum allocation of resources
- In reality, this model will be indicative only and a number of iterations through the model may be required to achieve the final funding scenarios
- As well as minimising lifecycle costs, the process of optimising and prioritising should include consideration of strategic network requirements and the accumulation of benefits from strategic corridor improvements compared with individual projects

- Decision-making techniques
  - Various decision-making tools and techniques are used to bring together and analyse information from the preceding processes in developing strategies and formulating work programmes
  - These programmes encompass operational expenditure (OPEX) and capital expenditure (CAPEX), optimised across financial, service and risk criteria to ensure an economically efficient and prudent set of overall actions
  - Decision-making techniques cover a range of analytical procedures and tools, which may be spreadsheet based, part of a comprehensive information management system, or drawn from other agency business processes

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- Important financial and economic considerations in decision-making include
  - Taking a whole of life approach in making investment or preservation choices, which includes agency costs, road user costs & other social & environmental costs
  - When to incorporate both agency and community costs and benefits (total transport costs)
  - Recognising and accounting for the economic value embodied in existing assets – noting that the timing of renewals has a significant economic impact
  - Addressing intergenerational equity, the question of who should pay for investments and how – considering both current and future users and their patterns of asset 'consumption'
  - Decision-making techniques and frameworks



➢ **Part 3: Funding scenarios**

- After the Total Needs Programme has been subjected to an optimisation and/or prioritisation process, a number of funding scenarios can be generated to reflect a number of possible funding levels
- These scenarios should be supported by a summary of the benefits and costs of each level of funding
- Ideally all projects should be considered equally and compete for the same funds but in reality, there are different funds available for road assets under different jurisdictions, programmes and projects

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- **A long term financial plan (LTFP) is needed by every organisation with long-lived assets and significant AM responsibilities relative to their income base**
- **A LTFP is for generating, spending and investing future income and raising and repaying borrowings as appropriate**
  - It highlights the financial implications of the organisation's proposed activities & anticipated events
  - It includes a projection of financial performance and position
- **The purpose of a LTFP is to express, in financial terms, the activities that an organisation proposes to undertake over the medium to longer term to**
  - Give effect to strategies proposed in the organisation's other strategic planning documents including its Strategic AM Plan and achieve its stated objectives

- **Relationship between the LTFP and the SAMP**
  - The relationship between AM planning and financial management and sustainability is essentially a two-way relationship
  - AM planning is focused on asset requirements to maintain and expand the organisation's current road network taking into account future demand, while the LTFP and the financial strategy underpinning it involves assessment of these needs in terms of their financial implications which are fed back to the asset managers
  - The AMP provides projections of road needs and expenditure requirements that are used as input for the LTFP
  - The LTFP must incorporate the cash flow needs, enabling it to undertake maintenance, renewal and replacement works in line with the timing indicated by the AMP

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- The LTFP should accommodate the organisation's cashflow need to enable it to carry out the asset maintenance activities and renewal and replacement of assets, as set out in the SAMP, providing the SAMP is based on financially sustainable service levels
- Affordable service levels cannot be determined by considering historic AM outlays or projected available budget cashflow capacity for AM
- The only simple, practical way to determine affordable service levels is by looking at an underlying trend accrual accounting projected operating result, and other financial results, over at least 5 to 10 years

- **The preparation of a LTFP generates improved information to guide decisions about the mix and timing of outlays on operating activities and additional assets and the funding implications of these outlays**

- **A LTFP, together with the use of accrual accounting for reporting and decision-making, are crucial for**
  - Effectively and equitably managing service level
  - AM and revenue raising decisions
  - Ensuring financial sustainability
  - Efficiently and equitably accommodating ongoing funding of
    - Existing services – operations, maintenance, asset renewal and upgrade
    - New services and assets, as required

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- **Any judgement of the affordability of future LoS needs to include the implications arising from expected future non-cash related financial events and changes in their level**
  - Various options should be evaluated before ultimately settling on a LTFP and a range of Levels of Service that best meets needs and preferences
- **Depreciation expense recognised in accrual accounting is calculated to reflect the rate of consumption of the service potential of assets**
  - Depreciation expense is typically 25% to 35% of local government annual operating costs

- **Balancing a LTFP requires the fulfilment of an organisation's service level responsibilities and objectives within the constraints of its Financial Strategy**
  - **It is not sufficient to simply ensure cash inflows match cash outflows each year**
- **The use of financial indicators can facilitate assessment of the compatibility of service level proposals included in a LTFP and achievement of an organisation's financial strategy**
  - A LTFP should highlight projected financial performance against appropriately determined targets for financial indicators that are suited to the organisation's circumstances
  - If a LTFP suggests that trying to achieve desired service levels will jeopardise ongoing financial sustainability, then the organisation needs to consider various alternative strategies to overcome this problem

243

SARF better roads

South African Road Federation

243

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- **The core approach to a basic LTFP is**
  - It is under-pinned by a sound financial strategy that ensures that the organisation's financial sustainability is protected or improved as necessary
  - It accommodates asset maintenance, renewal and replacement activity at levels and at points in time that minimises whole-of-life economic costs relative to required service levels
  - It accommodates service levels proposed in the organisation's strategic plans
- **An enhanced LTFP has additional features**
  - It is based on achievement of and discloses projected performance against carefully developed financial sustainability targets
  - It fully accommodates, in quantum and timing, outlays consistent with activities identified as warranted in the SAMP and other strategic planning documents
- **A LTFP should cover a period of at least 10 years with an initial 5 year planning horizon generating substantially better information for financial decision-making compared with a traditional annual budget**
- **A LTFP should include a description of the financial strategy on which the plan is based, including financial targets and their rationale**

