



Strategic Asset Management Plan

July 2020

Local Government Engineering Department

Local Government Division

Ministry of Local Government, Rural Development, & Cooperatives

Government of the People's Republic of Bangladesh



Local Government Engineering Department

Strategic Asset Management Plan

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This Strategic Asset Management Plan (SAMP) is cocreated by the Local Government Engineering Department (LGED) and the United Nations Office for Project Services (UNOPS) under the National Resilience Programme (NRP).

The NRP is a joint programme of UNOPS, UN Women, and UNDP in partnership with the Local Government Engineering Department, Department of Disaster Management, Department of Women Affairs and Programming Division of the Government of Bangladesh (GOB). The Programme is funded by the governments of the UK, Sweden, and Bangladesh.

This SAMP, in line with the ISO 55000, is a key component of the LGED's overarching Asset Management System (AMS) and aims to align and establish a clear line of sight between stakeholders' requirements, departmental objectives and the resulting Asset Management Objectives. It outlines how LGED will develop and improve its asset management capabilities and the AMS (i.e. process, information, system, people, tool, resources etc.)



Executive Summary

Infrastructure is a central pillar for sustainable and resilient development. Physical infrastructure assets provide a means for delivering essential services and play an important role in enhancing and protecting the lives and livelihoods of people and for the developing economy to thrive in Bangladesh.

The Local Government Engineering Department (LGED) under the Ministry of Local Government, Rural Development & Cooperatives is responsible for planning, developing, maintaining and managing local level rural, urban and small-scale water resources infrastructure nationwide. LGED recognizes that it is essential to manage assets to sustainably deliver appropriate levels of services to the community and to meet the expectations and needs of the present and future generations.

LGED's strong commitment to fulfilling this responsibility is evidenced by the development of an integrated, interdisciplinary Asset Management System (AMS). Asset Management provides a new lens through which LGED can refocus strategies and resources to deliver sustainable long-term value and performance from the local level infrastructure assets.

The Strategic Asset Management Plan (SAMP) is a key component of the AMS and aims to align and establish a clear line of sight between LGED's stakeholders' requirements, departmental objectives and the resulting Asset Management Objectives.

The SAMP applies to LGED's asset portfolio and all activities across an asset's lifecycle including planning, creation and/or acquisition, operation, maintenance, renewal and disposal.

Key fundamentals of this SAMP include:

- Setting out the foundations for LGED's AMS approach to manage their portfolio in alignment with government objectives which ensures it can sustainably deliver services to stakeholders and people;
- Provide 'line of sight' from strategic objectives through to implementation of lifecycle activities across LGED's portfolio;
- Provides a summary of the status of asset management practices and helps LGED to understand the strengths and weaknesses of current asset management practices and to identify priorities which require improvement or further development.

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1. Introduction

1.1 Purpose

Providing effective and efficient management of local infrastructure is a key obligation of LGED. LGED's Asset Management System (AMS) will provide a structured, and long-term approach of managing local infrastructure to deliver improvements in financial, social, economic and environmental performance. When implemented, the AMS will enable infrastructure assets to be managed in a way that contributes to the Government's strategic goals. The Strategic Asset Management Plan (SAMP) is a key component of the AMS and aims to align and establish a clear line of sight between LGED's stakeholders' requirements, organisational objectives and the resulting Asset Management Objectives.

The SAMP is defined in ISO 55000: 2014, 3.3.2., as "documented information that specifies how organizational objectives are to be converted into asset management objectives, the approach for developing asset management plans, and the role of the asset management system in supporting achievement of the asset management objectives".¹

The SAMP is intended for LGED's executive leadership and management, key stakeholders and those involved in the development and implementation of the SAMP and the Asset Management Plans (AMPs).

The purpose of the SAMP is to:

- Demonstrate that LGED's Asset Management System (AMS) is aligned with the requirements of ISO 55001: Management System for Asset Management;
- Describe the role of the AMS in supporting achievement of the AM Objectives, delivering appropriate asset performance e.g. Level of Service (LOS), cost effectiveness, with acceptable risk and meeting legislative requirements;
- Enable consistent and informed evolution from the current situation to a state where Asset Management is embedded as 'business as usual' and to enable stakeholders to collaboratively transition and adapt accordingly;
- Outline necessary development of asset management practices and improvement opportunities for LGED when managing assets and delivering services.

1.2 Scope

LGED's AMS aims to guide improved and sustainable management of infrastructure assets through the systematic and coordinated activities to maximize service and resilience potential.

¹ ISO 55000:2014, 3.3.2

This SAMP applies to LGED's asset portfolio and applies to all activities across an asset's lifecycle including planning, creation and/or acquisition, operation, maintenance, renewal and disposal.

Where data is required but is not readily available, findings are supplemented by organisational experience, judgement and assumptions. These areas require further investigation and validation.

1.3 Implementation and Review

This is the first SAMP prepared by LGED and as the inaugural version is intended as a 'live' document. It is anticipated that the SAMP will progressively improve and mature as the AMS and associated support elements such as people, processes, available technologies are developed, enhanced and embedded as 'business as usual'.

It is anticipated that LGED will review the SAMP on an annual basis at a minimum during the development stages. Future frequency and arrangements for the review, update and improvement of the SAMP may change in accordance with and to reflect LGED's increasing level of AMS maturity.

The Chief Engineer will oversee the AMS of the organization supported in the early stages of development by the Asset Management Committee (AMC). The AMC will be responsible for development, implementation and continuous improvement of all components of the Asset Management System (AMS) in coordination with the relevant LGED leadership persons and functional units. Continual improvement of the SAMP will be achieved in collaboration with key stakeholders within LGED.

2. Organisational Context

2.1 LGED Overview

The Local Government Engineering Department (LGED) is a public sector organization under the Ministry of Local Government, Rural Development & Cooperatives.

LGED is responsible for planning, developing, maintaining and managing rural, urban and small-scale water resources infrastructure at the local level. As one of the largest implementing arms of the government LGED, through its country-wide operation, recognizes that it is essential to manage assets to sustainably deliver appropriate levels of services to the community and to meet the expectations and needs of the present and future generations.

The aims of LGED's development activities are to improve the socio-economic condition of the country through management of infrastructure and ensuring connectivity and delivery of essential services at a local level and capacity building of stakeholders.

LGED's Mission and Vision statements (2019) follow:²

Table 1: LGED's Vision and Mission

Mission

Development and management of local infrastructure for increasing farm/non-farm production, generating employment, improving socio-economic condition, promoting local governance, reducing poverty and acting as agent of change at the local level.

Vision

LGED would continue to remain professionally competent, efficient and effective public sector agency for performing the interrelated and complementary functions of:

1. Developing, maintaining and managing transport, trading and small scale water resources infrastructure at the local level by ensuring LGI and community participation and taking care of environmental and social issues.
2. Providing technical and institutional support to strengthen the local government institutions and serving local communities and other stakeholders.

Currently, LGED, as a single institution, is managing over 2.0 billion USD each year, which approximates to 10-15% of the country's total annual development budget.

The organizational structure of LGED is substantially devolved with around 95 % of 13,394 staff located at regional, district and Upazila levels. It is one of the most decentralised organizations of the country.

LGED is strategically engaged in the process of development and management of physical infrastructure including roads, structures and trade centres, irrigated agriculture, minor drainage and flood control works and production and employment programs for the rural community.

² [http://www.lged.gov.bd/site/page/602c531f-acf4-4aab-a358-bb80acdc3356/-](http://www.lged.gov.bd/site/page/602c531f-acf4-4aab-a358-bb80acdc3356/)

2.2 Drivers of Change

LGED's responsibility to ensure delivery of essential services through the lifecycle management of local infrastructure assets is pivotal in enhancing and protecting the lives and livelihoods of people and for the developing economy to thrive in Bangladesh.

To achieve these aspirational goal following are the underlying drivers of change:

- The Allocation of Business of Local Government Division (2017 Update);
- National Integrated Multi-modal Transport Policy 2013;
- National Land Transport Policy 2004;
- Rural Road Maintenance Policy 2013;
- Perspective Plan 2010-2021, and 2021-2041;
- Five Year Plans;
- Bangladesh Delta Plan 2100, and
- Other relevant sectoral policies.

