

An aerial photograph of a city, likely Santiago, Chile, showing a dense urban landscape with numerous high-rise buildings and a mix of architectural styles. In the foreground, a cable car is visible on a steep, forested hillside, moving towards the city. The sky is clear, and the overall scene is vibrant and detailed.

Managing Infrastructure Assets for Sustainable Development

A Handbook for Local and National Governments

Managing Infrastructure Assets for Sustainable Development

A Handbook for Local and National Governments

Edited by

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About UN DESA

The Department of Economic and Social Affairs of the United Nations Secretariat is a vital interface between global policies in the economic, social and environmental spheres and national action. The Department works in three main interlinked areas: (i) it compiles, generates and analyses a wide range of economic, social and environmental data and information on which States Members of the United Nations draw to review common problems and to take stock of policy options; (ii) it facilitates the negotiations of Member States in many intergovernmental bodies on joint courses of action to address ongoing or emerging global challenges; and (iii) it advises interested Governments on the ways and means of translating policy frameworks developed in United Nations conferences and summits into programmes at the country level and, through technical assistance, helps build national capacities.

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Foreword

Welcome to *Managing Infrastructure Assets for Sustainable Development: A Handbook for Local and National Governments*.

With this publication, we aim to provide practical guidance to local and national governments on how to manage the assets on which people rely every day—the roads they use to get to work, the buildings where they live or attend school, the parks where their children play and the water and sanitation facilities they use to stay healthy.

Effective asset management has become as critical as ever across the globe and in the face of mounting pressures, such as limited resources, growing urban populations, shifting patterns of employment and land use, climate-related disruptions and health emergencies, including the COVID-19 pandemic. All of these challenges are felt most acutely in our daily lives as we interact with our built environment and our physical and technical goods and infrastructure. These are our local assets, our common goods. As people turn to government for reliable infrastructure, services and protection, their first point of contact is the village, city or district administration.

While most government assets are managed at the local level, national governments often manage critical assets as well, such as long-distance highways, electrical grids and airports. They are also in charge of creating a policy and administrative environment that enables systemic, sustainable asset management at the national and local levels. Done well, local and national asset management efforts not only improve essential service delivery, they also yield positive signals to citizens and public, private, domestic or foreign investors, helping governments to mobilize the resources needed for sustainable development and demonstrating to citizens that their representatives are safe custodians of the public common property.

The better governments become at managing their assets and anticipating what they will need, the more resilient they will be. This handbook shows how to improve the reliability and longevity of assets, and how to plan ahead with improved coordination among government and community stakeholders.

The handbook draws on the experiences and insights of numerous experts and practitioners from around the world. Authorities in the field within the UN system, multilateral and regional development banks, local government associations, universities and think tanks reviewed and made invaluable contributions to the Handbook.

In addition, the content draws on the diverse experiences of local governments in the implementation of UN asset management toolkits. The United Nations Department of Economic and Social Affairs and the United Nations Capital Development Fund, through its Local Development Finance team with 25 years' experience supporting local government financial management, collaborated with authorities in more than 40 districts, provinces and municipalities in

Bangladesh, Nepal, Tanzania and Uganda to develop, test and refine the simple and practical tools in these pages.

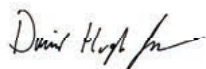
It is our hope that these tools will help make governments more effective in organizing, deploying and maintaining existing assets and planning for and implementing new capital investments, including in times of crises.

At the heart of the collaborative effort that resulted in this publication is the shared commitment, expressed by the world's governments in Goal 11 of the 2030 Agenda for Sustainable Development, to "make cities and human settlements inclusive, safe, resilient and sustainable". The commitment in the Addis Ababa Action Agenda to build capacity at local levels for financing the Sustainable Development Goals likewise inspires our work.

Effective infrastructure asset management is an often overlooked yet high impact area for capacity development at the local level. We hope this practical handbook and its wide dissemination and use by local and national authorities will begin a new era of resilient infrastructure asset management for a sustainable future, in which no one is left behind.



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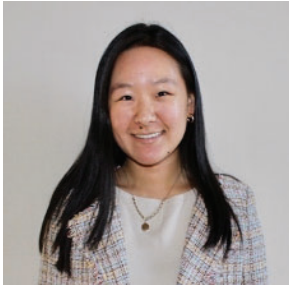
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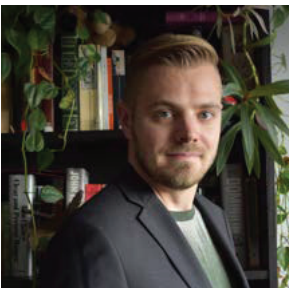


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Francis Byabagambi, Dustin Carey, Mitchell Cook, Catherine Dallaire, Mohan Prasad Dhakal, Vladimir Grozdev, Bidhan Krishna Das, Siasa Mzenzi, Linda Newton, and Bishnu Puri served as lead authors of the chapters. Each author is highlighted on the *About the editors and authors* page. Thanks to each and every one of you for your commitment to pushing forward the work on infrastructure asset management!

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Executive summary

Public infrastructure assets are the foundation of national and local economies. They provide essential services to our citizens yet they are often mismanaged. This Handbook provides local and national governments with a set of practical tools to improve infrastructure asset management. This includes guidance on how to adapt these tools to the socioeconomic and environmental challenges of our time.

The first four chapters present the basic framework for asset management and field-tested tools for assessing needs and taking action. The remaining four chapters build on this foundation and show how governments can expand on these tools to develop information systems, respond to crisis situations and establish an enabling environment for comprehensive and sustainable asset management at the local and national levels.

Chapter 1 introduces the reader to the fundamental principles of infrastructure asset management and demonstrates its key role in more reliable, equitable and inclusive delivery of essential public services, for present and future generations. Effective asset management enables governments to increase their financial viability, creditworthiness and public trust and confidence by anticipating future costs, demonstrating financial responsibility over costly assets and enhancing the accountability and transparency of government.

This first chapter presents the case for life cycle asset management. Often, governments place too much emphasis on the construction or acquisition of assets at the expense of planning, use and maintenance. This jeopardizes the sustainability of a project and risks undermining the impact of the initial investment, to the detriment of those it was meant to serve. The disposal of assets can also incur significant costs. When assets are not disposed of in a timely and efficient manner, they can deteriorate rapidly and drain local resources.

Key takeaways

- Asset management allows governments to maximize both the financial and the service value of physical assets, to the benefit of communities.
- A critical first step in the asset management journey is for governments to take stock of the assets they own and/or manage. Answering the ‘six whats’ will guide governments toward sound decisions that prioritize critical assets within a broader asset portfolio.
- Assets have to be managed adequately over their entire life cycles to ensure that initial investments in new infrastructure are sustained for present and future generations. Each phase of an asset's life cycle (planning, acquisition, use and disposal) requires policies and actions that draw on a unique set of human, material and financial resources.

Chapter 2 shows the reader how to develop a simple framework for asset management. This comprises the national and local plans, policies and strategy that articulate what is to be done and why. To meet their objectives, governments should address demand, life cycle and financial considerations—the three pillars of asset management. Guidance on risk management, as part of the life cycle discussion, helps the reader evaluate the likelihood and consequence of risk and, on that basis, make plans for the most critical assets.

Governments should strive for the right combination of people, resources and technology needed to deliver services effectively at minimum long-term cost. There must be clear and effective linkages throughout the asset management system, e.g. regular reporting between senior staff and government and compatibility across IT frameworks. In addition, the asset management office or team,

led by an ‘asset management champion’, must have political support and be visible to other parts of the local government and to external stakeholders.

Key takeaways

- Asset management must be embedded in a framework based on clear principles and objectives that reflect community needs and national development priorities. Each pillar of the asset management framework (demand, life cycle and financial management) deserves equal attention by governments seeking to design and implement policies and strategies that will make infrastructure investments go further.
- Asset management must follow a portfolio approach that maximizes the benefit and value of an entire collection of assets. Growing interdependency among infrastructure systems deepens the need for governments to weigh long-term trade-offs and risks when making decisions.
- Designating an ‘asset management champion’ is necessary to lead improvement efforts, increase visibility and ensure there is political commitment to sustain asset management. Good asset management involves a change in the organizational culture over time.

Chapter 3 introduces the UN/DESA-UNCDF Asset Management Diagnostic Tool. Readers are guided through the application of the tool, which helps them recognize the importance and value of taking incremental steps to improve asset management.

The tool consists of three parts. Part 1 is an organizational self-assessment of goals, assets and challenges. Part 2 is an on-site assessment, during which an assessment team visits and interviews operations staff and other key stakeholders using a specially designed questionnaire. In Part 3, interviewees’ responses are evaluated to determine strengths, weaknesses and areas of interest for asset management coaching and education. At the end, the

assessment team provides the organization with an ‘Asset Management Profile’ indicating recommended interventions and next steps as the basis for more action-oriented strategies and plans.

Since its initial pilot in 2017, the tool has been refined several times to ensure it is effective in raising awareness and assisting governments in improving their asset management. It is available as an Excel® spreadsheet or as a web-based tool (at <https://www.un.org/development/desa/financing/capacity-development/topics/infrastructure-asset-management>).

Key takeaways

- A successful start to asset management requires a comprehensive assessment of current needs and challenges. The UN/DESA-UNCDF Asset Management Diagnostic Tool offers a simple way to do this.
- The three-part assessment takes into consideration the many factors and stakeholders involved in asset management. An evaluation against set criteria (defining ‘Basic’, ‘Elementary’, ‘Progressing’ and ‘Advanced’ levels) results in a summary of recommended areas for policy intervention.
- The main aim of the Diagnostic Tool is to measure and raise governments’ awareness of asset management techniques. It is only the first step towards better asset management and should be followed by a concrete plan of action.

Chapter 4 covers how to design an Asset Management Action Plan (AMAP)—a tool to compare current and target scores on asset management knowledge, practice and documentation, as well as to identify gaps and actions to close them. An AMAP is specially designed to help a local government or agency identify how and where to invest funds to improve a priority asset in an optimal manner. While the Diagnostic Tool measures asset management awareness within government,

the AMAP process goes a step further by calling to action the human, financial and material resources needed to make substantive change in asset management practices. In designing an AMAP, teams assign focal points and set deadlines to keep everyone on track and accountable.

Key takeaways

- Governments can use the UN/DESA-UNCDF Asset Management Action Plan (AMAP) to lay out a clear and comprehensive map of actions and measures to improve the performance of priority assets.
- Creating an AMAP entails a series of steps, including stakeholder analysis, performance projections, gap assessment and corrective actions, to ensure follow-through and sustainability of improvement efforts.
- Having AMAPs in place for priority assets is an indication of a transparent and financially responsible government and can help attract additional public and private investment in sustainable development.