> *'…the decision whether or not to create an asset is typically the time where there is the most opportunity to impact on the potential cost and level of service impact. Once the asset is already in place, the decision of when and how to renew assets is the next greatest opportunity. Good infrastructure planning provides time to make good decisions and plan and coordinate activities in an effective and timely manner'.*
>
> *IIMM (IPWEA 2015)*

244

SARF better roads

South African Road Federation

244

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- **Funding and implementing programmes**
  - Programmes are typically developed at different levels, and aggregation and prioritisation processes are needed to produce robust budgets and achieve funding approval
  - For large agencies with multiple geographic areas, programmes might be built up layer-by-layer as follows
    - A road link, or project
    - A road corridor
    - A region
    - The entire road network
  - Results are incorporated in forward budgets, ready for consideration by the agency's senior executive and funders, often using AM plans

- Ideally, a long-term approach should be taken to develop multi-year programmes which are optimised & prioritised in line with the agency's objectives & strategies
- Short-term financial projections, typically covering a three to five-year period, should be reliable, while projections from 5 –10 years and beyond will usually be progressively less reliable
- Once programmes and funding have been approved, efficient programme and project management processes are needed to ensure that all work can be delivered within the timeframes and budgets established

245

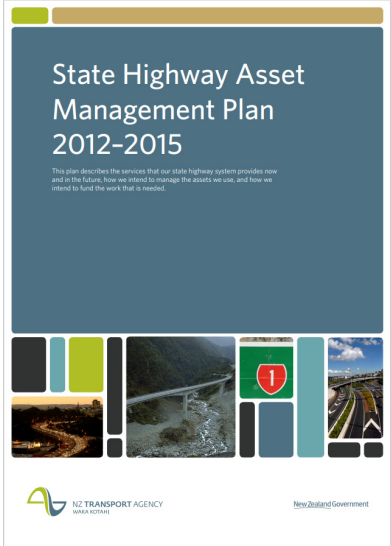
South African Road Federation

245

Phase 4: Develop Investment Programmes

©Mervyn Henderson Consulting

- **Part 4: Works Programme**
  - The final Works Programme should show the funding available for routine, preventative and periodic maintenance, as well as rehabilitation and construction, together with details of specific works
- **The Works Programme is published as part of the Strategic Asset Management Plan**
  - The SAMP was covered previously under 'Managing Asset Management'
  - The SAMP is an important requirement of ISO 55001



246

South African Road Federation

246

Phase 5: Implement Works Programme

©Mervyn Henderson Consulting

- **Phase 5 involves performing the projects and tasks defined in the Works Programme**
- **However, community consultation is a most desirable part of implementing a Works Programme, and so the Information and Communication Sub-Process is again emphasised**
- **Part 1: Information & Communication Process**
  - Public Report and Information Dissemination should be performed at this stage to inform the public of the final Works Programme
  - This may take the form of a document outlining major projects, timeframes and funding levels
  - Regular publication by Queensland of the 5 year rolling Roads Implementation Program is an example of outstanding practice (https://www.tmr.qld.gov.au/QTRIPonline)
  - At the project level, other media such as project specific newsletters and focus groups are used
- **Part 2: Service delivery models**
  - This topic is covered briefly in 'AM Enablers'

Source: The Citizen

247

South African Road Federation

247

Phase 6: Audit

©Mervyn Henderson Consulting

- **ISO 55001 requirements**
  - Define audit criteria and their scope, plan, establish and maintain an internal audit programme
  - The purpose of internal audits is to test conformance, implementation and maintenance of the AM system
  - This may lead to the identification of changes or improvements
- **An audit process should be implemented to ensure work activities reflect the Works Programme and satisfy the Asset and Organisational Strategies (and in turn stakeholder requirements)**
- **In this phase information should be provided to external stakeholders and other customers by means of public reports and other media**
- **Part 1: Audit of Work Carried out**
  - This audit can begin as the implementation of the Work Programme begins and can be integrated into an organisation's quality assurance systems
- **Part 2: Audit of the Asset Management Systems**
  - Audits should be performed to ensure that the AM cycle has been carried out as documented in the agency specific guidelines

248

South African Road Federation

248

Phase 7: Reviews

©Mervyn Henderson Consulting

- **ISO 55001 requirements**
  - Plan and carry out regular top-management reviews of the AM system to ensure its continuing suitability, adequacy and effectiveness
  - Identify opportunities for continual improvement and retain documented evidence of the audits and the opportunities
- **A number of feedback cycles should be used to give the AM Process its cyclic, continual nature**
- **Implementation of works programmes can influence stakeholder requirements, asset strategies and future asset performance**
- **The outcomes of the Works Programme should be used to influence various parts of the planning process**

- **Part 1: Review Asset Performance**
  - This should be a review of the requirements defined in the Road System Management Strategy to confirm that gaps in the network have been filled as initially intended
  - Review the levels of service agreed with customers
- **Part 2: Review Infrastructure Strategies**
  - The purpose of this review is to cross check that the implementation of the Works Programme has satisfied all the objectives as specified in the Infrastructure Preservation and Road investment strategies, and if not, to trigger action to generate improved processes for future use

249

South African Road Federation

249

Phase 7: Reviews

©Mervyn Henderson Consulting

- **Part 3: Review AM system performance**
  - A maturity assessment (previously covered) provides information on how well the AMS is performing
  - The status of AM implementation is evaluated using the self-assessment method was covered in 'Organisational AM improvement journey'
  - After new AMS performance targets are set, an Improvement Plan is prepared for implementation, previously covered under 'Planning for improvement'
  - The continuous improvement cycle is show in the figure
- **Part 4: Review Agency and Stakeholder Requirements**
  - The implementation of the Works Programme may affect stakeholders' perceptions and thus their requirements and expectations
  - This feedback process highlights the necessity to gauge stakeholders' requirements on an ongoing basis