2.2.1 Asset Management Guiding Principles

Key to the success of LGED's AMS is a set of asset management guiding principles which underpin LGED's AMS development. The guiding principles will shape and influence the formation and development of LGED's AMS.

The guiding principles have been developed through an iterative and participatory process including inquiry, exploratory workshops, and dialogue.






Table 2: LGED AM Guiding Principles

1		Supporting economic and socio-economic activity
2		Sustainable environmental practice
3		Enhanced equal empowerment of men and women
4		Resilient infrastructure and disaster response
5		Climate change

The guiding principles provide an interim interpretive structure which translates the government vision, goals, targets and aspirations into the context of LGED's AMS. The principles frame and integrate common values that ground and guide decision making, capturing the essence of how the AMS will be developed, improved and embedded. The table

below sets out the 'line-of-sight' between the guiding principles, Government strategic goals and the United Nations' Sustainable Development Goals (SDGs).³

Table 3: LGED AM Guiding Principles, GOB Strategic Goals, and UN SDGs

LGED AM Guiding Principles		GOB Strategic Goals	UN SDG #
	Supporting economic and socio-economic activity	<ul style="list-style-type: none"> Accelerating growth Empowering Citizens Reducing poverty 	8 2, 3, 4 1, 6, 7, 8
	Sustainable environmental practice	<ul style="list-style-type: none"> Environment friendly development Promote sustainable development and consumption 	9, 11, 12, 15 12, 14, 15
	Enhanced equal empowerment of men and women	<ul style="list-style-type: none"> Gender empowerment Social inclusion Social protection 	5 4 2
	Resilient infrastructure and disaster response	<ul style="list-style-type: none"> Ensuring available adequate infrastructure Integrate disaster risk reduction and foster innovation Build resilient infrastructure 	9 11 9, 11, 17
	Climate change	<ul style="list-style-type: none"> Climate resilient development Minimise adverse impacts Develop and deploy long-term policy and initiatives 	13 17 17

2.2.2 Challenges

LGED's primary challenge is to balance ever growing needs and expectations with the best use of limited resources whilst being responsive to an ever-changing operational environment - social, political, economic, climatic and physical. Prioritising connectivity of people, services and movement of goods is a key consideration of LGED for all investment decisions.

Bangladesh as a nation also faces numerous compounding challenges such as natural disasters, increasing resource scarcity, degrading environments, water pollution, rapid

³ Source 7Th 5 Year Plan Box2.1 p28.

urbanisation and climate change. There exists an acute awareness 2.2.2of challenges at a national level as listed below⁴:

Table 4: Overall Challenges

<ul style="list-style-type: none"> ● Public administration capacity; ● Economic governance; ● Public financial management; ● Private investment incentives and models; ● Land management; ● Alleviation of poverty; ● Gender bias; ● Increased life expectancy; ● Multi-modal transport networks; 	<ul style="list-style-type: none"> ● Quality and safety of infrastructure; ● Labour productivity; ● Production diversification; ● Consumption diversification; ● Resilience to climate change; ● Degradation of natural resource(s); ● Sustainable management practices.
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Challenges specifically encountered by LGED and which are foreseen to ensue include:⁵

Table 5: Specific Challenges of LGED

<ul style="list-style-type: none"> ● Local conflict in prioritizing roads for development; ● Inadequate flow of funds; ● Overloaded trucks causing early damage to the pavement; ● Climate change impacts such as floods, cyclones and river erosion over the rural infrastructures; ● Inadequate fund for maintenance; 	<ul style="list-style-type: none"> ● Lack of land use planning; ● Capacity building of LGIs for road maintenance and road safety; ● Land acquisition for up-gradation of Roads; ● Capacity building of LGIs to develop a framework of planned development beside roads to resist drainage congestion.
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2.2.3 Integrated strategic initiatives

The following documents outline important strategies, plans and policies which in turn inform LGED's mandate, roles and responsibilities:

- The Constitution of the People's Republic of Bangladesh (Part II - Fundamental Principles of State Policies, Article 16 – Rural Development and Agricultural Revolution);

⁴ GoB 7th 5 year Plan, Part 2

⁵ 7th 5 Year Plan - Part II: Sector Development Strategies, Sector 6: Transport and Communication, Section 6.2.1 – Roads and Bridges, Sub-section – Rural Transport, page 349

- Allocation of Business Among the Different Ministries and Divisions (Schedule I of the Rules of Business, 1996) (Revised up to December 2017): [A]. Local Government Division [7];
- Perspective Plan of Bangladesh 2010-2021
 - Chapter 9: Transport and Communication for the Future, Section 9.3 Sub-sectoral Goals, Objectives, Strategies – Rural Transport:
 - Chapter 4: Strategy for Food Security: Agriculture and Rural Development, Section 4.6 Rural Development and Institutions – Rural Non-Farm Activities (RNFA);
- Perspective Plan of Bangladesh 2021-2041
 - Chapter 6: Sustainable Agriculture for Food Security and Rural Development in a High-Income Country; Section 6.7 – Agriculture and Rural Development of the Future.
 - Chapter 10: Building Transport and Communication Infrastructure for Sustained Rapid Growth. Section 10.5 Transport Sector Strategy for PP 2041 (Strategy for Road Transport).
- The 7th Five Year Plan (2016-2020), (Part II: Sector Development Strategies, Sector 7: Local Government and Rural Development, Section 7.3.5 – Strategic Priorities of LGED for Rural Transport Development and Management
 - Part II: Sector Development Strategies, Sector 6: Transport and Communication, Section 6.2.1 – Roads and Bridges, Sub-section – Rural Transport
 - Part II: Sector Development Strategies, Sector 4: Agriculture, Section 4.6 – Managing Water Resources, Sub-section 14 – Small Scale Water Resources Development.
- The 8th Five Year Plan (July 2020 – June 2025), (Chapter 7: Strategy for Local Government & Rural Development)
 - Section 7.2.1: Infrastructure development.
 - Section 7.4.1: Local Government Division (Rural Transport Development & Management, Specific Objectives & Targets of Local Government Engineering Department)

2.3 Stakeholders

LGED’s mandate to manage infrastructure naturally entails engagement with many stakeholders across all stages of an asset’s life cycle. The diagram below illustrates key stakeholder groups. These have been primarily differentiated between external and internal stakeholders.



Figure 1: Stakeholders

LGED recognises that detailed statements specifically addressing the needs and expectations of the individual stakeholder groups will follow in the Asset Management Pan(s). These statements will inform the future definition of Level of Service, assist in prioritising, resolving conflicts and decision making.

3. LGED Asset Portfolio

3.1 Overview

LGED has the responsibility for managing local level infrastructure assets country-wide supporting a very broad array of different services over three sectors - rural, urban and small-scale water resources.

3.2 Asset Hierarchy

For the purposes of the SAMP and in line with good asset management practices, LGED has defined an asset hierarchy for asset classes (this inaugural version includes rural road infrastructure asset class only) which adopts a componentised approach. This will allow uniform and consistent referencing and reporting across the department. LGED's portfolio asset hierarchy is summarised below.