Chapter 5 argues that capturing and utilizing the right data and information is the foundation of effective asset management. It guides readers through the development of an asset register database, which starts with assembling a team of personnel with the technical know-how and means to collect data. Even once a database is established, the asset management team needs to keep it relevant, up to date and easy to use. A periodic evaluation of the database can ensure that the information provided continues to meet the needs of technical personnel, government officials, decision-makers and the asset management team.

Building on lessons from previous chapters, Chapter 5 emphasizes the link between adequate data collection and the strong performance of critical assets. A well-structured database with key information about, for instance, asset condition and valuation is vital to making informed decisions that will impact

delivery of basic services. These decisions will also shape government's ability to attract and manage new infrastructure investments.

Key takeaways

- A systematic, methodical approach to data collection will result in a more effective and robust asset management information system that delivers reliable information necessary for sound decision-making and, ultimately, for improved service performance.
- Having adequate data on the location, condition, performance and finances of assets allows governments to anticipate the resources that need to be set aside for repair, renewal and replacement over the long term, particularly for critical assets.
- Ensuring the accuracy, quality and quantity of asset information is a collective effort. However, the costs of collecting, validating and maintaining data should not exceed the value of information.

Chapter 6 makes the case for climate-resilient asset management. Climate change causes not only environmental degradation but also potential loss of life, destruction of infrastructure and disruption to key services. Asset management must factor in climate concerns if it is to support sustainable and equitable development in the face of these disruptions.

The chapter provides a blueprint for making climate resilience — decreased vulnerability of services and its underlying assets to climate impacts — part of routine government operations through asset management practices. The climate risk assessment process guides readers on how to assess the local impact of a changing climate. They can customize climate adaptation and mitigation strategies based on the exposure and adaptive capacity of the community to specific climate hazards. These levels of vulnerability, along with overall tolerance and appetite for risk, are deciding factors

in local resource allocation, as not all potential climate risks can be addressed.

Moreover, national and local governments already own some of the most cost-effective resources available in the form of natural infrastructure, such as lakes and wetlands.

Key takeaways

- Climate change threatens local services and the assets they rely on, jeopardizing the quality of life of residents. Local governments are closest to the lives of residents, so they play an essential role in adapting to climate change.
- Climate risk assessments provide information needed to make climate resilience a part of government operations through asset management practices. Publicly available climate information is often sufficient to conduct a high-level climate risk assessment.
- The economic value of climate resilience is enormous. By reducing service and asset vulnerability to climate impacts, local and national governments can reduce the costs of disaster events, while acquiring greater value from infrastructure investments.

Chapter 7 addresses how to strengthen asset management to enhance preparedness, response and recovery efforts in the face of major public health events and emergencies. As governments reckon with the broader societal and economic effects of COVID-19, well-managed assets have emerged as the first line of defense against public health threats.

Local governments can take concrete steps to institutionalize health emergency preparedness across the asset management system. The Emergency Response Asset Management Action Plan (ER-AMAP) guides governments on how to improve existing AMAPs in times of health crises by incorporating actions to support and improve emergency operations plans, coordination, safety and response time. As they are at the forefront of health emergency response,

local governments must ensure that their assets, from hospitals to temporary shelters, are equipped to perform—and also adapt—before, during and after emergencies. Government assets often suffer from public health disasters, but they are also necessary components of economic and social recovery programmes.

Key takeaways

- Aligning emergency operations plans and procedures with asset management strategies strengthens institutional preparedness for disasters, shocks and emergencies, but it is not enough; key stakeholders need to build operational readiness to act accordingly in times of uncertainty.
- Proactive asset management provides a first line of defense. When faced with situations of unanticipated scale and immeasurable impact, governments can use Emergency Response Asset Management Action Plans (ER-AMAPs) to mobilize key assets and resources for quicker, more effective response and containment.
- A strong and inclusive recovery requires revisiting the local asset management framework and identifying the measures and interventions that will maximize public infrastructure investments and community wellbeing for generations to come.

Chapter 8 outlines a role for central government to enable asset management by way of legislation, regulation, policies and programmes stemming from the national level. While national governments themselves manage a number of important assets, they also make policy, set safety and performance standards, and draw up budgets that govern or influence asset management at all levels of government. Central governments can also support effective local asset management through capacity development, data and technical support and advisory services. A key objective of such activities is to encourage long-term planning and implementation that extends beyond the next local-level elections.

In fostering an enabling environment for asset management across the local government sector, national governments might also scale expectations for asset management according to the unique size and financial position of local governments. A key step in developing the enabling environment is to understand long-standing pain points in managing infrastructure and propose solutions to help local governments address them. Through ongoing, multi-stakeholder dialogue and collaboration, the national government can create and sustain an environment that engages communities to advance their asset management systems and serve the needs of their population.

Key takeaways

- An enabling national legislative and policy environment can unlock the benefits that
- flow from good stewardship of public assets. Such an environment consists of legislation, policies and programmes that not only reflect but reinforce the commitment of senior local and national stakeholders to asset management.
- National policymakers should keep in mind the assorted priorities, objectives and compositions across a local government sector to ensure that country-wide asset management policies and interventions align with the actual needs of local governments, who stand at the forefront of service delivery.
 - Convening a multi-stakeholder technical advisory committee can guide and sustain the efforts of national and local officials to establish a supportive environment for asset management.

Introduction

The global context

Governments around the world are exploring innovative financing mechanisms to fill infrastructure financing gaps in support of the Sustainable Development Goals (SDGs). Often such efforts do not budget for the financial, human and material resources needed to manage infrastructure assets over their entire lifespans. As a result of a strong focus on the ‘new and shiny’, old assets are often neglected, while new ones are built without putting in place an asset management framework that supports reliable, inclusive and sustainable essential services.

Making this mistake can be extremely costly. Underinvestment in infrastructure maintenance has been estimated to cost some developing countries up to 2 per cent growth in GDP. Under-maintained infrastructure assets are more likely to fail, disrupting essential services like transport, water and sanitation or solid waste management. Such vulnerabilities become particularly evident—and the consequences even worse—in times of crises that put additional strain on these assets, such as extreme weather events or health emergencies like the COVID-19 pandemic. As a result, national and local governments are having to mobilize significant resources to respond to the economic and social impacts of such asset failures, all of which could have been prevented with farsighted and effective asset management practices.

Effective infrastructure investment strategies look beyond the initial acts of acquisition or construction. Contrary to common belief, the actual construction or acquisition cost of an infrastructure asset only accounts for 15-30 percent of overall expenditures. By contrast, 70-85 percent of the costs of an asset is incurred after it is bought or built. Consequently, accounting for the financial, human and

material resources needed throughout an asset’s life cycle will reduce vulnerabilities and strengthen the sustainability of public investment. Good asset management also supports debt sustainability by lowering long-term public expenditures tied to asset failures, increasing revenue potential and fostering creditworthiness.

In 2017, the UN Department of Economic and Social Affairs (UN DESA) and UN Capital Development Fund (UNCDF) designed and began to support implementation of a comprehensive asset management toolkit for local governments in developing countries. In the years since then, UN DESA and UNCDF have worked with ministry officials and local government leaders in four pilot countries—Bangladesh, Nepal, Tanzania and Uganda—to apply and fine-tune the toolkit under real-world conditions. This handbook is a result of that collaboration, which also involved and benefited from contributions made by other parts of the UN system, regional development banks, local governments associations, think tanks and academia.

The purpose of this handbook

This handbook is intended to guide local and national government officials in managing infrastructure assets for sustainable development. It further discusses the related needs for enabling policies and information systems. It offers detailed instruction for those seeking practical guidance at the operational and planning levels, as well as a broader discussion of overarching themes and notable lessons for a wider audience of decision makers and stakeholders.

The guidance and illustrative examples provided on the following pages are drawn from the

experiences of individuals and government organizations at the forefront of managing assets and delivering essential public services—including in the face of climate and public health crises.

We define infrastructure assets as all physical assets that are essential to the delivery of basic public services. Such assets include traditional infrastructure facilities, like roads and water and sanitation systems, as well as the land that roads are built on, the buildings that house essential services and the equipment and information technology systems needed to operate and maintain them.

Asset management, then, is a coordinated series of activities that monitor and maintain things of value. Effective asset management demands increased attention, commitment and resources. Yet, even by adopting some

relatively simple changes in their current understanding, policy and practice, governments can achieve early victories that will help ensure the sustainability and value of public investments.

Ultimately, asset management is a way to align strategic planning with infrastructure and service delivery in the real world. What assets do people need? How can these assets be made to last the longest and perform the best? How can their potential to save or generate revenue be maximized so as to unlock financial resources for other community needs, now and in the future? In the answers to these questions lies the key to ensuring the reliability of public infrastructure and services at all levels. This handbook aims to equip readers to find the answers in their specific national and local contexts.

Part 1 Reader's tools



Abbreviations

ADB	Asian Development Bank
AM	Asset Management
AMAP	Asset Management Action Plan
AME	Asociación de Municipalidades Ecuatorianas
AMF	Asset Management Framework
BCR	Benefit-Cost Ratio (also known as the Benefit-to-Cost Ratio)
CAD	Computer-aided Design (Software)
CAO	Chief Administrative Officer
CH4	Methane
CoP	Community of Practice
COVID-19	Coronavirus Disease 2019
CRC	Current Replacement Costs
DB	Diminishing balance method
DDB	Double-declining balance method
DRC	Depreciated Replacement Costs
EERP	Ebola Emergency Response Project
EOP	Emergency Operations Plan
ER-AMAP	Emergency Response Asset Management Action Plan
ESL	Expected/ Estimated Service Life
FCM	Federation of Canadian Municipalities
FMDV	Global Fund for Cities Development
GBA-SUDP	Republic of The Gambia's Greater Banjul Area: Sustainable Urban Development Programme 2020-2040
GDP	Gross Domestic Product
GHGs	Greenhouse Gases
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation)
GPS	Global Positioning System
IAM	Institute of Asset Management
IDB	Inter-American Development Bank
IIMM	International Infrastructure Management Manual

IPWEA	Institute of Public Works Engineering Australia
ISO	International Organization for Standardization
IT	Information Technology
KCCA	Kampala Capital City Authority
LCA	Life Cycle Analysis
LOS	Level of Service
NAMS	New Zealand Asset Management Support
NDCs	Nationally Determined Contributions
NGO	Non-governmental Organisation
NPV	Net Present Value
N₂O	Nitrous Oxide
OECD	Organisation for Economic Co-operation and Development
O&M	Operations and Maintenance
PIFUD	Programme on Integrated Local Finances for Sustainable Urban Development
PPP	Public-Private Partnerships
PR	Public Relations
PRC	People's Republic of China
RCP	Representative Concentration Pathway
REACH	Rapidly Expanding Access to Care for HIV
SAMP	Strategic Asset Management Plan
SDGs	Sustainable Development Goals
SIDA	Swedish International Development Cooperation Agency
SL	Straight-line method
SMART	Specific, Measurable, Achievable, Relevant and Timely (to describe goals)
SYD	Sum of years' digits method
TFE	Brussels Task Force Equipements
UCLG	United Cities and Local Governments
UN	United Nations
UNCDF	United Nations Capital Development Fund
UN DESA	United Nations Department of Economic and Social Affairs
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Programme
UN-Habitat	United Nations Human Settlements Programme

UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
WASH	Water Sanitation and Hygiene
WBS	Work Breakdown Structure
WHO	World Health Organization

Glossary

Activation Triggers: Conditions under which predetermined plans, procedures or response packages would be automatically implemented.