250

South African Road Federation

250

Case Study: Using AM to address the Climate Emergency

©Mervyn Henderson Consulting

- **Overview**
  - This case study is based on the IAM publication '*Climate Emergency Action Planning: Guidance for asset owning organisations*', October 2021
  - The infrastructure continues to get older, posing a risk to life and safety, with reducing resilience to the effects of the environment, particularly the effects of climate change and natural disasters
  - The use of IAM concept model to provide guidance for addressing the climate change emergency is described

Topics

- **Role of asset management**
- **Building on good AM practice**
  - Strategy and planning
  - Lifecycle delivery
  - Risk and review
  - AM decision making
  - Asset information
  - Organisation and people
- **Developing Climate Emergency Action Plans**
- **Developing Climate Change Adaptation Plans**

251

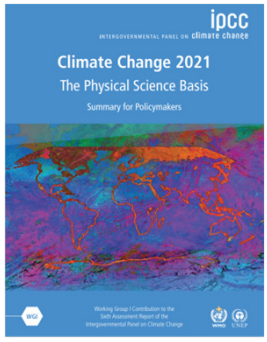
South African Road Federation

251

Role of AM in addressing the climate emergency challenge

©Mervyn Henderson Consulting

- **The Secretary-General of the United Nations describes the Intergovernmental Panel for Climate Change (IPCC)'s Sixth Assessment Report as '*code red for humanity*'**
- **Rapid action is required across sectors and globally to mitigate climate change and build climate change resilience**
- **The world faces a major climate emergency, unprecedented in human history and this is resulting in sustainability and resilience issues across society**



Source: Daily Maverick

Source: IOL

252

South African Road Federation

252

Role of AM in addressing the climate emergency challenge

©Mervyn Henderson Consulting

- **The Institute of Asset Management UK notes that in combination with implementing actions to mitigate climate change through reduced GHG emissions, organisations must introduce measures to adapt their systems and infrastructure to be resilient to changes in the climate, e.g.**
  - Addressing increased asset degradation/ failure risks due to exposure to extremes of temperature, drought, and flooding
- **Organisations must also consider the broader issues of environmental, social and economic sustainability, by reducing their detrimental environmental impacts and using resources sustainably**
  - Producing change requires urgent and clear leadership from these organisations
- **Increasingly governments throughout the world are mandating organisations to demonstrate that the impact of their actions on the environment is a core part of their decision-making processes**
  - Making sustainable and climate conscious investment decisions is essential if we are to be effective in tackling the climate emergency
  - The aim should be to embed the UN Sustainable Development Goals and other environmental and social drivers into an enhanced AM approach

253

SARF better roads

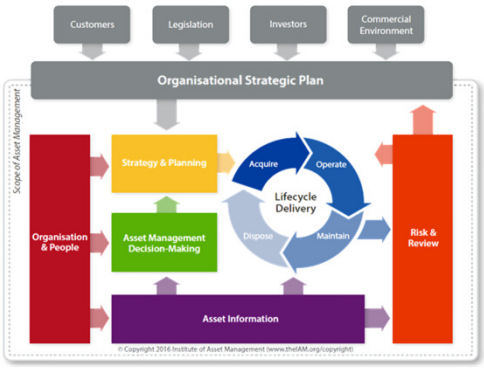
South African Road Federation

253

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **The foundation of good AM is the delivery of long term sustainable value & this is achieved using a**
  - Whole-life, whole system approach that is guided by stakeholder expectations
  - Optimises the use of resources
  - Has clearly defined targets based on transparent processes and evidenced-based methodologies
- **The whole-life approach also supports the concept of a circular economy, where the longevity and durability of material selection, and end-of-life repurposing opportunities are encouraged**
- **Avoidance of functional, organisational and technical boundaries that can lead to sub-optimal solutions is central to this approach**
- **These characteristics are required for the development of climate emergency action plans**
- **IAM Conceptual AM Model**
  - The IAM's conceptual model for AM identifies the six key subject groups that together enable an organisation to ensure that its approach to AM effectively, efficiently and sustainably supports the delivery of the organisational strategic plan & objectives



254

SARF better roads

South African Road Federation

254

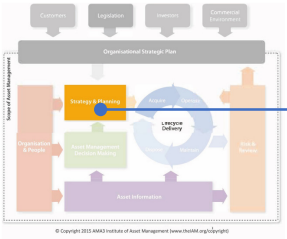
Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

➢ **Strategy and planning**

- This is the most critical group of activities within an organisation's AM system, identifying the asset and asset-system related activities that are necessary to deliver long-term value to the organisation and its stakeholders, and to support the delivery of the organisation's strategy and objectives
- Reviewing the activities included in this subject group should be a priority for an organisation addressing the climate emergency challenge
- It is not necessary, and probably highly ineffective, to develop a strategy and plan for addressing climate emergency separately from that necessary to deliver other organisational objectives
- Climate-related risks pose new challenges to achieving corporate objectives and changes which address those risks should be identified as part of an AM Strategy

- Existing AM Strategies and plans, including the Technology Strategy, should be broadened in scope to address the additional climate emergency requirements
- To achieve this the senior team within the organisation must determine and communicate its requirements for addressing the climate emergency challenge, both in terms of scope and timescales



Group 1 – Strategy & Planning
1. Asset Management Policy
2. Asset Management Strategy & Objectives
3. Demand Analysis
4. Strategic Planning
5. Asset Management Planning

255

SARF better roads

South African Road Federation

255

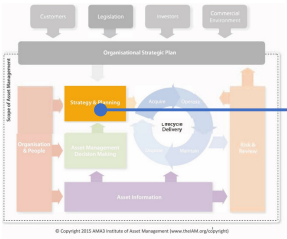
Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