Table 6: Asset Hierarchy

Level 1 Asset Class	Level 2 Asset sub-class	Level 3 Asset Type	Level 4 Asset sub-type	Level 5 Asset Component
Rural Road Infrastructure	Upazila Road Union Road Village Road	Pavement	<ul style="list-style-type: none"> Flexible Rigid HBB WBM Uni-Block Earthen 	<ul style="list-style-type: none"> Asphalt Base Base Sub-base Improved subgrade
		Surfacing	<ul style="list-style-type: none"> 25mm Bituminous Carpeting+7mm Seal Coat 25mm Bituminous Carpeting+12mm Seal Coat 40mm Bituminous Carpeting+12mm Seal Coat 25mm Dense Bituminous Carpeting 40mm Dense Bituminous Carpeting 50mm Dense Bituminous Carpeting 60mm Dense Bituminous Carpeting 	
		Embankment	<ul style="list-style-type: none"> Earthworks 	
		Road Safety	<ul style="list-style-type: none"> Intersection Platform Median Strip Roundabout Speed Breaker Rumble Strip Level-crossing Gate Studs Traffic Signs 	<ul style="list-style-type: none"> Regulatory/Mandatory Warning/Precautionary Informative
		Side Drains	<ul style="list-style-type: none"> Masonry Brick 	

Level 1 Asset Class	Level 2 Asset sub-class	Level 3 Asset Type	Level 4 Asset sub- type	Level 5 Asset Component
			<ul style="list-style-type: none"> Reinforced Cement Concrete 'V'-Drain 'L'-Drain 	
		Roadside	Hard Shoulder	<ul style="list-style-type: none"> Blacktopped Hard Shoulder WBM HBB Uni-Block CC Block
			Verge	Earthen
			Trees	<ul style="list-style-type: none"> Timber Fruity Herbal
			Slope Protection	<ul style="list-style-type: none"> Turfing Gunny Bag Rip-rap Gabion Masonry Brick and Pre-cast RCC Post RCC Plate and Post CC Block Mattress RCC Retaining wall Bio-Engineering Slope Protection
			Road Barriers	<ul style="list-style-type: none"> Guide post New Jersey Barrier Sight Rail Guardrail Crush barrier
	Structures	Bridges	<ul style="list-style-type: none"> PC Girder Bridge Steel Structure Bailey Bridge RCC Bridge Box Girder Bridge Arch Bridge Sluice Gate 	<ul style="list-style-type: none"> Wing wall Abutment Girder Slab Railing Rail post Expansion Joint Walkway Wheel Guard Pier & Pier Cap Cross Girder Diaphragm Bearings
		Cross Drainage	<ul style="list-style-type: none"> Pipe culvert Box culvert Slab culvert U-Drain Arch Culvert Wooden Bridge Iron Bridge 	
		Waterways Terminal	<ul style="list-style-type: none"> Ghat Jetty 	

3.3 Roles and responsibilities

The table below summarises LGED's varying roles and responsibilities across their portfolio. It is envisaged that, over time, this SAMP will provide guidance on all asset classes in LGED's portfolio depending on roles and responsibilities, and asset class and type.

Table 7: Assets, Roles and Responsibilities

Asset Class	Asset Sub-Class	Technical Advice and Support	Plan	Design	Build	Maintain/rehabilitate	Operate	Dispose
Rural road infrastructure	Upazila road	√	√	√	√	√	√	√
	Union road	√	√	√	√	√	√	√
	Village road	√	√	√	√	√	√	√
	Structures	√	√	√	√	√	√	√
Trade Centre	Multi-storied markets	√	√	√	√	Maintained, operated, and disposed by the Local Government Institutions		
	Growth centres	√	√	√	√			
	Rural markets	√	√	√	√			
Buildings	Upazila Parishad Complex	√	√	√	√	√	√	√
	Union Parishad Complex	√	√	√	√	√	√	√
	LGED Functional buildings	√	√	√	√	√	√	√
	Cyclone shelters	√	√	√	√	√	√	√
Small Scale Water Resources	Sluice Gate/Regulators	√	√	√	√	√	√	√
	Rubber Dam	√	√	√	√	√	√	√
	Embankment	√	√	√	√	√	√	√
Urban Facilities	Streets	√	√	√	√	Maintained, operated, and disposed by Urban Local Government Institutions		
	Drains	√	√	√	√			
	Solid Waste	√	√	√	√			
	Bridge/culverts	√	√	√	√			
	Recreation centres	√	√	√	√			
	Water supply	√	√	√	√			
	Sewerage and Sanitation	√	√	√	√			

Future demand, risks and opportunities across the asset categories requires further investigation, analysis and synthesis and will be incorporated in future iterations of the SAMP.

3.4 Asset summary

The list of asset portfolios LGED involves in planning, designing, building and maintaining and their total replacement asset values are shown below:

Table 8: Asset Summary

Asset Class	Asset Sub-Class	Quantity	Unit	Replacement Value (million BDT)
Rural Road Infrastructure	Upazila Road			
	Flexible Pavement	30015	km	343,671.75
	Rigid Pavement	824	km	9,888.00
	Brick Pavement	1751	km	9,980.70
	Union Road			
	Flexible Pavement	23112	km	218,177.28
	Rigid Pavement	899	km	9,529.40
	Brick Pavement	3655	km	16,813.00
	Village Road-A			
	Flexible Pavement	25504	km	240,757.76
	Rigid Pavement	1307	km	13,854.20
	Brick Pavement	9135	km	42,021.00
	Village Road-B			
	Flexible Pavement	5311	km	40,098.05
	Rigid Pavement	318	km	2,696.64
	Brick Pavement	2936	km	10,980.64
	Structure: Bridges			
	Arch Masonry	2242	m	2,578.30
	Bailey Bridge	8662	m	9,961.30
	Bailey with Steel Deck	6643	m	7,639.45
	Iron Bridge	119205	m	137,085.75
	Light Traffic Bridge	123291	m	141,784.65
	PC Girder Bridge	56735	m	65,245.25
	RCC Girder Bridge	420023	m	483,026.45
	Steel Beam & RCC Slab	2637	m	3,032.55
	Truss with RCC Slab	2187	m	2,515.05
	Truss with Steel Deck	10690	m	12,293.50
	Wooden Bridge	9518	m	10,945.70
	Structure: Cross Drainages			
	Box Culvert	310140	m	217,098.00
	Slab Culvert	119826	m	71,895.60
	Pipe Culvert	56453	m	22,581.20
	U-Drain	79459	m	23,837.70
LGED Functional Buildings				

Asset Class	Asset Sub-Class	Quantity	Unit	Replacement Value (million BDT)	
Buildings	Office Building	15152.19	Sqm	802.54	
	Residential Building	11533.53	Sqm	610.87	
	Office Building cum Garage	102.96	Sqm	5.45	
	Dormitory	599.3	Sqm	25.39	
	Garage cum Dormitory	1171.18	Sqm	41.35	
	Garage	2536	Sqm	26.86	
	Laboratory Building	898.16	Sqm	47.57	
	Other Buildings				
	Upazila Complex Building	158	each	11,060.00	
	Union Parishad Complex	3232	each	19,392.00	
	Cyclone Shelter	1404	each	70,200.00	
Trade Centres	Growth Centre	2066	each	12,396.00	
	Rural Market	2214	each	7,749.00	
Small Scale Water Resources	Hydraulic Structure	10078	m	48,374.40	
	Rubber Dam	52	each	2,340.00	
	Embankment	2354	km	353.10	
Total Replacement Value (million BDT)				2,343,413.42	
Total Replacement Value (billion BDT)				2,343.41	
Total Replacement Value (billion USD)				28.23	

(Note: Due to insufficient data, neither the asset classes nor their valuation could be fully encompassed; Compiled from multiple sources in 2019; Exchange Rate: 1USD = 83 BDT)

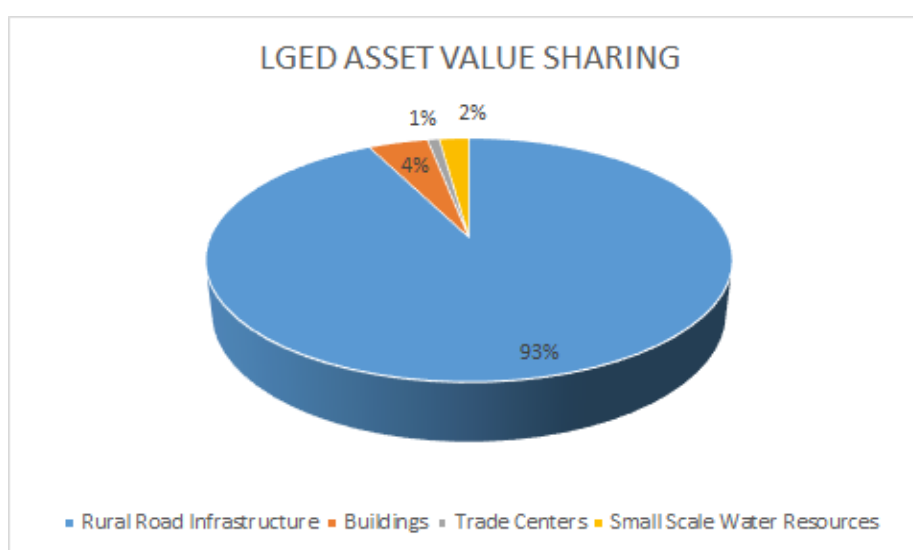


Figure 2: LGED Asset Value by Percentage and Category

4. Asset Management System

4.1 Overview

LGED's strong commitment to fulfilling its roles and responsibilities in managing local level infrastructure in a manner consistent with the Government's development priorities is evidenced by the development of an integrated, interdisciplinary Asset Management System (AMS). When implemented, a consistent and robust AMS will ensure infrastructure assets are managed in a way that contributes to the Government's vision and strategic goals.