Acute Public Health Events: Any event that may have negative consequences for human health. The term includes events that have not yet led to disease in humans but have the potential to cause human disease through exposure to infected or contaminated food, water, animals, manufactured products or environments.

Adaptation: Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change.

Adaptive Capacity: The measure of a system's existing resilience to shocks or changes. It assesses how capable an asset, system or service is to accommodate stresses before adaptive interventions are required to maintain the service level you currently provide.

Asset: Something tangible or intangible that is of value to a person or organization. In the context of this handbook the term "asset" refers to a "tangible" i.e. "physical" asset, unless stated otherwise.

Asset Management: The coordinated series of activities that monitor and maintain things of value - in our case, physical assets. This involves balancing risk, cost, opportunities and performance to fully and effectively realize the value of an asset over its entire lifespan. [in short: The right assets, in the right place, at the right time, managed by the right people.]

Asset Management Action Plan (AMAP): A tool to help compare an organization's present management knowledge, practice and documentation for a priority asset against good asset management practices, and to identify gaps and ways to close them.

Asset Management Champion (or focal point): A senior-level individual tasked to promote asset management internally and to help coordinate interactions with external stakeholders.

Asset Management Framework (AMF): An essential route map that guides asset management activities and links these to the objectives of national and local governments. The AMF comprises asset management policies and strategy, plans and direction to meet the objectives and the three pillars of asset management (demand, life cycle and financial management).

Asset Management Information System: The asset management information system – or asset information in general – provides relevant information to all asset management stakeholders and facilitates better coordination between them.

Asset Management Information Team: The team charged with providing the necessary resources for capturing, verifying and effectively interpreting relevant data for asset management. It comprises of local government officials and, potentially, outside experts and stakeholders, each with a clear list of duties and responsibilities.

Asset Management Plan: Activities necessary to manage all assets. The plan is often broken down by service area (i.e. water provision, roads) or asset category (i.e. land, equipment).

Asset Management Policy: Objectives and principles that will guide asset management in an organization.

Asset Management Strategy: A high-level, comprehensive action plan that guides how assets across the organization will be managed over time to ensure meeting the organization's objectives.

Asset Operations: The day-to-day activities associated with planning, acquiring, using and disposing of an asset. They also comprise the people and equipment necessary to ensure that assets deliver the services that have been promised to the community at the expected performance levels.

Asset Portfolio: A related group of assets that contributes to the financial and physical wealth of an organization.

Asset Register Database: A database that generates timely, relevant and accurate information on all the assets you own and manage, including their structure and condition.

Asset Register Hierarchy: A clear, holistic and logical breakdown of assets that shows which assets are employed for what category.

Asset Renewal Funding Ratio: A ratio that indicates whether the asset owner has the financial capacity to fund projected asset renewals or replacements as required in the future.

Benefit-Cost Analysis: Decision-making tool that ranks options for asset management-related actions over a predetermined analysis period by comparing (1) associated net present values (NPV) of all life cycle costs and benefits of each action or (2) benefit-cost ratios of each action.

Benefit-Cost Ratio (BCR): The ratio of the present value of all net benefits to the present value of all net life cycle costs.

Capital Investment: Investment needed to address community growth or changes, or to renew existing assets to maintain their service levels.

Capital Planning: The act of planning for the long-term costs associated with managing major assets. Such planning must allow for unknowns and the possible effects of natural hazard and climate change impacts on assets and the services they support.

Climate Change: Changes in the global climate which result from increasing average global temperature over multiple decades.

Climate Impact Statements: Step 2 of the climate risk assessment process. Climate Impact Statements articulate how each hazard will translate into an impact on your community.

Climate Projections: Climate projections are assessments of the likelihood of future climate conditions, based on how high atmospheric greenhouse gas concentrations become.

Communities of Practice: Network of professionals with different backgrounds and skills that share lessons learned and jointly develop solutions for specific problems.

Coronavirus Disease 2019 (COVID-19): The infectious disease caused by the most recently discovered coronavirus.

Corrective Maintenance: Repairs to defects or failure of minor components.

Critical Asset: Assets with a high service value and/or high financial value.

Data: Facts, presented in a raw format, unorganized and unprocessed.

Data Integrity: A set of attributes and characteristics that ensures overall data has not been altered or destroyed and is complete and sound for the purposes required of it.

Deferred Maintenance: Maintenance that should have been performed but was not undertaken as planned. It is a liability as it means that an asset will not achieve its design service life.

Demand: (of an asset) A measure of how much customers use the services provided by the assets, i.e. clean water supply or sewage disposal over time. The ability to consistently predict demand helps governments plan and meet that demand. It also helps manage the impact and consequence (risk) of not meeting it.

Demand Management: A pillar of the asset management framework where governments address the current and future demand of assets and their services in order to plan how to meet that demand, and the impact and consequence (risk) of not meeting it.

Design Service Life: The service life of an asset determined during the operational planning phase.

Disaster Risk Reduction: Disaster risk reduction is a systematic approach to identifying, assessing and responding to vulnerabilities and risks in order to prevent or mitigate the effects of disaster events.

Emergency Operations Plans (EOPs): EOPs are formalized plans that identify and coordinate standard precautions and measures to be taken, the resources required and who is responsible for what actions in the event of an emergency in an effort to reduce room for failure, anticipate potential scenarios and minimize the degree of impact.

Emergency Response Asset Management Action Plan (ER-AMAP): A modified AMAP that helps emergency responders and key decision-makers achieve high performances of assets in support of an emergency response when information is incomplete and levels of uncertainty are high.

Expected Service Life: The maximum period during which an asset will serve its intended use. It is influenced by how much an asset is used and maintained.

Exposure: Exposure refers to the degree to which a given system may be directly or indirectly affected by changes to climatic conditions (i.e. average summer temperature) or a specific climate change impact (i.e. a heatwave).

Financial Management: A pillar of the asset management framework that involves financial analysis of and reporting on asset-related revenues and expenditures and leads to the organization's funding or financial plan.

Financial Value: (of an asset) The cost of acquiring an asset. This value fluctuates over the asset's life cycle as it undergoes depreciation and impact from other decisions throughout its use phase.

Gap Analysis: The assessment of current asset management practices, tools and technologies against a government's or an organization's stated goals and objectives to identify gaps and areas for improvement.

Geographic Information System (GIS): System designed to manipulate, visualize, capture, analyze

and store geographical data of assets.

Hazard Identification: Step 1 of the climate risk assessment process. Hazard identification uses climate projections and consideration of past disaster impacts to identify the specific climate hazards that are likely to affect your community.

Human Immunodeficiency Virus (HIV): A virus that attacks the body's immune system, specifically the white blood cells called CD4 cells. HIV destroys these CD4 cells, weakening a person's immunity against infections such as tuberculosis and some cancers.

Infectious Disease Preparedness: The set of actions taken in advance of an outbreak or epidemic to ensure adequate control measures that prevent the worst impacts, facilitate fast and effective relief, and create a path of recovery from immediate public health, economic and social consequences.

Information: Processed and structured facts, needed to make informed decisions. It is the result of interpretation, organization and contextualization of data.

Information Roll-down: Navigating from macro-level data to data on a system's subcomponents.

Information Roll-up: Navigating from data on the system's subcomponents to macro-level data.

Infrastructure Interdependencies: The dependence of infrastructure assets on each other. Interdependencies can be categorized into four primary types: physical interdependencies, cyber interdependencies, geographic interdependencies and cascading interdependencies.

Level of Service (LOS): The scale of service provided by an asset or group of assets to meet an organization's goals.

Life Cycle: The series of stages in the management of an asset, including planning, acquisition, use and operation and its eventual disposal. The life cycle cost of an asset is the total of all costs incurred throughout the four phases.

Life Cycle Analysis (LCA): The assessment of the total costs and benefits derived from an asset over its lifetime.

Life Cycle Cost: Total cost of all the activities undertaken throughout the service life of an asset.

Life Cycle Management: A pillar of the asset management framework involving the set of specific activities implemented to manage an asset during all four phases of its life cycle.

Lines of Dependencies: A hierarchical structure that effectively establishes dependencies within and between asset systems. Typically, assets are represented as nodes and their linkages as lines.

Low-Carbon Resilience: Set of strategies to reduce both GHG emissions and vulnerabilities to climate change impacts.

Multi-Criteria Analysis Method: A practice that involves using several criteria to decide which option or project to prioritize.

Nationally Determined Contributions (NDCs): A country's commitments to reducing carbon emissions in line with the Paris Agreement on climate action. NDCs may include or supplement strategic policies and plans for achieving emissions reduction targets.

Natural Infrastructure: Existing, restored, enhanced or simulated combinations of land, water and vegetation.

Natural Wealth: The organic environment from which comes the goods and services that sustain life.

Net Present Value (NPV): $NPV = (\text{Present Value of net benefits}) - (\text{Present Value of net life cycle costs})$

Operations and Maintenance (O&M): All actions necessary for retaining an asset as near as practicable to its original condition but excluding rehabilitation or renewal.

Personal Protective Equipment: Personal protective equipment is a type of infection prevention and control measure consisting of garments to protect health care workers and any other persons from getting infected. The standard garments include gloves, a mask, protective eye gear and a gown.

Portfolio Management Approach: Managing assets to maximize service value for the entire portfolio of assets rather than individual or single groups of assets.

Priority Assets: The critical assets that are most important to delivering the local government's objectives. These assets need close attention, as neglecting them carries a significant risk to the organization, government and community.

Public Health Emergency Asset Portfolio: A related group of assets that contribute to early identification, early warning, emergency response and containment surrounding a public health emergency.

Public Health Emergency of International Concern: An extraordinary event which is determined, as provided in the updated International Health Regulations of 2005: (i) to constitute a public health risk to other States through the international spread of disease and (ii) to potentially require a coordinated international response.

Reactive Maintenance: Responding to an issue once it has already failed or has fallen into a state of disrepair.