➢ **Strategy and planning *continued***

- This should be based on a detailed understanding of stakeholder needs and expectations, and an understanding of the capability of the organisation, its assets and its supply chain partners to meet these requirements
- The AM Policy should be updated to reflect these requirements and its value criteria, and decision support tools enhanced to evaluate strategic options
- Based upon the outcome of this analysis – and after agreement with the senior team and key stakeholders which may involve adjustments to the organisation's strategy and goals – a revised set of AM Objectives will be produced containing explicit reference to the delivery of the climate emergency goals

- The existing AM Strategy, the Strategic AM Plan (SAMP) and supporting AM Plans should then be updated, budgets adjusted and delivery and monitoring regimes put in place
- These plans must include consideration of GHG emissions and other environmental outcomes, such as bio-diversity, as well as whole-life cost, if the planning and delivery of asset maintenance and operations is to be sustainable and climate resilient



Group 1 – Strategy & Planning
1. Asset Management Policy
2. Asset Management Strategy & Objectives
3. Demand Analysis
4. Strategic Planning
5. Asset Management Planning

256

SARF better roads

South African Road Federation

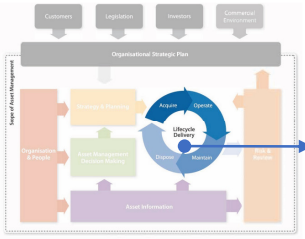
256

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Lifecycle Delivery**
  - Organisations incur the majority of their asset related expenditure during the Lifecycle Delivery stage
  - We need to adjust the focus from the avoidance of cost, and recognise that mitigating environmental impact and remaining adaptable and sustainable are equally, if not more, valuable to the organisation and its stakeholders
  - Asset investment appraisal criteria must reflect this broader understanding of value and must include consideration over the whole-life of the asset
  - With capital assets often having a lifespan of many decades, the decisions and actions taken within the Lifecycle Delivery stage have long lasting consequences from an environmental and sustainability perspective, and organisations' assets must operate within the context of a rapidly changing environment

- It is imperative that asset managers ensure that all activities across the entire asset life (including asset disposal and repurposing opportunities) mitigate the impact of current and future assets on the environment; and that they can adapt to rapid and unprecedented changes to operating environments while still remaining a sustainable solution



Group 3 – Life Cycle Delivery
11. Technical Standards & Legislation
12. Asset Creation & Acquisition
13. Systems Engineering
14. Configuration Management
15. Maintenance Delivery
16. Reliability Engineering
17. Asset Operations
18. Resource Management
19. Shutdown & Outage Management
20. Fault & Incident Response
21. Asset Decommissioning & Disposal

©Copyright 2015 AMA3 Institute of Asset Management (www.theIAM.org/copyright)

257

SARF better roads

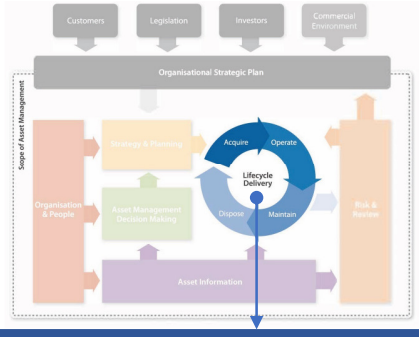
South African Road Federation

257

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Lifecycle Delivery *continued***
  - Addressing climate emergency best practice and strategies, the Lifecycle stages will need to reflect an asset's vulnerability to climate effects and facilitate adaptation measures over the lifetime of an asset, e.g. to accommodate changes in technology and resources
  - A vital component of this consideration will be addressing environmental requirements within systems engineering
  - The Lifecycle stages will need to allow for mitigation opportunities throughout the life of an asset and minimise the asset's GHG footprint while still achieving the organisations objectives
    - This requires an understanding of the overall GHG contribution (embodied, operational and maintenance, and during disposal) as well as the environmental impacts



Group 3 – Life Cycle Delivery
11. Technical Standards & Legislation
12. Asset Creation & Acquisition
13. Systems Engineering
14. Configuration Management
15. Maintenance Delivery
16. Reliability Engineering
17. Asset Operations
18. Resource Management
19. Shutdown & Outage Management
20. Fault & Incident Response
21. Asset Decommissioning & Disposal

©Copyright 2015 AMA3 Institute of Asset Management (www.theIAM.org/copyright)

258

SARF better roads

South African Road Federation

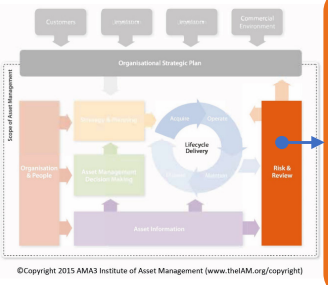
258

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Risk and review**
  - ISO defines risk as the '*effect of uncertainty on objectives*'
  - Although it is understood that climate change will have significant impacts on assets, products and services, the degree or extent of various climate-related impacts across different time horizons remains uncertain
  - The impact of this climate risk or uncertainty upon organisations is that sustainability and GHG emissions targets must be managed within thresholds of variation
  - Climate change effects, both in terms of frequency and severity, could have an impact on the performance of assets and therefore on the delivery of organisational objectives
  - It is essential therefore that climate emergency uncertainties (both adverse and opportune) are thoroughly explored and levels of risk appetite and tolerance re-examined
  - An understanding of stakeholder expectations is a vital part of these considerations

- Risk models and lists of priority/critical assets should be reviewed and updated to reflect these uncertainties & to facilitate the development of robust climate change plans
- Monitoring and review are essential components of an effective AM system, primarily to ensure that the actions necessary to support the implementation of the AM Strategy have been executed effectively and ensuring that desired outputs are achieved and that processes are subject to continuous improvement