LGED's AMS aims to guide improved and sustainable management of infrastructure assets through the systematic and coordinated activities to maximize service and resilience potential.

4.2 Asset Management System (AMS)

LGED's AMS provides a systematic approach, is consistent with the ISO55000 Asset Management suite of standards and The Institute of Asset Management's (IAM) "The Anatomy" where requirements are defined at an organisational level which direct and inform the following key components:

- Asset Management Policy;
- Strategic Asset Management Plan (SAMP) including Asset Management Objectives;
- Asset Management Plans (AMPs).

These components are set within a framework with the integrated cross-cutting themes of:

- Leadership;
- Commitment;
- Planning;
- Support;
- Delivery;
- Evaluation, and
- Continual improvement⁶.

The relationship and interdependencies are illustrated in the diagram below.

⁶ ISO 55002:2018

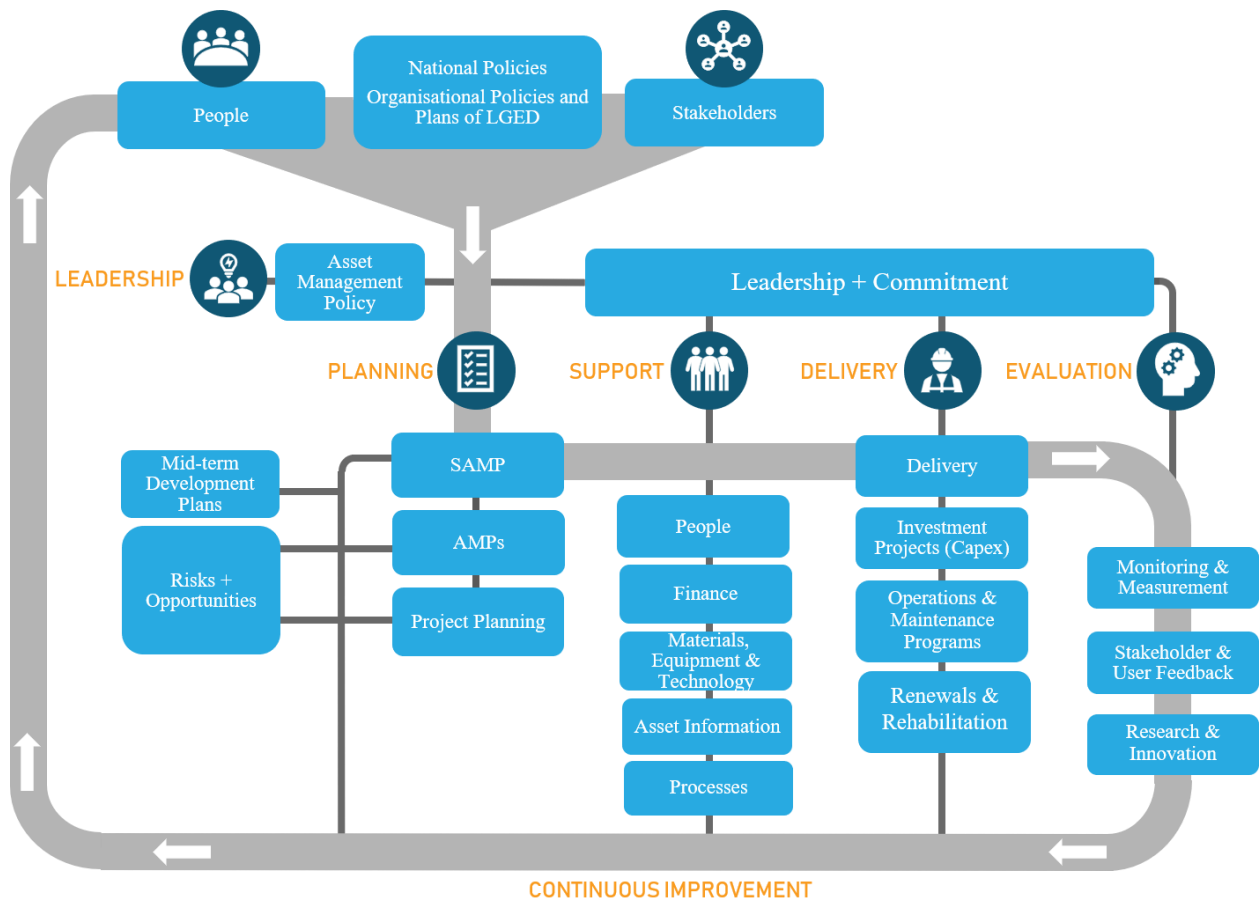


Figure 3: Relationship and Interdependencies Among Various Elements of the AMS

4.3 Asset Management Governance

The Chief Engineer is the curator of the LGED’s AMS. The initial development stage of the AMS is managed under the direction of the Asset Management Committee (AMC). This proposed governance structure ensures leadership and commitment in the critical early developmental stages.

The AMC is responsible for:

- developing and implementing LGED’s AMS, extending to the change management process(es) performance and management review(s), auditing and continual improvement of LGED’s AMS.

The AMC will contribute to the development of a ‘Stakeholder Engagement and Communication Plan’ with regard to implementation of LGED’s Asset Management System.

4.4 AMS Aims

LGED’s AMS sets the framework for undertaking asset management in a structured and coordinated way. This will be achieved by:

Table 9: Aims of LGED AMS

<ul style="list-style-type: none"> • Ensuring a consistent approach to asset management; • Continuous improvement of asset management through leadership, cross functional integration, effective communication and culture; • Ensuring that the assets are managed in a sustainable manner, with appropriate levels of service that balance the needs of users, environmental requirements, social obligations, available resources, and operational capabilities; • Maximizing value-for-money, considering the whole life cycle costs covering planning, designing, creation, operation, maintenance and decommissioning of assets. 	<ul style="list-style-type: none"> • Demonstrating transparent and responsive asset management processes that align with established best practices; • Developing and continual updating of a Strategic Asset Management Plan as the primary framework to maintain asset services for current and future generations; • Providing resources and support to enable improved asset and infrastructure data attributes and information; • Sharing of asset data for robust decision making and managing risks associated with assets to meet the needs of the people and key stakeholders, and • Promoting continuous professional development on asset management.
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5. Asset Management Objectives

5.1 Overview

LGED's Asset Management (AM) Objectives set out the long-term goals for the lifecycle management approach of physical assets and the development of LGED's Asset Management capability ensuring alignment with LGED's organisational objectives.

LGED's AM Objectives are consistent with LGED's AM Policy (2019), and set the context and direction for development and improvement of LGED's AMS and lifecycle management of local level infrastructure into the future. The objectives reflect LGED's departmental and also the Government's strategic goals.



5.2 AM Objectives



LGED's AM Objectives are defined in terms of the needs of people at a national level within the context of LGED's AMS. Displayed in the table below are LGED's AM Policy Statement, Guiding Principles, and Objectives.