Representative Concentration Pathways: Set of four standard scenarios used by scientists when modeling the future climate. RCPs estimate the amount of excess energy retained in the climate system due to how much we have enhanced the greenhouse effect, and the resulting global temperature increases.

Risk: The measure of the likelihood that an incident will occur and the consequence if it does.

Risk Appetite: The level of risk that an organization is willing to accept before any action is deemed necessary to reduce the risk.

Risk Evaluation Factor: Specific evaluation factors that reflect outcomes asset owners are particularly eager to avoid.

Risk Management: The process of preventing or adapting to undesired effects or mitigating risks in order to achieve certain objectives and outcomes. This is a key component of life cycle management.

Risk Score: A score that helps prioritize which impact receives the most immediate response strategies.

Risk Tolerance: Risk tolerance is the degree of residual risk an organization is comfortable with following risk treatment.

Service Life: Period of time over which an asset fulfills the purpose for which it was built or acquired, with no unforeseen costs or disruption for maintenance or repair.

Service Value: The level of a service an asset (or assets) provides to users, owners, the community and its citizens.

Stakeholders: People or organizations who have an interest in and/or influence on the way you conduct your asset management activities.

Strategic Asset Management Plan (SAMP): The resulting document when an asset management strategy is combined with the asset management plan (or plans).

Sustainability Ratio: Measures the extent to which assets are being replaced as they reach the end of their useful service lives.

Vector-Borne and Zoonotic Diseases: Vector-borne and zoonotic diseases, such as malaria or avian flu, that are caused by the transmission of pathogens that spread through vectors, like mites or mosquitoes, or through direct contact between animals and people.

Vulnerability: Vulnerability is a function of the exposure and adaptive capacity of a particular service or asset to suffer harm from hazard events.

Vulnerability Assessment: Step 3 of the climate risk assessment process. A vulnerability assessment determines which climate impacts have the potential to cause a notable disruption to the community.

A scenic view of a pond surrounded by lush greenery. The pond is in the middle ground, with ripples on its surface. The foreground is filled with dense, vibrant green plants and ferns. In the background, there are more trees and a building partially visible through the foliage. Large, dark green leaves hang from the top of the frame, framing the scene. Overlaid on the right side of the image is the text "Part 2" in a smaller font above "Fundamentals" in a larger, bold font, both in white.

Part 2
Fundamentals

Chapter 1

Basic tenets of asset management

Key takeaways

- ▶ Asset management allows governments to maximize both the financial and the service value of physical assets, to the benefit of communities.
- ▶ A critical first step in the asset management journey is for governments to take stock of the assets they own and/or manage. Answering the 'six whats' will guide governments toward sound decisions that prioritize critical assets within a broader asset portfolio.
- ▶ Assets have to be managed adequately over their entire life cycles to ensure that initial investments in new infrastructure are sustained for present and future generations. Each phase of an asset's life cycle (planning, acquisition, use and disposal) requires policies and actions that draw on a unique set of human, material and financial resources.

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The terms in **bold** can be found in the Glossary.

What is an **asset**?

The most basic definition of an asset is something that is of value to a person or an organization. Assets can belong to private or public organizations. They can be tangible, meaning that they are physical and can be touched, or they can be intangible like financial assets.

Physical public assets are tangible assets (like physical infrastructure, buildings, equipment, property and natural assets) that are owned and/or managed by the government (see Figure 1).

But what do we mean by *value*?

Assets provide a service to users, owners and the community. We call this the **service value**. Assets also have a **financial value**; they cost money to acquire. We will talk more about these two concepts later. What is important to note at this stage is that both a public asset's service value and its financial value contribute to the community's overall wealth.

In this publication, which is aimed at all levels of government, we use the terms 'asset', 'public asset', 'government asset' and 'public infrastructure asset' interchangeably. We define them as all the physical assets that are essential to the delivery of basic public services and are owned or managed by the local or central government. While we recognize that many governments involve the private sector in the provision of basic services, the focus of the Handbook is on public assets under direct control of the public sector. Such public assets typically include traditional infrastructure like roads and water and sanitation systems, as well as the land that roads are built on, the buildings that house essential services, and the equipment and information technology systems needed to operate and maintain them.

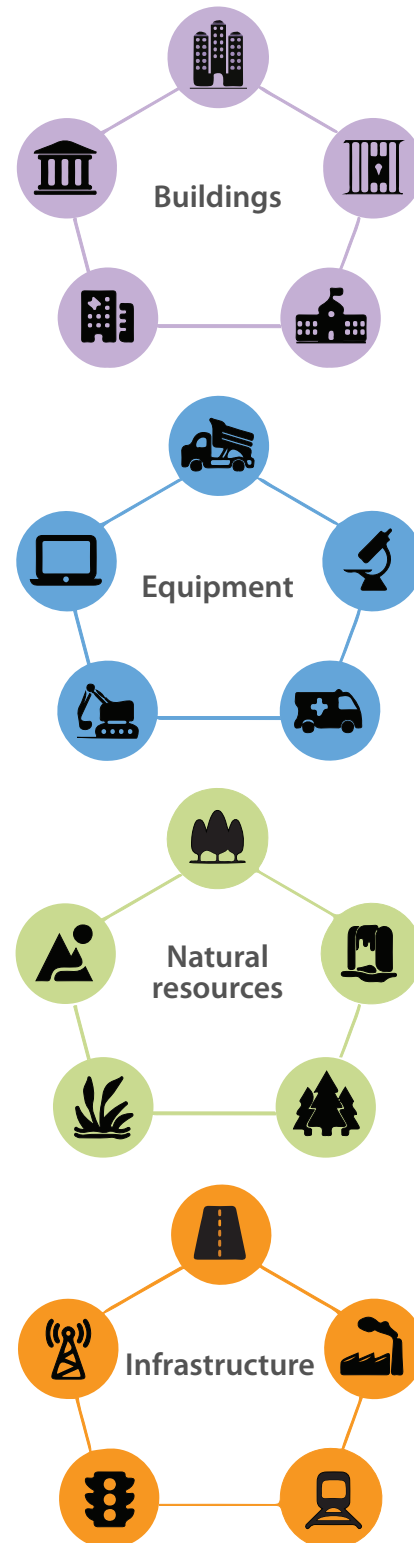
Here is a more detailed list of typical public assets:

- Land and natural assets such as wetlands, forests and vegetation.
- Buildings such as schools, health centres,

Figure 1

Public assets

Public assets are all the physical assets that are essential to the delivery of basic public services and are owned or managed by a local or central government.



community centres, jails and government offices.

- Infrastructure such as:
 - Roads and signage
 - Street lighting
 - Water utilities (water supply, wastewater and storm water systems)
 - Flood control systems such as dykes and levees
 - Energy supply systems (electricity generation, transmission, distribution and storage)
 - Parks and recreational facilities
 - Cultural facilities
 - Telecommunications networks
 - Ports and port facilities (wharves, docks and cranes)
 - Information technology and systems
- Equipment such as garbage trucks, graders, computers and medical machines.

Assets with a high service value and/or high financial value are called **critical assets**. Countries around the world differ in their division of responsibilities for asset management so, depending on where you are, some critical assets might be managed at the local level while others are the responsibility of the national government. In most cases, essential services such as water and sanitation, solid waste management and road maintenance are assigned to local governments. We will look at how to prioritize critical assets in Chapter 4.

Regardless of who owns government assets, their purpose is to deliver a service. What service is delivered, why it is delivered and how it is delivered is what we will discuss in this chapter.

Asset management in short

The right assets, in the right place, at the right time, managed by the right people

1.1 What is asset management?

Asset management refers to the coordinated series of activities that monitor and maintain things of value — in our case, physical assets. This involves balancing risk, cost, opportunities and performance to fully and effectively realize the value of an asset over its entire lifespan.¹

1.1.1 Basic tenets of government asset management

The objective of asset management is to meet a required **level of service**, in the most cost-effective manner, while considering sustainability for current and future users. Therefore, good asset management involves:

- Focusing on the asset's entire lifespan so that decisions are made based on the lowest long-term cost and the greatest long-term benefit to the community, not just on trying to save over the short term.
- Applying a **portfolio management approach**, which seeks to maximize value for the entire portfolio of assets rather than individual or single groups of assets (this is, as we shall see later, an advanced form of asset management that only works if all individual assets are managed effectively over their entire lifespans).
- Ensuring that the people involved in asset management over an asset's lifespan are competent and qualified (they include the engineers, contractors, planners, procurement professionals, etc.).

Figure 2 gives some pointers and examples of what good and poor asset management look like.

1.1.2 Benefits and challenges

Good asset management entails both benefits and challenges. Governments make major investments when acquiring assets. The benefits are obtainable, but they may not come until

later. In contrast, the challenges are front and center and can seem overwhelming. With the right tools in place, however, asset management is feasible and ultimately rewarding.

1.1.2.1 Benefits of asset management

Best practices in asset management yield many benefits for local authorities, central governments and communities:







- Economic sustainability is enhanced by reducing the cost of delivering services.
- Social equity and benefits are realized because the community has more resources for services and amenities.
- Environmental sustainability and reliance are stronger because resources are conserved, and attention is given to long-term solutions rather than short-term affordability or convenience.
- Proper valuation of natural assets, such as land, lakes, rivers and groundwater, helps mobilize resources and political will to protect them and to ensure they serve present and future generations.
- Governments can improve the resilience of public services to a variety of hazards, including climate change and health-related emergencies.
- Citizens enjoy better, more dependable services without unexpected failures or indefinite interruptions.

- The financial viability of a local or central government is enhanced because future costs are anticipated, and reserves set aside. Greater creditworthiness comes as a result and helps to mobilize new investments.
- Well-managed and evaluated assets (e.g. land that is properly titled, registered and valued) can be used as collateral for future investments.
- Government transparency is enhanced, which leads to better communication with the public and greater public confidence in government.
- Communication is more effective with rate payers, elected officials, financial rating organizations, regulatory agencies and potential public or private investors because plans and results are documented and shared.
- Maximizing the value of infrastructure investments through their underlying assets and services contributes to the achievement of national and international development agendas and goals, including the Sustainable Development Goals (SDGs).

These benefits can spill over into the economy and the many levels of government. As local authorities improve their management of scarce resources, for example, the entire country is able to attract more capital and investment from domestic and foreign sources due to improved creditworthiness.

Figure 2

What do good and poor asset management look like?

 Undertaking regularly scheduled maintenance, like oiling machinery, painting buildings or grading roads, ensures that assets last.	 Not maintaining assets reduces service value and requires expensive replacements.
 Redeveloping or selling under-used land generates revenue and financial value for the community.	 Neglecting infrastructure disrupts water and sanitation services, resulting in health hazards and possibly social unrest.
 Open, competitive procurement and contracting enhance public confidence.	 Starting construction with insufficient funding jeopardizes its completion. A local school sits unfinished and deteriorates—and so does public confidence.