Group 6 – Risk & Review
31. Risk Assessment & Management
32. Contingency Planning & Resilience Analysis
33. Sustainable Development
34. Management of Change
35. Asset Performance & Health Monitoring
36. AM System Monitoring
37. Management Review, Audit & Assurance
38. Asset Costing & Valuation
39. Stakeholder Engagement

259

South African Road Federation

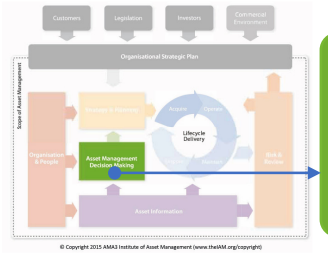
259

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Risk and review *continued***
  - Consideration should also be given to the risks associated with supply chain disruption, especially considering reliance on resources, parts and materials that are difficult to source or need to be transported over long distances
- **Asset Management Decision Making**
  - To ensure the most effective management of assets in line with climate change causes and risks, targeted risk-based decisions need to be made at each asset lifecycle stage
  - Organisations need to consider sustainability, effect on the environment and output requirements to ensure greater asset resilience from climate changes
  - It is vital to understand the climate and environmental impact from an organisation's assets and then to ensure robust and timely mitigations are in place, minimising GHG emissions and climate change causes as much as possible

- The AM System should ensure that robust decision-making processes and criteria are defined and recorded and that regular reviews take place to learn lessons of previous decisions
- All processes within the AM system that increase associated GHG emissions should be considered, e.g., construction methodologies, operations and maintenance provision, and resourcing strategies



Group 2 – AM Decision Making
6. Capital Investment Decision-Making
7. Operations & Maintenance Decision-Making
8. Life-Cycle Value Realisation
9. Resourcing Strategy
10. Shutdown & Outage Strategy

260

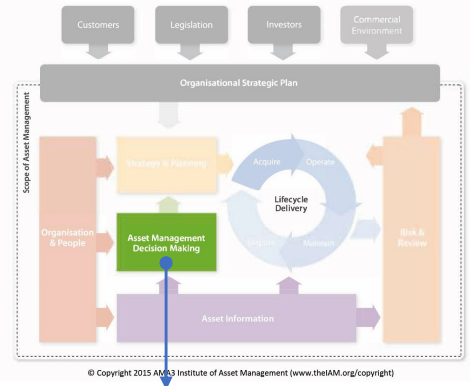
South African Road Federation

260

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Asset Management Decision Making *continued***
  - Developing value-based analysis and lifecycle costing tools which take into account the impact on the organisation's triple bottom line (financial, societal and environmental) will be essential in providing the organisation with the information needed to make informed decisions at each lifecycle stage
  - Develop risk models that consider the local and global effect of climate change which is increasing adverse weather effects, such as flooding, drought, higher atmospheric temperatures, and increased wind speed, which will then enable decisions to be made to keep, change or modify existing assets to further support or maintain asset resilience



Group 2 – AM Decision Making
6. Capital Investment Decision-Making
7. Operations & Maintenance Decision-Making
8. Life-Cycle Value Realisation
9. Resourcing Strategy
10. Shutdown & Outage Strategy

261

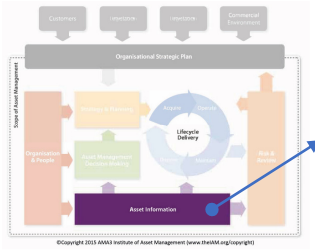
South African Road Federation

261

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Asset Information**
  - Good practice approaches to asset information broadly support the delivery of climate change objectives
  - However, more complex questions and analysis are likely to be required to address the climate emergency
    - To support long term decision making when selecting optimum future strategies and
    - To undertake enhanced reporting to demonstrate the effectiveness of actions and plans
  - New information sources, different data types and greater data volumes are likely to be used, increasing the data management challenge for organisations
  - The challenges arising from climate change will sometimes not have been experienced in the past
  - Extremes of impact and frequency of events will most likely increase; therefore, data and information need to be considered with these factors in mind
  - Leading indicators and near misses will become ever more important, as will extrapolating past data with 'what if' scenarios
  - Innovation & emerging technologies are an important component of climate change resilience and mitigation
  - Specifically, asset innovations, including
    - Enhancement to existing technologies, as well as
    - Applications of emerging technologies may also present challenges to asset managers due to e.g. a lack of asset knowledge and data on performance



Group 4 – Asset Information
22. Asset Information Strategy
23. Asset Information Standards
24. Asset Information Systems
25. Data & Information Management

262

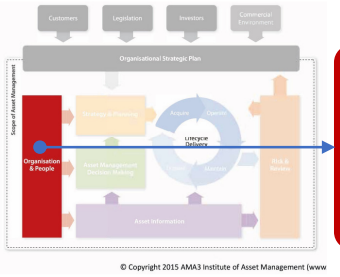
South African Road Federation

262

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Organisation and people**
  - Effective leadership is critical
  - Developing and implementing a climate emergency action plan will be a challenge for most organisations and it is essential that the senior team within an organisation fully demonstrate in both words and actions their commitment to the plan
    - **Strategy** – the management team must ensure that
      - The strategy is clearly articulated & regularly communicated
      - The necessary funds and resources are made available
      - Describe the consequences of failing to deliver the strategy
    - **Structure** – the organisational structure and performance monitoring regime may need to be modified to reinforce the delivery of this strategy
      - People within the organisation must have the competence required to enable them to address the climate emergency challenge
      - This may necessitate changes to staff training programmes and the creation of new roles, potentially requiring the recruitment of new staff with specific expertise in key tasks e.g., expertise in low carbon technologies, legislative and regulatory knowledge



Group 5 – Organisation & People
26. Procurement & Supply Chain Management
27. AM Leadership
28. Organisational Structure
29. Organisational Culture
30. Competence Management