LGED's Asset Management Policy Statement

LGED is committed to sustainable asset management, complying with all legislative and regulatory requirements to contribute to improved resilience and delivering services to current and future generations by managing risk, optimizing performance and managing expenditure on infrastructure assets through the whole of asset lifecycle






Table 10: LGED AM Objectives




LGED AM Guiding Principles	Ref	AM Objectives
Supporting economic and socio-economic activity 	1.1	To support economic opportunity and livelihoods by connecting rural areas and urban centres through sustainable infrastructure
	1.2	To improve liveability of rural and urban areas by providing reliable connections between communities, social institutions, essential services and supply chain
	1.3	To ensure access and availability of safe and reliable infrastructure which is inclusive of all users, including the disadvantaged and people with disabilities
	1.4	To promote strong community awareness of the role that sustainable and resilient infrastructure plays in supporting socio-economic activity and economic growth
Sustainable environmental practice 	2.1	To ensure asset planning, construction, operation and maintenance activities are delivered effectively and sustainably with respect to the environment and key resources (human, finance, information and materials)
	2.2	To ensure asset management practices support the realisation of both the national development plan and the UN Sustainable Development Goals
	2.3	To embed a strong culture and capability of sustainable practice with LGED, which is underpinned by innovation,

LGED AM Guiding Principles	Ref	AM Objectives
		knowledge capture and knowledge sharing to achieve good practice
	2.4	To prioritise projects which meet sustainable practice objectives (lowest life cycle cost)
Enhanced equal empowerment of men and women 	3.1	To integrate gender needs into planning, design and operation of assets and reducing vulnerabilities, through increased participation and engagement of females
	3.2	To promote gender equality within LGED by encouraging and supporting inclusive work environments, awareness and education of gender responsive and risk informed infrastructure planning and delivery
	3.3	To increase the participation of women in roles across the whole asset lifecycle, and close the gap between male and female participation
Resilient infrastructure and disaster response 	4.1	To build strong community awareness of what critical infrastructure is in place and the importance of resilience during disaster events
	4.2	To adopt a holistic approach to resilience planning and disaster risk management which encourages collaboration and capacity building for those responsible for critical infrastructure
	4.3	To prioritize and ensure delivery and maintenance of infrastructure which delivers increased resilience and reduces vulnerabilities to shocks and stresses
	4.4	To adopt a risk-based decision-making approach utilising accurate and relevant asset information to enable planning and response to disaster events
Climate change 	5.1	To integrate asset management practices to support the realisation of the national level policies, strategies and frameworks related to climate change
	5.2	To build strong community awareness about climate change and how this may impact infrastructure
	5.3	To integrate consideration of climate change, including climate change adaptation and mitigation measures, within all asset management practices as standard process

The table below sets out what success looks like, providing outcome statements across the AM Objectives.

Table 11: Outcome Statements Across the AM Objectives

Do	What?	Outcome Statements
Implement	<p>A structured asset management system consistent with the requirements of ISO 55000 integrating all LGED's functional units.</p> 	<ul style="list-style-type: none"> Sustainable infrastructure supports economic opportunity and livelihoods by connecting rural areas and urban centres. Liveability of rural and urban areas is improved by reliable connections between communities, social institutions, essential services and supply chain. Safe and reliable infrastructure access is available which is inclusive of all users, including the disadvantaged and people with disabilities. There is a strong community awareness of the role that sustainable and resilient infrastructure plays in supporting socio-economic activity and economic growth. Asset planning, construction, operation and maintenance activities are delivered effectively and sustainably with respect to the environment and key resources (human, finance, information and materials). Asset management practices support the realisation of both the national development goals and the UN Sustainable Development Goals. There is a strong culture and capability of sustainable practice with LGED, underpinned by innovation, knowledge capture and knowledge sharing to achieve good practice. Projects which meet sustainable practice objectives (lowest life cycle cost) are prioritized. Gender needs are integrated into the planning, design and operation of assets and reducing vulnerabilities, through increased participation and engagement of females. Gender equality is promoted within LGED, supported by inclusive work environments, awareness and education of gender responsive and risk informed infrastructure planning and delivery. The participation of women in roles across the whole asset lifecycle is increased, closing the gap between male and female participation. There is strong community awareness of what critical infrastructure is in place and the importance of resilience during disaster events. Resilience planning and disaster risk management are undertaken holistically, encouraging collaboration and capacity building for those responsible for critical infrastructure. The delivery and maintenance of infrastructure which provide critical services are prioritized to increase resilience and reduce vulnerabilities to shocks and stresses. Infrastructure related decision-making is risk-based using accurate and relevant asset information to enable the robust planning and response to disaster events.
Adopt	<p>Holistic, risk-based investment practices utilising accurate and relevant asset information.</p> 	
Understand	<p>The risk represented by and the performance requirements of local level infrastructure in order to improve delivery of investment programmes, maintenance and operational works.</p> 	
Deliver	<p>Effective asset management activities that positively contribute towards national commitments and UN Sustainable Development Goals.</p> 	
Prioritise	<p>Programmes, projects and activities which deliver increased resilience and reduce vulnerabilities to shocks and stresses.</p> 	
Integrate equality	<p>By incorporating gender needs into planning, design and operation of assets and reducing vulnerabilities through increased participation and engagement of females.</p>	

Do	What?	Outcome Statements
		<ul style="list-style-type: none"> Asset management practices support the realisation of the national level policies, strategies and frameworks related to climate change. There is strong awareness within the community about climate change and how this may impact infrastructure. Climate change is considered within all asset management lifecycle activities as standard process, including climate change adaptation and mitigation strategies.
Generate data	<p>Which is consistent, integrated, accessible and reliable across LGED and develop data management principles and governance.</p> 	
Promote	<p>Community awareness of critical infrastructure is in place and the importance of resilience with respect to climate change and disaster events.</p> 	

LGED will seek to develop and incorporate appropriate outcome-oriented Key Performance Indicators (KPIs) for the AM Objectives in future iterations of the SAMP. These strategic KPIs will support evaluation of how effectively infrastructure systems contribute to the AM Objectives and outcomes, rather than measure the performance of the asset itself.⁷

LGED acknowledges the requirements outlined in ISO 55001 (Clause 6.2.1) and the following indicative format may be considered for future development of Asset Class Summaries and AM objectives:

⁷ There is a need to understand the distinction between two complementary yet distinct levels of KPI's - both of which are used to inform asset related decision making:

- Technical KPI's: the purpose of which is to measure and provide insight into performance and are used to inform operational decision making (AMPs)
- Strategic KPI's: the purpose of which provides an overview of performance at a system or sector level and are used to support long-term evaluation of infrastructure performance against high level strategic objectives (SAMP).

Table 12: Indicative Format for Future Development of Asset Class Summaries

Asset Class	
Statement	<i>[concise objective statement]</i>
Assets	<i>[reference to Asset hierarchy levels classifications]</i>
Measure / KPIs	<i>[SAMP KPI's - strategic and aligned with vision] [what measures / KPIs will be used to measure success and monitor performance] [technical KPIs = AMP] [should not be constrained by available data]</i>
Acceptance Criteria	<i>[what does success look like? what are the KPI targets?] [what is the geographical scale?]</i>
Target Timeframe	<i>[start and end dates for implementation]</i>
Responsibilities	<i>[who is responsible to deliver]</i>
SDG goal	<i>[identify linked SDG and target]</i>
Initiatives:	<i>[in order to achieve this objective LGED will...:]</i>

LGED intends to transition from the aspirational objectives tabled above towards S.M.A.R.T objectives. This will occur over time as LGED's maturity and capability increases.

5.3 Asset class summaries

LGED aims to create Asset Class Summary tables for the SAMP, but due to data unavailability, this particular version of the SAMP cannot feature those tables. Nonetheless, LGED plans to incorporate these tables in future SAMP versions. As an illustration, a sample summary table for road infrastructure is provided solely for example purposes, with the intention of developing comparable tables for all asset classes in future.