“ (Our) Municipality has not yet realized roads, bridges and culverts, irrigation facilities, water and sanitations, education and health, public buildings, electricity, transport as assets of [Local Governments] nor the direct linkages with service delivery. Even federal and state governments have not yet realized those are assets and need to be recorded and maintained. There is a need for more asset management awareness plus support for policy development, training and technical assistance at all levels.

Asset Management Focal Point, Dhulikhel Municipality, Nepal²

1.1.2.2 Challenges of asset management

The challenges of asset management fall into several categories:

- Poor asset information, for example, in the form of incomplete or inaccurate asset registers, impedes effective and efficient management.
- Poor awareness about assets can lead to their not being used, or not used correctly, and in turn can shorten their lifespans or increase their costs.
- Unclear asset management roles, responsibilities and accountability between levels of government or among agencies, officials and staff can hinder efficiency and result in costly duplication or errors.
- A lack of a clear process to establish and transmit asset management policy and guidance from the national to the local level can lead to the misuse and mismanagement of existing assets and the haphazard acquisition of new assets. This can result from lacking awareness of the gaps and challenges in the enabling environment as a whole.
- Inadequate funding, often the result of inadequate investment planning, leads to ad hoc asset acquisition and poor asset operations and maintenance. This also applies to funding that is subject to political whims or pressures.
- The lack of basic materials and equipment, such as storage facilities and technology, can also impede asset management.

- Uncertainty about the effects of climate change, public health emergencies and other systemic shocks can affect the design, construction, operation and maintenance of physical assets and the delivery of services.
- Inadequate buy-in from senior leadership on the importance of robust asset management can prevent organizational objectives from being realized.

Arguably, the easiest challenge to address is that of incomplete asset information, while the hardest challenge to overcome is that of funding: there will never be enough money. As we will see, many challenges can be confronted in a reasonable amount of time with good asset management.

1.1.3 Hazard and risk management

The adoption of a risk management approach to dealing with the effects of natural hazards, disease outbreaks and a changing climate is an important element of an effective asset management strategy. Given that shocks and stresses to assets can have spillover effects across multiple infrastructure systems, it is essential that critical assets are identified and made resilient against future threats. This idea is captured in the portfolio management approach introduced earlier and will be explained in detail in Chapter 2.

The following sections illustrate two broad types of hazards and risks that asset management strategies and plans should include.



Photo © Linda Newton

1.1.3.1 Climate change impacts

Climate change is forcing national and local governments to re-think how they do business, including how they plan, design, build and manage infrastructure. Climate change also is affecting how services are delivered, the level of service provided and the costs and risks of delivering the service. The assets most affected are transportation systems, buildings, water management systems, marine infrastructure and natural assets such as parks and forests.³

“If communities do not consider climate change when designing new or renewed assets, they are essentially reducing the expected life of the asset right from the beginning.

Asset Management British Columbia, p. 9⁴

Many infrastructure systems are interconnected and interdependent. Due to their interdependence, the failure of one system will have cascading effects on others, likely leading to their failure. For example, flooding can overwhelm storm and sanitary drainage systems and in turn contaminate a local aquifer that provides potable water. It may also send uncovered waste from landfill sites onto streets or into lakes and rivers, putting the

health of communities and the natural environment at risk.

Beyond the immediate impacts of climate-related shocks, infrastructure systems are also being subject to increasing stresses, which can lead to future systems failure. Drought and volatile weather have hit agricultural employment and fueled urbanization, with the influx of people seeking jobs in cities putting a strain on local assets and service delivery.

Bangladesh, for example, is one of many developing countries in which people are leaving rural areas and moving to cities, increasing the strain on existing urban infrastructure. Waste management has proven to be particularly inadequate, especially when extensive flooding occurs during the monsoon season. The impact goes beyond putting pressure on infrastructure services, resulting also in social and health problems within the population.⁵

In mountainous Nepal, where only 17 per cent of land is suitable for agriculture, even small changes in climate matter. There have been more heat waves in recent years, followed by greater rainfall that has led to flooding and landslides. The national strategy for achieving the SDGs makes a priority of climate change adaptation and mitigation. Of the financial resources this would involve, the largest

share (more than 50 per cent) would go to climate proofing infrastructure projects and improving the resilience of buildings.⁶ This is considered strategically important for Nepal to realize plans to develop existing urban areas in the hills and reduce the movement of younger people to bigger cities.

In practice, climate change is forcing governments—even those with sound asset management—to re-evaluate their long-term plans and approaches to risk management. Proactive asset management, however, can help governments mitigate and adapt to the impacts of climate change and improve their overall response to natural disasters. In Chapter 6, we will look more closely at the impact of climate change on physical infrastructure and at how governments can use asset management to improve climate resilience.

1.1.3.2 Public health emergencies

The events of 2020 have shown us that we must also consider the impact of public health events on government assets. The COVID-19 global pandemic had a significant impact on local and national health service delivery, with clinics and hospitals struggling to cope. The pandemic also hit local and national government finances by driving up operating costs even as

economies faltered and revenues declined. In Chapter 7, we will look in depth at how national governments can support local governments financially in times of crisis, and at how good asset management and planning can mitigate public health challenges such as COVID-19.

“Every preventive and containment measure requires resources and has a fiscal aspect. To finance their epidemic response, local governments rely on three major sources: own revenues, intergovernmental transfers and subnational borrowing. The latter is only available in countries with a supportive legislative and policy environment.”

UNCDF, p. 47

Organizations are unable to manage risk to their infrastructure systems and associated physical assets if they lack the data and knowledge to make informed and evidence-based decisions. With adequate knowledge of their existing asset portfolio, organizations can undertake hazard vulnerability assessments, complete scenario planning and develop effective strategies and plans to manage risk. We will cover asset information in Section 1.3.



Photo © Linda Newton

Exercise 1

- a. Which assets is your government or organization responsible for, and which is the responsibility of other levels of government or agencies? Identify any areas where responsibility overlaps between levels of government.

Asset	Who is responsible

- b. Think about and list five major asset management challenges you face. Why are they challenges? What measures could help address those challenges?

Challenge	Action

- c. Think about the impact of climate change on your country. What are the top three risks you face from climate hazards and why? What are you doing to address them?

Risk	Action

1.2 The asset life cycle

The **life cycle** of a physical asset involves four phases: planning, acquisition, use and, when it no longer meets our needs, disposal. Each phase of the life cycle varies in length and costs, as suggested by Figure 3. The life cycle cost of an asset is the total of all costs incurred throughout the four phases.

Let us look at what is generally involved in each of the four phases. We will look at the specific activities associated with each phase in Chapter 2.

1.2.1 Plan

Planning is the most important phase in the asset life cycle as this is when performance and level of service requirements are defined. Such specifications shape the type and quality of service an asset is expected to provide.

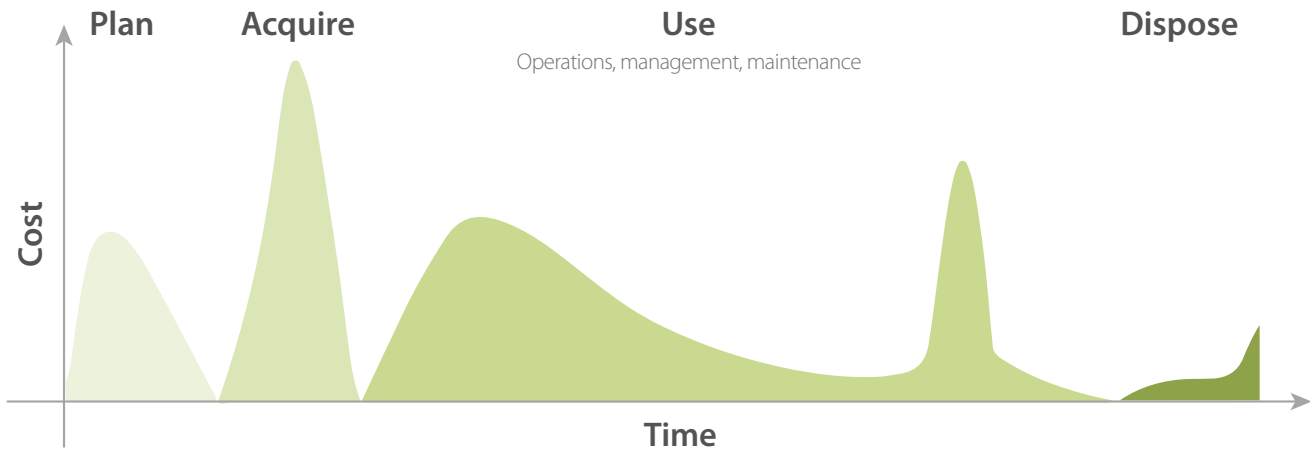
Planning is the least expensive phase, but unfortunately it seldom is given the attention it deserves. Every decision made during this phase will influence the cost of the asset as well as the service it provides to the community, over its whole life cycle. These decisions also affect the ability of the government to achieve its development objectives.

Basic questions to answer during the planning phase include:

- Why do we need the asset?
- What function will it perform?
- What service will it deliver and for how long?
- Are other assets affected by this asset?
- Who will use it?
- Can we afford it?
- How will we acquire it?
- How will we maintain it?

Figure 3

The life cycle of a physical asset



- Do we have the right people to operate and maintain it?
- How will we dispose of it?

The involvement of operations staff and political leaders, as well as consultations with the local community, are essential during this phase.

There are three levels of planning as seen in Figure 4:

For example, let's say we are planning for the purchase and construction of a new landfill for solid waste collection. Let us apply each level of planning to the assets involved (new and old).

At the *strategic* level, we want to think about the potential location and size of a new landfill. We also want to plan for the closure and monitoring of the existing landfill. On these considerations, we will consult the local community, i.e. through town hall meetings, surveys, focus groups, etc.

At the *tactical* level, we will consider the type of landfill and how much it will cost to manage over its entire life cycle. We will also consider the type of collection services it requires and their associated costs. We can discuss service options with the local community and review types of collection and transfer systems with operations staff.

At the *operational* level, we will consider the design of the landfill, the types of vehicles needed for collection and training requirements for operators. We will meet with operations staff to review these considerations to ensure equipment used at the new site is properly operated and maintained.

Decisions made at each level will eventually influence the type of landfill constructed, the level of solid waste management services provided to the community, the types of vehicles purchased to collect the waste, and the life cycle costs of the landfill and related assets.

“Asset management planning is the process of making the best possible decisions regarding the building, operating, maintaining, renewing, replacing and disposing of infrastructure assets. The objective is to maximize benefits, manage risk, and provide satisfactory levels of service to the public in a sustainable manner.