263

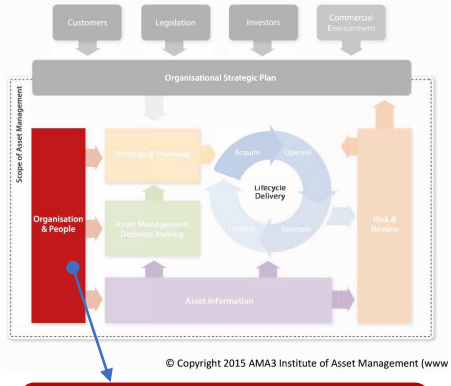
South African Road Federation

263

Building on good AM practice to address the climate emergency

©Mervyn Henderson Consulting

- **Organisation and people *continued***
  - **Culture** – the management team must ensure that the culture of the organisation underpins this approach
    - Encouraging an environment where challenge, innovation and cross-team working is encouraged
    - Progress is not delayed by competing team goals, local priorities or a blame culture where an innovation has not delivered everything expected
  - Organisations need to identify the suppliers that are key to their success and work closely with them to ensure that their actions are fully aligned with the delivery of the strategy
  - This may require changes in the supply chain, in interactions with suppliers and moving away from organisations that do not share the organisation's commitments in preference to suppliers that have aligned values



Group 5 – Organisation & People
26. Procurement & Supply Chain Management
27. AM Leadership
28. Organisational Structure
29. Organisational Culture
30. Competence Management

264

South African Road Federation

264

Developing Climate Emergency Action Plans

©Mervyn Henderson Consulting

- **Scope and prioritisation**
  - Addressing the climate emergency challenge requires action on two key issues
    - Reducing and removing GHG emissions
    - Improving the resilience of the organisation's infrastructure to expected climate changes
  - Critically, achieving both of these must be achieved in a sustainable manner
  - These actions are known respectively as climate change mitigation and climate change adaptation
  - Prioritisation is essential
  - Before embarking on extensive plans organisations are recommended to assess the scale of the climate challenge and how this might vary in different parts of the organisation, particularly for those whose operations are geographically dispersed
  - It is also considered worthwhile carrying out a high-level assessment of the relative importance of mitigation and adaptation plans

- Organisations must consider the vulnerability of their asset base in terms of exposure to climate change factors, such as extremes of heat or flooding
- They must determine what needs to be addressed in terms of adaptation to improve resilience and mitigation to reduce emissions, and prioritise their investment accordingly
- The purpose of effective AM is not simply supporting the delivery of the organisation's goals, but it is also about helping the organisation formulate and shape these goals, providing the decision-makers within the organisation with an understanding of what is possible and over what timescale

265

SARF better roads

South African Road Federation

265

Developing Climate Emergency Action Plans

©Mervyn Henderson Consulting

- **Scope and prioritisation *continued***
  - These appraisal and planning processes should invariably identify choices for the organisation, presented in a format that allows the management team to make effective decisions
  - It is likely there will be significant interrelation between an organisation's climate change mitigation and adaptation strategies; this may generate both conflicts and opportunities, e.g. early replacement for resilience vs life extension for mitigation of GHG emissions
  - It is essential that organisations use multi-criteria assessments in their option appraisal tools, to reflect the fact that the value calculations must include
    - Consideration of GHG emissions
    - Environmental impact
    - Water and energy usage
    - Costs
    - Any other criteria that represent what the organisation values

- Understanding changes in climate and potential impact on assets
  - The IAM recommends addressing this challenge by the use of risk-based models, considering the increasing likelihood and consequence of asset failure/ degradation due to climate change and the impact this might have on the delivery of the organisation's goals, and this necessitates
    - Understanding the expected changes in the climate in which the assets operate
    - Assessing the likely impact of these changes on the performance of the assets and the ability to manage the assets
    - Assessing the consequences of this impact in terms of the delivery of the organisation's objectives
    - Developing strategies and plans to manage this impact
    - Monitoring the effectiveness of these plans and making adjustments as required

266

SARF better roads

South African Road Federation

266

Developing Climate Emergency Action Plans

©Mervyn Henderson Consulting

- **Scope and prioritisation *continued***
  - Developing a climate change model
    - Developing an adaptation model requires an understanding of how the climate may change over the life of the assets, the extent of this change and the potential impact on the assets
      - The framework in the table below provides an illustration of how this assessment can be carried out, and it is against such a framework that adaptation strategies can be considered

- In assessing the potential climate change impact, it is important that the approach adopted is not limited solely to the physical impact on the assets: the processes for managing the assets and potential changes in demand for the organisation's products and services should also be considered, e.g.
  - Adverse weather conditions could severely impede the ability of the organisation to carry out routine or corrective maintenance activities, potentially leading to further degradation to the asset

267

South African Road Federation

267

Developing Climate Emergency Action Plans

©Mervyn Henderson Consulting

- **A framework for assessing the impact of climate change**

Factor	Climate changes	Metrics	Potential impact
Water	• Heavy rain, causing damage and/or leading to localised flooding • General rises in sea and river levels and flow rates • Ground movement and landslides • Increase in frequency and intensity of lightning, hail, snow or ice storms	• Annual rainfall • Peak rates and duration	• Transport disruption / delays • Supply chain interruptions • Damage to bridge foundations • Increased loading on bridge supports • Water ingress damage
Drought	• Reduced rainfall • Lowering of river and lake levels • Ground movement	• Annual rainfall • River and lake water levels	• Shortage of potable water for road construction • Lack of drinking water, reduction in water quality • Veld & forest fires • Habitat degradation • Food shortages • Dust storms