Table 13: Indicative Format for Road Asset Class Summaries and Measurement of KPIs

Rural Road Infrastructure (Example purpose only)	
Statement	Well designed, maintained, cost effective, durable (resilient), safe and quality road network(s) and infrastructure is critical for delivering essential services, connecting rural and regional communities, facilitating trade, integrating societies, promoting socio-economic growth, and poverty reduction.
Assets	<ul style="list-style-type: none"> Upazila, Union and Village Roads; Associated structures including: bridges, cross drainage and waterways terminals.
Measure/KPIs	National (or system level) KPI's include: <ul style="list-style-type: none"> % of road networks in good and fair condition (Year A: xx%, Year B: xx%) Improvement/rehabilitation of roads (Year A: xx km, Year B: xx km)

Rural Road Infrastructure (Example purpose only)	
	<ul style="list-style-type: none"> • Construction of bridges (Year A: xxx meter, Year B: xxx meter) • Reduction in road traffic accident fatalities (Year A target xx% reduction)
Acceptance Criteria	<p><i>[what does success look like? what are LGED's KPI targets?]</i> <i>[what is the geographical scale?]</i> Include here the targets and timescales from above KPIs</p>
Target Timeframe	Year xx to Year yy
Responsibilities	<ul style="list-style-type: none"> • LGED • Service providers including third parties • other LGIs including RHD - connectivity with major corridors and highways
SDG goal	<i>[identify linked SDG and target]</i>
Initiatives:	<p>In order to achieve these objectives LGED will:</p> <ul style="list-style-type: none"> • develop a Rural Roads Asset Management Plan; • Develop a Bridges Asset Management Plan; • Review and update the Rural Roads Master Plan; • Address the implementation gaps of the Five-Year Plans by developing a backlog strategy; • Identify and address current constraints in the delivery of investment projects and programs; • Work with other LGIs to develop strategies and plans which build upon the Government's commitment to promote regional connectivity; • Review and improve design standards; • Improve availability, quality and accessibility of road data; • Prioritise projects which meet sustainable practice (lowest life cycle costs); • Adopt a holistic approach to increase resilience of rural road infrastructure; • Aim to progress integration of Transport policies and planning frameworks; • Undertake demand analysis - and in doing so identify data and information gaps and address; • Seek improved integration of land use planning which recognise the needs and requirements of road (and drainage) infrastructure; • Review construction methods and material specifications; • Continue to seek funding to match need especially maintenance; • Develop a performance management framework to manage the delivery of construction, O&M activities and service provision; • Include also about building the capability of the workforce.

5.4 Reviewing AM Objectives

With the aim of continuous improvement, it is intended that the AM Objectives will be reviewed annually at a minimum or in response to any significant LGED or Government policies and goals to ensure consistency with strategic and organisational goals.

A formal procedure will be developed and incorporated into the overall plan for the management of change.

6. AMS Development Approach

6.1 Overview

LGED is applying the approach recommended by The Institute of Asset Management (IAM) conceptual model titled “The Anatomy” to design and implement the AMS. The Anatomy depicts the asset management system enablers across six (6) areas and 39 subjects.⁸

Supporting the development and improvement of LGED’s AMS are six (6) asset management enabling subjects:

- Asset Management Strategy & Planning;
- Asset Management Decision Making;
- Lifecycle Delivery Activities;
- Asset Information;
- Organisation & People; and
- Risk & Review.

These are detailed in the following sections.

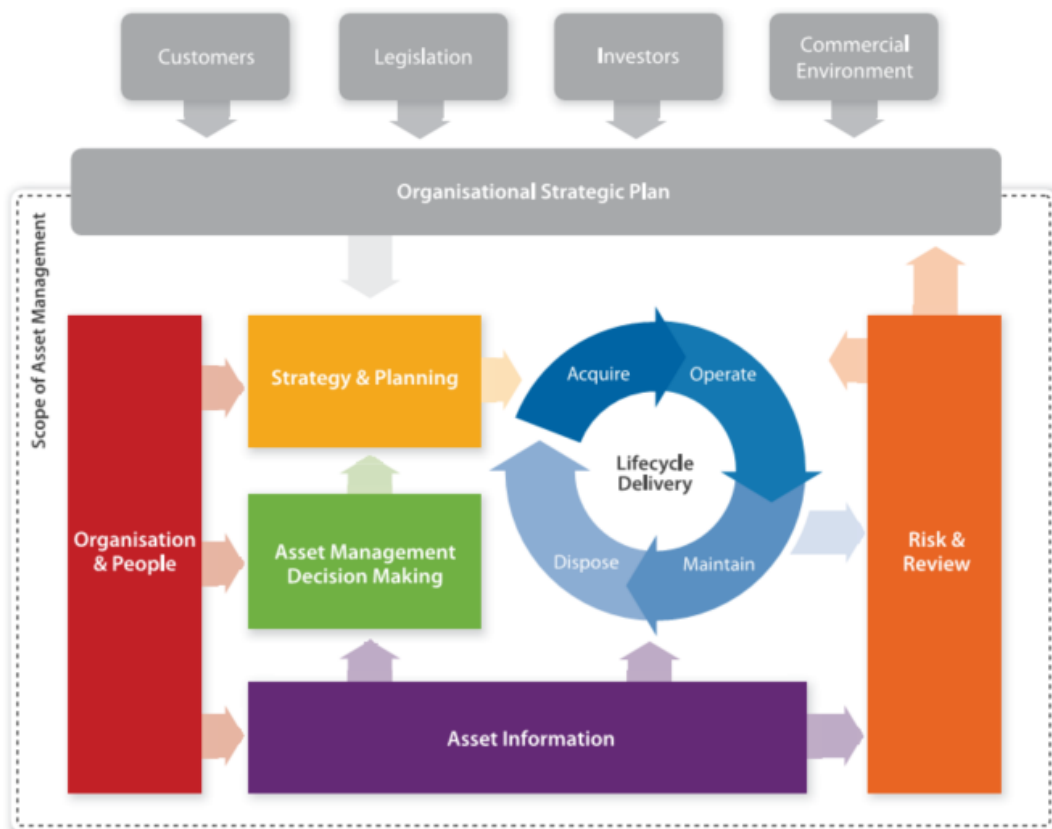


Figure 4: IAM Conceptual Model for Asset Management

⁸ ‘The Anatomy’ conceptual model is consistent with the ISO 55000 suite of standards and the Global Forum on Maintenance and Asset Management (GFAMAM) Landscape.

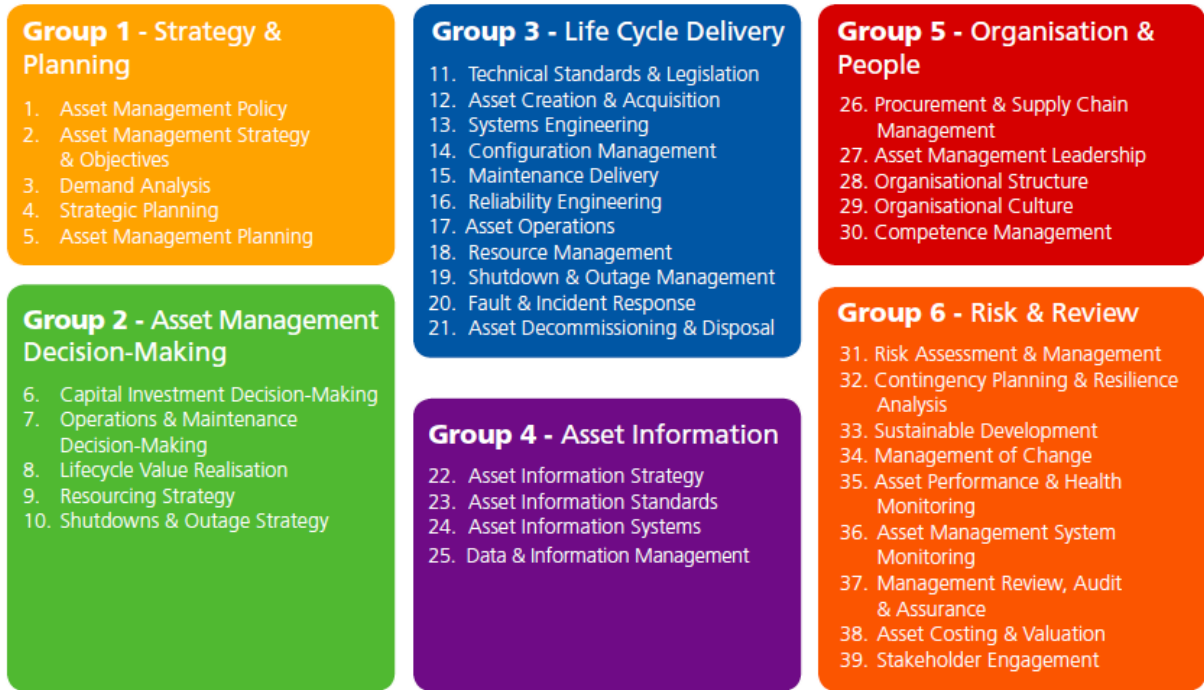


Figure 5: Six Subject Groups of the IAM Conceptual Model

6.2 AM Strategy & Planning

LGED’s strategy & planning will align asset management activities with the overall department’s business objectives and goals. This ‘line of sight’ enables clear communication and understanding of the rationale for ‘Why’ management and maintenance activities are undertaken across LGED’s asset portfolio, and ‘Why’ decisions are made.