Ministry of Economic Development, Job Creation and Trade⁸

Figure 4

Asset management planning, short- and long-term



Exercise 2

Use the table below to identify what you would have to consider at each level of planning for either (1) a new bus terminal or (2) a new market in your locality.

Strategic

Tactical

Operational

1.2.2 Acquire

Acquiring an asset is often the shortest phase in its life cycle. It is when we act on our plans and obtain new assets to meet increased requirements, enhance service provision or replace old assets that no longer meet the community's needs. Many people believe that this phase is the most expensive in the asset life cycle, as it involves paying out the largest amount of money in the shortest period of time. In reality, however, it only accounts for 15–30 per cent of an asset's life cycle cost.⁹

Asset acquisition can be done in many ways.

Items such as equipment, buildings and land can be purchased. New assets can also be constructed. Existing assets such as buildings, roads, landfill sites or water and wastewater infrastructure can be expanded. Natural assets can be acquired by working with local communities to designate public forests or protected areas.

It is not always necessary to own assets. If we only need the asset for a short period of time, or if we cannot afford the purchase price, we might decide to lease the asset from another entity.

This phase of an asset's life cycle is most susceptible to:

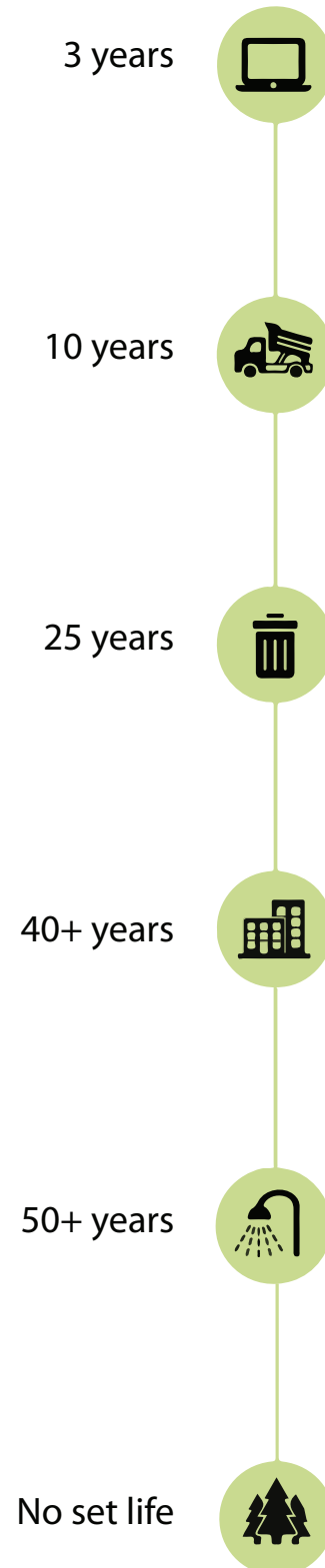
- Inflation, i.e. an increase in the cost of raw materials or land
- Material shortages, i.e. a lack of steel or wood
- Labour shortages, i.e. too few workers to build or manufacture assets
- Corruption, especially in procurement and provider selection.

1.2.3 Use

This is when an asset provides service to the government or community. It is usually the longest and costliest of the four phases. Costs incurred during this phase range from 60–80 per cent of the total asset life cycle cost and often include the replacement of major components to keep

Figure 5

Typical service life of infrastructure assets



the asset functioning. For example, the engine of a truck or the roof of a building will need replacing, or a road might need resurfacing.

The **service life** of an asset is the period of time over which an asset fulfills the purpose for which it was built or acquired, with no unforeseen costs or disruption for maintenance or repair. The service life is determined during the operational planning phase and is often called the **design service life**.¹⁰ By its own nature, an asset has a typical service life as seen in Figure 5, but it can be cut short or extended depending on how well we manage the asset throughout its lifespan.

An asset reaches the end of its service life when it becomes one or more of the following:

- Unsafe
- Costly to maintain and preserve
- Destroyed by natural or human action
- Functionally obsolete
- A cause of delay and inconvenience to users.

Some assets, such as telecommunications

equipment, become functionally obsolete before they become unsafe. Others, such as roads, can function beyond their initial design service life if well maintained.

The Grand Trunk road, spanning 2,500 km between Kabul and Kolkata, has existed since the third century.

Operations and maintenance (O&M) relates to the day-to-day functioning of assets during the *Use* phase. O&M is defined as “[a]ll actions necessary for retaining an asset as near as practicable to its original condition but excluding rehabilitation or renewal.”¹¹

Responsible operation and planned routine maintenance of physical assets is critical to maximizing service life; providing the required level of service to the community at the lowest possible life cycle cost; avoiding or mitigating the consequences of asset failure; and improving resilience to the impact of

When does an asset become a liability?

A small council had just re-sealed its small airstrip and the councilors, concerned at the very high cost, were asking questions.

Councilor: *How many planes use this airstrip?*

Engineer: *None, they prefer to use the new airfield up the road [in another council district] because that's open 24/7 with more facilities and is in better condition.*

Councilor: *You mean no one uses it?*

Engineer: *Well, the planes don't but gliders do.*

Councilor (a keen glider flyer): *But we don't use the hard sealed part, we like to land on the soft verges.*

Silence! ... then

Councilor, puzzled: *If no one uses the hard surface, why did you re-seal it?*

Engineer, equally puzzled: *Why, to preserve the asset of course!*

Moral: If it is costing you and providing no benefit, it is not an asset, it is a liability.

Anecdote provided by Penny Burns, Chair at Talking Infrastructure (<https://talkinginfrastructure.com/>), for the purposes of this handbook. Adapted with the author's permission.

hazards. Asset failure and a reduction in the level of service also increase financial and reputational risks to the asset owner (i.e. a government or an organization).

Environmental conditions and weather impact heavily on the performance of assets in the use phase.

1.2.4 Dispose

The last phase of an asset’s life cycle is disposal. It is important to plan for the disposal of assets as they can be a drain on resources if no longer used in their intended ways. We would dispose of assets for any of the following reasons:

- It is underperforming, i.e. it does not meet revenue projections.

- It no longer meets requirements because it is obsolete or no longer in mandate.
- It is too costly to maintain.

Disposal can take several forms, including selling or transferring the asset to another party or demolishing the asset. We can sell or auction off underperforming property to the private sector to generate one-time revenue to invest in other assets. We can transfer assets that no longer meet the mandate of one government department to another department, level of government or community group. Assets that are too costly to maintain can be demolished and replaced or, in the case of land, repurposed. We can also sell assets to the private sector and then lease it back after the new owner has renewed the asset. Furthermore, we can take apart assets and reuse or recycle their materials for other public

Figure 6

Before you dispose of an asset



services. Regardless of how the asset is disposed, there are a number of considerations (see Figure 6).

In many countries, the disposal of local government assets requires central government approval. In these scenarios, it is important to minimize red tape and ensure swift and efficient communication between central and local governments. If unused assets are

not disposed of in time, they lose value and deteriorate, which can lead to a significant loss of revenue from their sale or become a public safety hazard and liability.

In another scenario, assets become liabilities when they are preserved but cease to serve their intended purpose (see *When does an asset become a liability?*).

Exercise 3

Why, when and how do you dispose of assets? Whom do you need to consult?

1.3 Asset information

Getting good asset information is a key challenge at all levels of government. We cannot manage assets without adequate information about them. The information that provides the foundation of asset management is derived from six questions. These are commonly known as the 'six whats' (see Figure 7).

Being able to answer the 'six whats' entails having the following types of information:

- Physical data about assets
- Asset location and spatial connections to other assets

- Data about maintenance or asset replacement activities
- Asset performance data
- Asset condition data
- Asset financial data.

Gathering and recording this information is essential. It must be accurate, timely and, most importantly, relevant. Information takes time and money to gather and to manage, so it is critical to know what information you want and why, before you decide how to capture it. This is why all organizations should have an asset management information policy that should, at a minimum, identify:

- What information will be captured (following a clear, consistent classification of assets) and why.
- How the information will be captured and when.
- Who will have what roles and responsibilities for information validation and verification.

Chapter 5 will guide you through how to specify these for your government or organization.

So how exactly does adequate information support good asset management?

Asset managers need to know the quantity and type of assets they own or lease to help plan for the future. They also need to know their value and condition in order to prioritize and plan for their renewal and repair. Not every individual involved in asset management must know every detail of each asset,

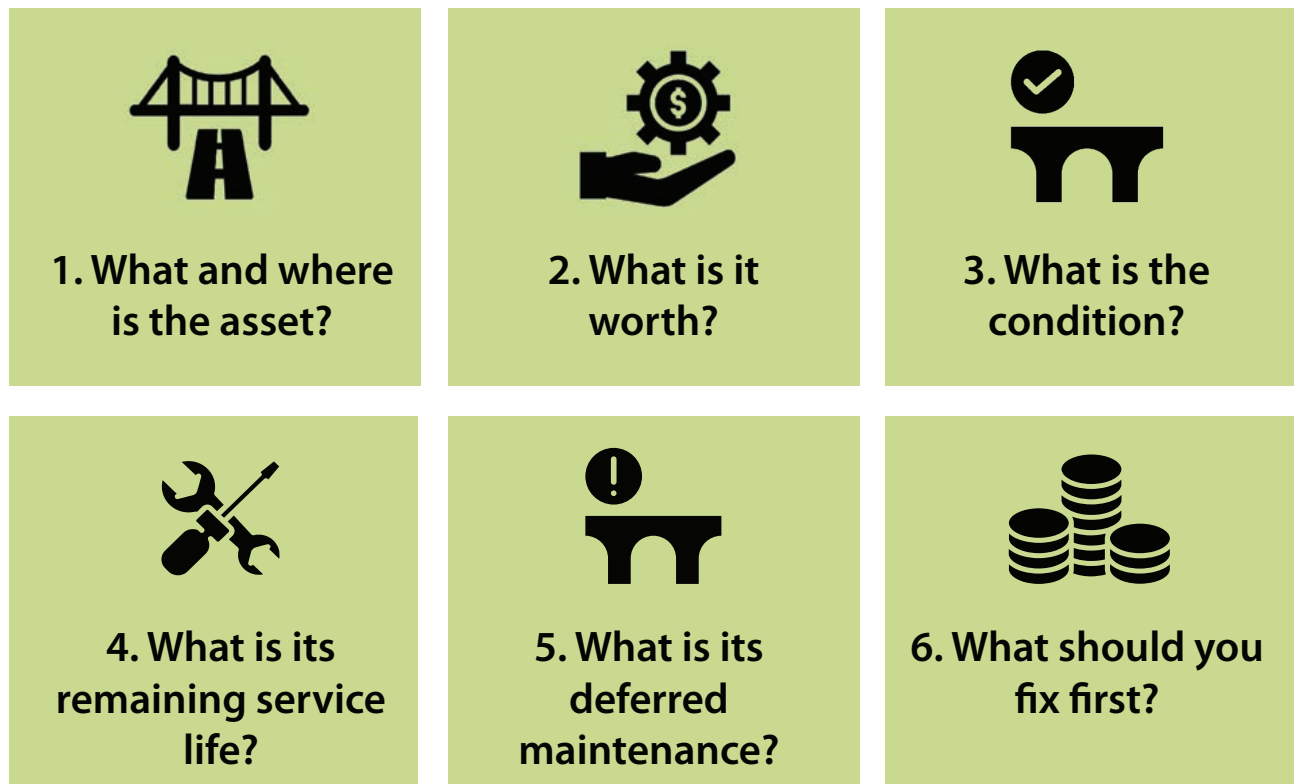
but basic asset information should always be on hand and kept up to date. It should also be organized in a way that supports various levels of decision-making, from strategic to tactical and operational.