268

South African Road Federation

268

Developing Climate Emergency Action Plans

©Mervyn Henderson Consulting

- **A framework for assessing the impact of climate change *continued***

Factor	Climate changes	Metrics	Potential impact
Temperature	• Changes in duration and timing of seasons (reduced predictability) • Periods of intense heat • Less frequent cold periods, but perhaps more intense • Drought and fires • Invasive species causing damage to assets (or harm to employees) • Biodiversity crisis	• Daily, weekly, monthly temperatures	• Impact on asset specifications • Overheating of buildings/ assets • Transport disruption/ delays • UV degradation • Equipment failure
Wind	• Speed • Dust storms	• Mean wind speeds • Gust wind speeds	• Impact of storm damage • Impacts of increased cooling on assets • Impact on design specifications

269

South African Road Federation

269

Developing Climate Change Adaptation Plans

©Mervyn Henderson Consulting

- **Scope and prioritisation *continued***
  - Developing Climate Change Adaptation Plans
    - The table on the following three slides provides an overview of how existing AM strategy, planning and implementation processes provide the platform for developing robust, risk-based adaptation action plans
    - In line with the prioritisation recommendations in the 'Scope and Prioritisation' section, critical assets, processes and supply chains should be considered first, extending the approach as necessary.
    - This further consideration may include connected assets in systems/ networks to identify single points of failure for less critical individual assets that would have a whole system/ network failure impact

- **Understanding the mitigation challenge and Developing a Climate Change Mitigation Strategy and Plans**
  - Refer to the IAM '*Climate Emergency Action Planning – Guidance for asset owning organisations*', version 1, October 2021, for more information

Source: Oudtshoorn Courant

270

South African Road Federation

270

Developing Climate Change Adaptation Plans

©Mervyn Henderson Consulting

Subject group	Actions
Risk	• Agree and document climate change assumptions using the type of framework outlined in 'Developing a climate change model' for a planning horizon relevant to the expected life of the organisation's assets • Identify assets (including networks of connected assets) that are critical to the operation of the organisation. Repeat this planning process as considered necessary for other assets • Assess the likely impact of the climate change scenario(s) on these assets and the resulting business impacts using multivariate analysis techniques and expressing these impacts wherever possible in both financial & organisational value terms • Update risk models and logs
Asset Management Decision Making	• Ensure decision criteria and whole-life cost and performance models are modified as necessary to take into consideration impacts arising from expected climate changes • Identify and cost options to alleviate this impact. Develop business cases for potentially viable options. Note adaptation options may include: ○ Improving resilience of existing assets ○ Immediate replacement of an asset with one with a revised but more resilient specification ○ Waiting until an asset is due for renewal, then replace with a more resilient asset ○ Making the asset redundant by innovation

Developing Climate Change Adaptation Plans

©Mervyn Henderson Consulting

Subject group	Actions
Strategy and Planning	• The senior team should provide clear leadership on adaptation, ensuring that its importance is fully understood throughout the organisation • Ensure the Asset Management Policy is updated to reflect the organisation's approach to adaptation • Agree a climate change adaptation strategy, targets, timelines and monitoring regime • Update the Asset Management Strategy to reflect the requirements of the climate change adaptation strategy, providing details of: ○ Climate change adaptation strategy implementation costs and expected benefits ○ How the implementation of the strategy will be monitored ○ Identify expected asset performance as a result of these plans ○ Residual risks, key enablers and key assumptions • Update the organisation's Asset Management Plan to reflect the revised Asset Management Strategy
Organisation and People	• Update organisational roles, responsibilities & team objectives to reflect the climate change adaptation strategy • Ensure that adequate resources are made available to deliver the climate change adaptation plan • Review employee capabilities and implement a training programme as required • Ensure the procurement strategy reflects the climate change adaptation strategy requirements, e.g. asset resilience requirements, asset life-expectancy

Developing Climate Change Adaptation Plans

©Mervyn Henderson Consulting

Subject group	Actions
Asset Information	• Identify and source information required to develop and implement climate change adaptation plans • Identify information required to monitor the delivery and impact of the climate change adaptation plans • Update data collection processes, systems, training, communication etc. to ensure availability of the required information
Lifecycle Delivery	• Ensure investment approval processes and criteria reflects the climate change adaptation strategy requirements • Ensure each asset has a dynamic environmental standards register that is updated with changes to legislation and standards relevant to the asset • Document and implement revised asset specifications and/or operating and maintenance regimes with updated climate change adaptation strategy requirements • Collect required information relating to asset costs and performance, including GHG emissions and environmental impact, to assist with the review process and with further strategy development
Review	• Monitor the implementation of the climate change adaptation plans as defined within the organisation's Asset Management Plan • Monitor the expected level of performance of the assets • Identify improvement opportunities

273

South African Road Federation

273

©Mervyn Henderson Consulting

If you found this course on asset management a bit of an elephant and its hard to digest, try eating it one bite at a time!

Or, if its more like climbing a mountain…

274

South African Road Federation

274

©Mervyn Henderson Consulting

End

275

About sources

©Mervyn Henderson Consulting

- **Major reference materials used**
  - Guide to Asset Management, Austroads, 2018
  - Draft TMH 22, COTO, 2013
  - Capital Planning Guidelines, National Treasury, 2018
  - Framework for Infrastructure Delivery and Procurement Management, National Treasury, 2019
  - ISO 55000/1/2: Asset Management, International Organization for Standardization, 2014
  - ISO/TC 251 WG4 resources (https://committee.iso.org/tc251)
  - Asset Management – an anatomy, version 3, Institute of Asset Management, 2015/2018
  - Asset Management Policy, Strategy and Plans, Institute of Asset Management, 2015
  - Climate Emergency Action Planning – Guidance for asset owning organisations, Institute of Asset Management, 2021
  - International Infrastructure Management Manual, IPWEA, 2011 & 2015
  - Highway Infrastructure Asset Management Guidance Document, Department for Transport UK, 2013
  - Asset Management Landscape 2nd Edition, Global Forum on Maintenance & Asset Management, 2014
  - AASHTO Transportation Asset Management Guide, American Association of State Highway and Transportation Officials, 2002
  - AASHTO Transportation Asset Management Guide—A Focus on Implementation, American Association of State Highway and Transportation Officials, 2011
  - Ask the experts Asset Management Webinar June 2016 - Levels of Service-Cost-Risk and Asset Management Plan, Inframanage, https://inframanage.com/inframanage-blog/, accessed July 2021
  - Asset Management: Whole-life management of physical assets, Editor Chris Lloyd, 2010