LGED will seek to formalise strategy and planning processes which address outputs from demand analysis, asset management lifecycle activities and decisions, risks, performance and costs. Processes may include:

- Long-term renewal, enhancement, maintenance volumes and estimates;
- Identification of future funding requirements;
- Identification and quantification of associated risks, impact, likelihood and costs;
- Scenario development and modelling, incorporating non-asset intervention(s).

It is envisaged that asset management strategic planning will be embedded as business as usual within LGED’s planning functional unit and associated plans, programs and calendar.

6.2.1 Asset Management Policy

LGED's AM Policy (2019) provides the first stage of 'line of sight' between LGED's organisational mission, vision, and objectives and infrastructure asset interventions. LGED's AM Policy Statement follows:

LGED is committed to sustainable asset management, complying with all legislative and regulatory requirements, to contribute to improved resilience and delivering services to current and future generations by managing risk, optimizing performance and managing expenditure on infrastructure assets throughout the whole of asset lifecycle.⁹

6.2.2 Strategic Asset Management Plan (SAMP)

The SAMP (this document), describes:

- the long-term approach to the management of LGED's portfolio;
- specifies how business and organisational objectives are translated into AM Objectives;
- the approach for developing AMP's and the role of the AMS in supporting achievement of the AM Objectives.

6.2.3 Demand Analysis

LGED recognises that demand analysis typically includes the analysis of future demand for the service(s) level requirements, reliability and criticality of local level infrastructure assets. Several elements require consideration:

- Historic demand;
- Drivers for demand;
- Future demand and change in demand over time;
- Changes in required levels of service;
- Current and future utilisation and capability of assets;
- Impact on the future performance, reliability, condition, and capability.

It is important that non-asset solutions are considered in the early planning stages.

6.2.4 Asset Management Plan(s)

Asset Management Plans (AMPs) aim to specify the detailed activities, resources, responsibilities, timescales and risks for achieving the specified AM Objectives for a specified

⁹ LGED Asset Management Policy

asset class. Essentially, an AMP documents actions such as the planning and development processes and communicates:

- Who needs to do what: identify and assign activities to internal staff;
- What resources will be required: management and leadership commitment to ensure required resources are made available over the duration;
- What performance is required of the asset class to meet demand(s);
- What is required from other specialists (HR, Learning & Development and Finance, ICT).

Typically, an AMP would include the following:

- Review of previous activities and any recovery plans;
- Identify and define the required level of service(s) expected of the asset class including reliability, performance and expectations of stakeholders;
- Intended activities to be undertaken to achieve the AM Objectives and level of service required;
- Identify activities required to deliver activities to statutory, regulatory, industry and technical standards where applicable;
- The costs associated with delivering these activities;
- The outcomes expected from the application of these activities;
- The resources necessary to execute the AMP;
- Integration of the AMP with other LGED and government strategies and plans such as financial, health & safety, environmental, human resources;
- How the plan will be approved, monitored, reviewed and updated.

6.3 AM Decision Making

LGED is committed to meeting its achieving its organizational objectives. To do this, people and business functions within the organisation are required to make key decisions, take actions and provide reporting and evidence.

In context of LGED's AMS, the focus of effective decision making supporting positive outcomes include:

- Improved asset performance, such as, but not limited to:
 - condition,
 - reliability,
 - availability, and
 - resilience.
- Improved asset value;
- Improved evidence and reporting.

A set of appropriate decision-making supporting tools will be developed with the following aims:

- to prioritise projects or other initiatives undertaken;
- to ensure transparency and auditability;
- to support projects that will increase value, reduce risk, meet compliance or safety obligations;
- to protect and enhance LGED's reputation.

Typical Asset Management decisions would be categorised as follows:

- Investment Decision making (capital expenditure);
- Operations and Maintenance Decision making;
- Lifecycle Value realisation (lifecycle costing).

6.4 Lifecycle Delivery Activities

LGED will develop guidelines, processes and procedures, to cover the following life cycle delivery activities:

- **Plan** : identify need, new requirement;
- **Create** : select, design, construct, commission;
- **Utilise** : operate, maintain, assess, (may also include rehabilitate);
- **Dispose** : de-commission, manage residual liabilities.

6.5 Organisation & People

The success of LGED's AMS will rely on staff with the right skills, knowledge and experience making informed asset management decisions. The AMS will provide the framework within which decisions are made, but the decisions will need to be made by competent staff with the requisite expertise.

LGED's staff are the ultimate sponsors, implementers and users of the Asset Management System.

6.5.1 Leadership and Commitment

The continued commitment and leadership from LGED's Chief Engineer is the key to successfully progress development and implement the AMS to realise the greatest possible value.

6.5.2 Organisational Culture

LGED's AMS and AM Policy requires a collaborative culture to be created and embedded within LGED. Strong leadership and clear consistent communications from LGED's management team, combined with the AMC will ensure effective implementation of the AMS across LGED, resulting in a cultural shift in thinking across the department. This change requires careful handling and management.

6.5.3 Competency

LGED recognises specific asset management roles and competence is required. To address this, LGED has developed a Professional Development Strategy (PDS) that outlines the framework and approach for delivering the professional and capability building interventions aimed to build and strengthen LGED key officials and staff's capacity to effectively establish and implement the Asset Management System.

The PDS aims to provide the impetus for developing and implementing a robust capacity building and professional development along asset management to ensure that the department will have the capacity and competencies to establish and institutionalize the AMS.

The PDS aligns with the IAM Competence Framework¹⁰ and has defined seven (7) key roles and associated competencies: 1) policy development, 2) strategy development, 3) asset management planning, 4) implementing asset management plans, 5) asset management capability development, 6) risk management and performance improvement, and 7) asset knowledge management. These roles correspond to the key areas in establishing and implementing an asset management system.

6.5.4 Governance

The Chief Engineer is the curator of the LGED-AMS. Delegation of the necessary roles, responsibilities and activities (refer list below) will be at the discretion and order of the Chief Engineer.

LGED's AMS governance roles and responsibilities include:

- Ensuring a whole-of-organisation approach to the effective and efficient delivery of AM objectives;
- Ensuring the AM Policy, SAMP and objectives are compatible with LGED business objectives and reviewed accordingly with any updates;
- Ensuring adequate development and integration of all supporting systems into the AMS through systematic internal audits;
- Identifying gaps in resource requirements and competencies;

¹⁰ Institute of Asset Management (IAM) Competence Framework, based on the requirements of ISO 55000

- Provide input into regular internal communications to promote a strong asset management culture, and to effectively engage with internal and external stakeholders;
- Promote cross-functional collaboration across LGED departments (and other Local Government institutions) and systems that provide input into the AMS; and
- Advancing AM training, leadership, practice and skills development across LGED

The development and deployment of the AMS is managed under the direction of LGED's Asset Management Committee (AMC). The AMC will oversee the development of the key AMS components. It is envisaged that internal owners, managers, maintainers of assets will be identified and their responsibilities clearly articulated. This will provide a further line of sight to functional unit plans and objectives, through to objectives and key responsibilities of individuals within LGED.