Figure 8 spells out the types of information that should be collected and kept in an asset register, accessible to all those directly involved in managing assets.

Maintenance we have not done but that we should have performed is called **deferred maintenance**. It is a liability as it means that an asset will not achieve its design service life. This is why we need to know where we stand with regard to maintenance. The remaining service life can tell us if we have been maintaining our asset properly or if it is going to need major repair or renewal ahead of schedule. Measuring this requires certain information about the asset.

Figure 7

The 'six whats' of asset management



Adapted from D.J. Vanier, p. 4, with select icons from the Noun Project¹³

“The register for motor vehicles leaves out information on parts that need repairs. This makes it difficult to determine costs of repairs per vehicle and eventually to make sound decisions.

Asset management focal point in Abim, a district in Uganda¹²

The first five questions of the ‘six whats’ bring us to the final one: what should we fix first? Some assets are more critical than others, and the risk associated with failure or compromised service is not acceptable. Costly projects can also be riskier. The answer to this last question is the basis of our capital and operating plans. Once these plans have been

formulated, the question becomes, are they affordable? This is the link to the financial plan. We can view capital and operating plans as prioritized wish lists. If they are to be realized, they must be affordable in the short and long term.¹⁴

Lastly, validation and verification of the asset inventory is essential. It is a good practice to identify one person who will be in charge of ensuring that data is entered correctly and reviewing a sample of the data monthly to check for errors. Again, Chapter 5 contains more in-depth guidance on how to develop and implement a basic asset management information system that enables you to capture and use the right data for effective asset management.

Figure 8

What information do we collect in an asset register?

basic asset information

advanced asset information



Exercise 4

Do you have an asset register? Yes No

If so, what basic information do you have in it? Do you trust the information—is it accurate?

Information	Comments on reliability, accuracy, etc.

Endnotes

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Icon 1: infrastructure by Adrien Coquet from the Noun Project, downloaded from <https://the-nounproject.com/icon/2496483/>
Icon 2: Value by Sumit Saengthong from the Noun Project, downloaded from <https://thenounproject.com/icon/3078356/>
Icon 3: Bridge Not Affected by OCHA Visual, US from the Noun Project, downloaded from <https://thenounproject.com/icon/2009218/>
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Chapter 2

The dynamics of asset management

Key takeaways

- ▶ Asset management must be embedded in a framework based on clear principles and objectives that reflect community needs and national development priorities. Each pillar of the asset management framework (demand, life cycle and financial management) deserves equal attention by governments seeking to design and implement policies and strategies that will make infrastructure investments go further.
- ▶ Asset management must follow a portfolio approach that maximizes the benefit and value of an entire collection of assets. Growing interdependency among infrastructure systems deepens the need for governments to weigh long-term trade-offs and risks when making decisions.
- ▶ Designating an 'asset management champion' is necessary to lead improvement efforts, increase visibility and ensure there is political commitment to sustain asset management. Good asset management involves a change in the organizational culture over time.

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The terms in **bold** can be found in the Glossary.

In Chapter 1, we defined assets, discussed the benefits and challenges of asset management and explored such basics as the four phases of the asset life cycle. In this chapter, we will set local asset management in its national context, describe an asset management framework and explore the dynamics that determine whether that framework succeeds. Remember, the goal of asset management is ensuring that the right assets are in the right place at the right time, and that they are managed in the right way by the right people.

2.1 The big picture

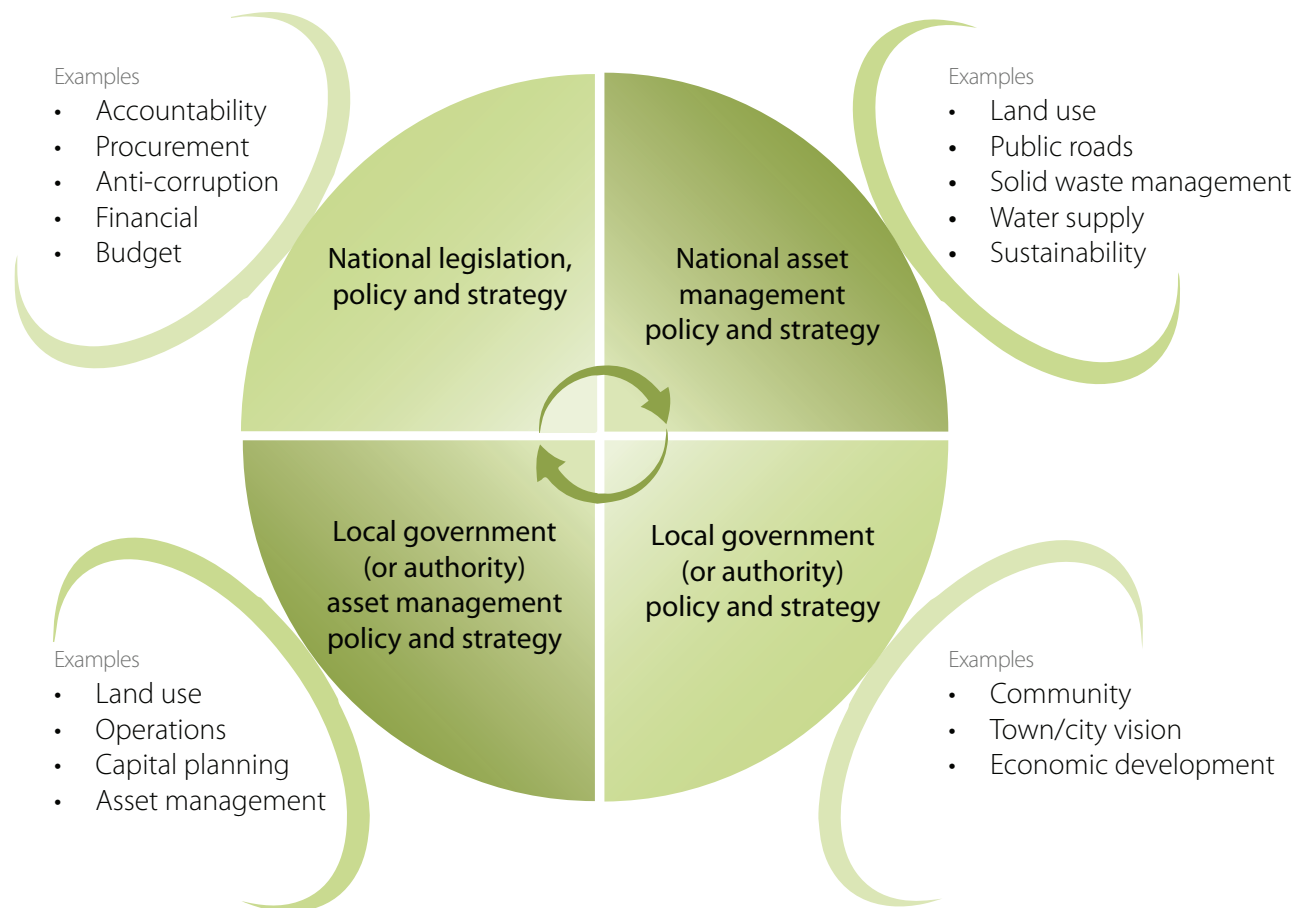
Local infrastructure systems and individual assets exist to meet community needs and

expectations, and to realize strategies and plans for local development. In fact, sustainable, resilient and inclusive infrastructure directly contributes to development efforts at both local and national levels. Research by the UN Office for Project Services (UNOPS) and the University of Oxford indicates that it influences the achievement of all 17 Sustainable Development Goals (SDGs), including up to 92 per cent of their targets.¹

At the national level, infrastructure and assets exist within a broader context or ‘big picture’. Here, the national government usually issues national direction and provides guidance through legislation, policy and establishment of minimum standards. This broader context then informs national asset management. In

Figure 1

National and local government direction and guidance—the big picture



setting the context, the national government takes into consideration legislative, economic, social and environmental factors that influence public infrastructure and how it is managed. This is the foundation on which specific national agencies (those in charge of roads, electricity or water, for example) and local authorities base their own direction and guidance.

As described in Figure 1, an asset management framework consists of policies, strategies and plans resulting from the interaction of direction and guidance at the national and local levels.

Because it provides the basis for national and local direction and guidance, the central government has a determining role in creating an enabling environment for local asset management that supports the achievement of national and local government objectives. This is discussed in detail in Chapter 8.

For now, let us look at the legislative and national policy frameworks.

2.1.1 Legislative framework

Almost every country has overarching financial legislation that covers government financial administration, accountability and budgeting. Such legislation typically specifies the fiscal and administrative responsibilities as well as the level of political autonomy of local governments. Common names for such laws include:

- Financial Administration Act
- Public Finance and Accountability Act
- Budget Act
- Public Procurement Act
- Anti-corruption, Transparency and Open Government Act

A national constitution generally establishes the legal status of local governments. This relationship is codified in legislation such as a 'Local Government Act', which defines the roles and responsibilities of different levels of government. Most critically, this legislation outlines what local governments can

and cannot do, who is responsible for the provision of certain services and thus which government assets are needed at what level. You can think in terms of broad service areas, e.g. universities and schools, hospitals and health clinics, highways and community roads. Local governments also enter a social contract with direct responsibilities to their electorate.

In addition to general legislation, laws can further define roles and responsibilities for specific assets: whether land is governed centrally or is decentralized, for example, how tenure is assigned and how land use is determined (e.g. rural versus urban land use). These documents may also establish the basic levels of service provision.

Figure 2

Link between national and organizational direction and guidance



Figure 3

Legislative framework checklist



Is the existing national framework clear in giving authority to local governments over certain public assets?



What specific legal provisions give local governments the authority on:

- Issuance of land management and zoning regulations?
- Registration of asset ownership?
- Acquisition, use and disposal of assets?
- Asset valuation and price negotiations for buying and selling assets?
- Leasing assets?
- Subcontracting service provision?
- Data and information collection for asset management?