276

About acronyms for organisations

©Mervyn Henderson Consulting

- AASHTO – American Association of State Highway and Transportation Officials
- BS – British Standard
- BSI – British Standards Institution
- CNAM – Canadian Network of Asset Managers
- FHWA – Federal Highway Administration (USA)
- GFMAM – Global Forum on Maintenance and Asset Management
- IAM – Institute of Asset Management UK
- IPCC – Intergovernmental Panel for Climate Change
- IPWEA – Institute of Public Works Engineering Australasia
- ISO – International Organization for Standardization
- NDOT – National Department of Transport, South Africa
- NRCC – National Research Council of Canada
- NZ – New Zealand
- NZTA – New Zealand Transport Authority
- OECD – Organisation for Economic Co-operation and Development
- PIARC – World Road Association
- PSAB – Canadian Public Sector Accounting Handbook
- RMS – Roads & Maritime Services (New South Wales)
- SA – South Africa
- TRB – Transportation Research Board (USA)
- TRL – Transport Research Laboratory (UK)
- UK – United Kingdom
- UN – United Nations
- US – United States
- US DoT – United States Department of Transportation

About acronyms for asset management & other

©Mervyn Henderson Consulting

- AM – Asset Management
- AMP – Asset Management Plan
- AMS – Asset management system
- BS – British Standard
- BSI – British Standards Institution
- CAPEX – Capital expenditure
- CIDMT – Cities Infrastructure Delivery Management Toolkit KPI – Key Performance Indicator
- CLoS – Customer-focussed level of service
- CNAM – Canadian Network of Asset Managers
- FWP – Forward work programme
- GHG – Green house gases
- GIAM – Government-wide immovable asset management
- GIAM – Government-wide immovable asset management act
- GPS – Government Policy Statement (NZ)
- HMEP – Highways Maintenance Efficiency Programme
- HR – Human resources
- IT – Information technology
- KRA – Key Result Area
- LoS – Level of Service
- LTFP – Long Term Financial Plan
- MAP-21 – Moving Ahead for Progress in the 21st Century
- ONRC – One Network Road Classification (NZTA)
- OPEX – Operational expenditure
- PAS – Publicly available standard
- PDCA – Plan-Do-Check-Act
- PRMG – Provincial Road Maintenance Grant
- PSAB – Canadian Public Sector Accounting Handbook
- RAMP – Road Asset Management Plan

About acronyms for asset management & other

©Mervyn Henderson Consulting

- SAMP – Strategic Asset Management Plan
- SHAMP – State Highway Activity Management Plan (NZTA)
- SHIP – State Highway Investment Proposal (NZTA)
- SPE – Statement of Performance Expectations (NZ)
- TAM – Transportation Asset Management
- TIP – Transportation Improvement Plan
- TMH – Technical Methods for Highways

279

South African Road Federation

279

About Synonyms

©Mervyn Henderson Consulting

- **'Agency' is used synonymously with 'authority' and are used in a generic sense and not to designate a particular organisational type**
-

280

South African Road Federation

280

About the course compiler

©Mervyn Henderson Consulting

- Mervyn Henderson Pr Eng
- Career - 44 years in the roads industry, South Africa & Australia
  - Consultant – Asset Management Services, Western Cape
  - Specialist Engineer, Roads Branch, Western Cape (RBWC)
  - Team Leader Asset Management, ARRB Group, Queensland, Australia
  - Program Manager – Strategic Investment and Network Performance, Brisbane Office, Metropolitan Region, Assets & Operations, Queensland Department of Transport and Main Roads, Australia (TMR)
  - Acting Director: Road System Governance, Engineering & Technology Division, TMR
  - Head: Pavement Materials and Rehabilitation. Roads and Stormwater Department, City of Cape Town
  - Chief Engineer: Pavement Engineering, Roads Branch, Western Cape
- Qualifications
  - MSc Engineering (Civil)
  - (Post) Graduate Diploma in Engineering (Civil)
  - Graduate Diploma of Management (Technology Management)

- Some achievements in asset management
  - Compiled the Western Cape Road Asset Management Plan (RBWC)
  - Compilation of an AM policy, AM strategies & AM plans (RBWC)
  - Development of integrated business processes all road projects and routine maintenance (RBWC)
  - Best Practical Paper Award for the paper "*Management of unpaved roads: Developing a strategy and refining models*", South African Transportation Conference, Pretoria, July 2017
  - Coordination of the implementation of Asset Management Elements in the Metropolitan Region of TMR
  - Implementation of dTIMS in 2012/13 for the $300 million 5 year TMR Road Asset Management Contract for Southeast Queensland (ARRB)
  - Development and establishment of new management systems: Gravel Management System, Pavement Quality Management System, Project Management System (RPM), the Seal Planning & Design System (RBWC)
  - Implementation of the Deighton Total Infrastructure Management System (dTIMS) (RBWC)
  - Development of programmes for rehabilitation, programmed maintenance, upgrading and regravel in the Western Cape and co-author of *'A Strategic analysis for optimal fund allocation and budget level'* (RBWC)
  - Planning and leading strategic planning sessions for the Western Cape Roads Branch and development of the 1st Business Plan (RBWC)
  - Editor and coordinator for Materials Manual (RBWC)