6.6 Asset Information

LGED acknowledges that a holistic whole-of-life asset management approach requires a robust information management process to enable effective, informed decision making.

6.6.1 Asset Information Strategy

LGED has developed an Asset Information Strategy which defines and describes:

- The importance of asset information;
- The asset information objectives and why asset information is necessary for business decisions;
- How the AM Objectives will be achieved through effective decision making;
- The lifecycle of asset information;
- Understand asset information stakeholders and their needs, roles and responsibilities.
- Improve asset data through an accurate asset register, with condition and criticality ranking (risk of failure and consequence)
- Deployment of cost-effective methods and tools to collect data;
- LGED will, where possible, move away from paper-based data collection and reporting and move towards digital methods to improve the speed, accuracy and reliability of data. This also aligns with the sustainability goals.

6.6.2 Data and information management

LGED will seek to generate consistent, integrated, accessible and reliable asset data across the entire department. This data will support informed risk-based decision making for asset lifecycle activities.

To achieve this:

- LGED will develop its capability to reliably collect, store, analyse and manage data in a cost-effective manner to inform its asset decision making.
- Tools, procedures and software shall be updated or sourced to support asset information activities. This includes tools to enable real time monitoring, processing of edge computing devices and IoT, digital modelling technologies and analytic and dashboard reporting tools.

LGED plans to define and document asset relevant Data Management Principles and governance which will guide consistent specification, capture, access, use, analysis and storage.

6.6.3 Technology Innovation

LGED aspires to streamline current asset information management practices and systems and improve connectivity, access and user interface.

LGED will need to review existing asset data repositories, registers and develop a program of future improvement works.

6.7 Risk & Review

6.7.1 Risk

LGED will seek to understand and actively manage the risks represented by and the performance requirements of local level infrastructure assets, in order to improve delivery of investment projects, maintenance and operational works.

To achieve this LGED will:

- Develop and integrate risk assessment processes and procedures for asset management activities throughout lifecycle activities;
- Conduct risk assessments to assess the impact of hazards on the continued delivery of services to stakeholders;
- Undertake risk assessments and document in relevant AMP's ¹¹

This approach outlined above includes the consideration of different categories of risks, and the appropriate weighting of consequences, and how risks change with time.

¹¹ It is intended that the evaluation of risk will use a matrix approach combining consideration of probability and consequence, and include guidance for consistent and objective assessment. The evaluation of risk will consider all significant categories of risk, including the consequences of physical failure, operational risks, risks to the environment, failures resulting from external events (such as loss of services) and risks arising during all aspects of asset management activities throughout the lifecycle (such as risks from poor design).

6.7.2 Performance

LGED recognises that monitoring and reporting of performance and the use of this information to support and improve plans, drive continuous improvement and make business decisions is essential to good asset management practice. LGED will seek to achieve this by defining, measuring and monitoring asset performance.

To achieve this LGED will:

- Define the asset performance, levels of service and outcome requirements;
- Develop asset specific key performance indicators to track performance against targets, which may include:
 - Criticality;
 - Desired condition;
 - Residual service life;
 - Utilisation and capacity;
 - Risk classification, and
 - Availability.
- Develop life cycle cost models for critical assets, eventually covering all asset classes; and
- Strive towards achieving lowest life cycle costs to meet the required performance criteria and acceptable risk levels.

6.7.3 AMS Review

LGED aims to implement an AMS aligned with ISO 55000 series of standards to ensure a systematic, consistent approach to asset management. To achieve this LGED will:

- Develop several performance management levels which address:
 - Delivery of services to customers / communities and users; and
 - AMS (system) evaluation and improvement
 - Define success and measure realisation of benefits by short term and long term KPIs. These KPI's require development.
- Undertake regular health check(s) on the development and deployment of the AMS. A set of processes and procedures to ensure consistency in approach to its management reviews and health checks is required. In future, it may prove of value to commission a maturity assessment by an external party.

6.7.4 Management of change

LGED acknowledges and intends to develop a Change Management Plan to support the development and deployment of LGED's AMS and continual improvement process. The change management plan will identify responsibilities and actions to be taken to ensure that

risks are managed, performance managed and the continuity of essential asset management services.

6.7.5 Sustainable development

LGED are committed to perform asset management activities that align with the Government's National Sustainable Development Strategy (2010-2021), and the United Nations' Sustainable Development Goals.

To achieve this LGED will:

- Ensure asset planning, construction, operation and maintenance activities are delivered effectively and sustainably with respect to the environment and key resources (human, finance, information and materials);
- Develop assets and infrastructure which incorporates a long-term view, and develop whole of life plans and costings to improve resilience;
- Embed a strong culture and capability of sustainable practice with LGED, which is underpinned by innovation, knowledge capture and knowledge sharing to achieve good practice;
- Prioritise projects which meet sustainable practice objectives (lowest life cycle costs); and
- Aim to incorporate and mainstream sustainability requirements and criteria into all asset related decision making across the asset life cycle.

7. SAMP Improvement Plan

LGED will develop a SAMP Improvement Plan identifying areas which require further investigation, analysis and synthesis. The interdependency, precedence and priorities of the activities will be considered, including risks and mitigating actions - resources, cost, etc. This will be incorporated in the next SAMP iteration.

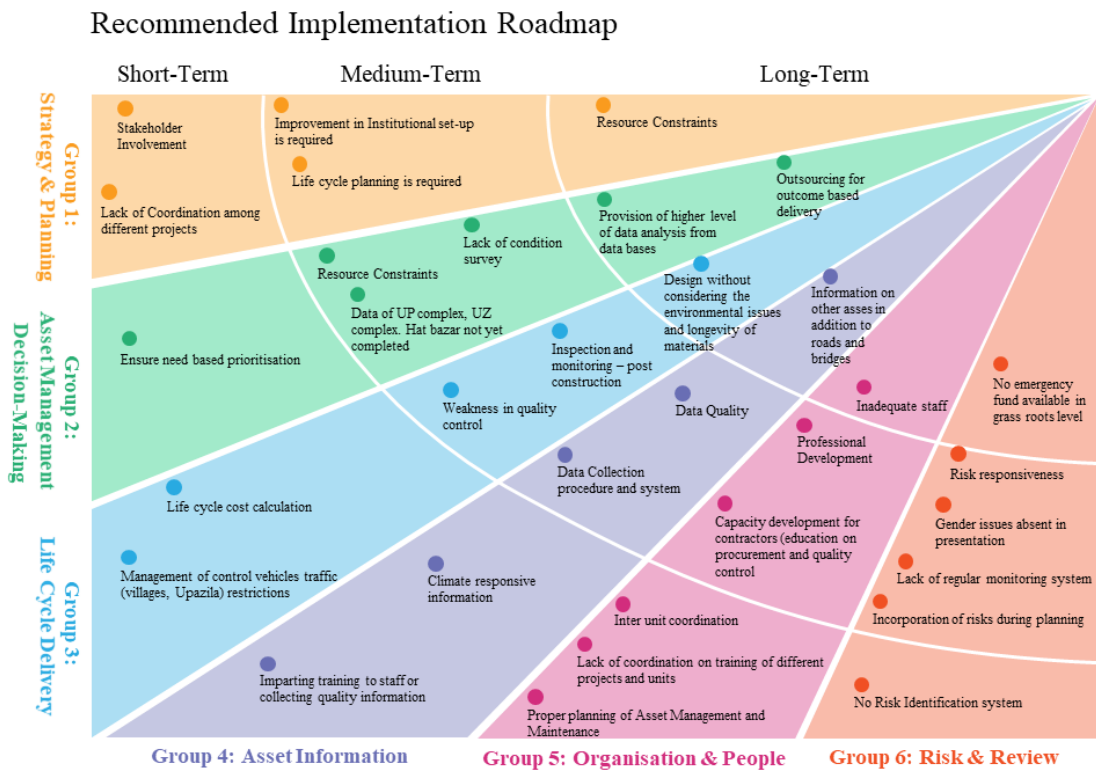


Figure 6: Recommended Implementation Roadmap for AMS Development

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