What other conditions and regulations (related to the environment, culture and heritage, health and safety, etc.) apply to local governments?



Does the local government have the power and resources to enforce planning regulations?



Does the legislation clearly establish the methods of valuation and payment for expropriation of properties?

Adapted from Fernando Fernholz and Rosemary Morales Fernholz, p. 4²

Examples of this type of legislation include:

- Land Use Act
- Electricity Act
- Public Roads Act
- Solid Waste Management Act
- Water Supply Act
- Environmental Protection Act
- Health and Safety Act
- Civil Rights Act

Very few national governments currently have an 'Asset Management Act' as such. (South Africa has the *Government Immovable Asset Management Act, 2007*.) There are, however, various laws to guide local authorities on development planning that involves infrastructure and the environment. These laws can have a bearing on local asset management. Figure 3 provides a checklist of what to consider when developing a legal and administrative framework for asset management:

Exercise 1

Answer the questions from the legislative framework checklist in Figure 3 for your organization.

2.1.2 Policy framework

While legislation tells us *why* we do certain things, policies tell us *what* is to be done. They provide more detailed direction, including on roles and responsibilities. They can be general to government department operations (e.g. procurement) or specific to assets. They can take the form of regulations, memoranda or directives. Examples include:

- Local Economic Development Policy
- Public Procurement Regulations
- Public Assets Management Policy
- Government Assets Guidelines
- Local Government Tender Board (Contract Committee) Establishment and Proceedings
- Public Oversight Proceedings (if any)
- Local Government Financial and Accounting Manual
- Local Government Performance Assessment Manual

Policies can also define the level of service that is to be provided, such as the maximum number of students per classroom, minimum frequency of garbage collection or minimum provision of potable water. Section 2.3.3 looks more closely at levels of service in asset management.

Policies do not specify *how* the service is to be provided. That is the domain of strategy and planning.

2.1.3 National strategy

Assets and asset management must align with the national government's vision and strategic direction in areas such as sustainable economic and social development. This is especially important when the national government is responsible for funding asset renewal or acquiring new assets.

Consider the Government of Nepal's National Planning Commission. It has developed the *Nepal Sustainable Development Goals: Status and Roadmap 2016–2030* in response to the

SDGs. Let us look at one of these goals: "Goal 6: Ensure availability and sustainable management of water and sanitation for all."³ The country's strategic roadmap describes six targets and specific indicators for each. The first target and indicators are:

"6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

- Population using safe drinking water
- Households with access to piped water supply
- Basic water supply coverage
- Households with E. coli risk level in household water ≥ 1 cfu/100ml
- Households with E. coli risk level in source water ≥ 1 cfu/100ml
- Proportion of population using safely managed drinking water".⁴



What does this mean to local governments? It means that they will have to plan for, acquire, operate and maintain the physical assets needed to meet the targets for clean water set out in the national strategy.

While there is a clear link between SDG 6 and the physical assets needed to meet it, asset management has a role to play in the pursuit of all 17 SDGs. Literacy cannot be improved without schools, health cannot be improved without clinics and hospitals, and urban development cannot occur without the right physical infrastructure to support it. Consequently, all governments committed to achieving the SDGs will need to identify the underlying assets and performance targets that this work will entail. The same effort is needed to ensure that governments comply with **nationally determined contributions** (NDCs). This includes the climate-related targets set out in the Paris Agreement and the disaster risk reduction targets and priorities defined in the Sendai Framework for Disaster Risk Reduction.⁵ The box below provides

Fostering evidence-based infrastructure in Saint Lucia

In 2008, the government of Saint Lucia issued the country's *National Vision Plan*, a development framework that largely relied on the long-term planning of infrastructure systems. The lack of technical capacity at the government level as well as a lack of data on national infrastructure hindered Saint Lucia's ability to effectively implement the *National Vision Plan*.

UNOPS and collaborating partners provided technical assistance to the government of Saint Lucia to help it implement its *National Vision Plan*. The team delivered targeted recommendations and identified a pipeline of potential projects to meet the country's growing infrastructure needs—while also aligning national

development priorities with international development commitments, including the Paris Agreement and the SDGs. The recommendations were based on the results of cross-sectoral analysis and impact forecasting of Saint Lucia's national infrastructure. The team assessed social, economic and environmental risks posed by climate change, across 24 sectors, to help the government prioritize adaptation measures and improve its decision-making, with a view towards sustainable and resilient infrastructure. That way, limited resources could be applied to maximize socioeconomic development while protecting the country's unique natural resources.

Further capacity-building activities focused on enhancing the government's ability to manage infrastructure data and make evidence-based decisions.

Contribution provided by Geoffrey Morgan from the UN Office for Project Services for the purposes of this handbook. Adapted with the author's permission.

insight on how the Caribbean island of Saint Lucia is addressing national development needs through more strategic planning of infrastructure systems.

Strategic decisions do not always involve new government assets. Sometimes, governments determine that a service is better provided by the private sector and make the strategic decision to divest of its assets or not invest in new ones. For example, solid waste collection is done by the private sector in many places. However, strong monitoring systems and well-designed contracts need to be put in place to ensure that the entire community benefits from these arrangements and that the risks and rewards are shared fairly between the private and public sectors.

2.2 The asset management framework

Once the national context is understood, we can develop our **asset management framework** (AMF). The AMF guides asset management activities and links these to the objectives of national and local governments. The AMF is an essential road map, and all

national and local government organizations that manage physical assets should have one (see Figure 4).

An AMF comprises:

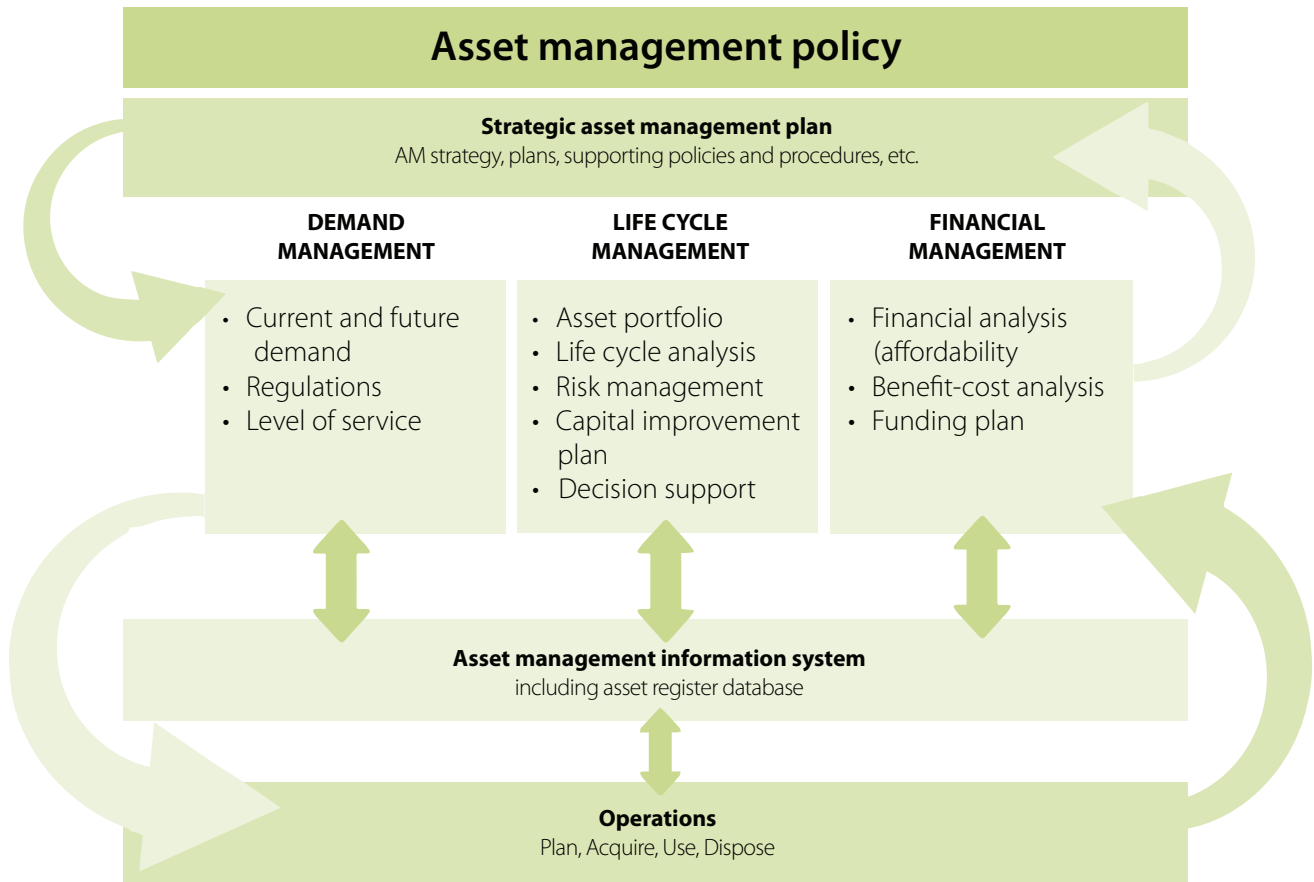
- Asset management policies and strategy that tell us what we are doing and why.
- The plans and direction to help us meet our objectives.
- Three pillars of asset management—demand, life cycle and financial management.

An AMF allows us to deliver needed community services while obtaining the maximum value from our assets.

Decision makers and stakeholders should jointly develop asset management policy and strategy. This often involves several rounds of consultation and communication through surveys, town hall meetings and other methods to solicit input on areas such as levels of service, approaches to be taken and stakeholder expectations. This ensures that the community's needs are taken into consideration—as are the experiences of those who manage the assets on a daily basis. This gives all stakeholders the opportunity to understand how and

Figure 4

Asset management framework



why governments make decisions, even if they do not fully agree with a policy or strategy.

Let us look at asset management policy, strategy and direction in more detail.

2.2.1 Asset management policy

An **asset management policy** identifies the objectives and principles that will guide asset management in your organization. It stresses the benefits of asset management to the organization and addresses the following elements:

- National and local context
- Overall vision, mission and strategic goals
- Asset management vision and goals
- Mandatory requirements
- Additional asset management policies that

support the strategic goals

- Asset management roles and responsibilities
- Links to business processes

A good policy is written in clear, plain language. The first step in writing an asset management policy is to identify objectives for how assets will be managed. Typical management objectives include:

- Having a community focus
- Being risk-based
- Taking a life cycle management approach
- Having a focus on service
- Being forward looking
- Being transparent
- Being resource-efficient
- Adopting a sustainable approach

The policy also should incorporate principles that govern our operational approach to asset management. Figure 5 provides an example of how objectives and operational principles combine to determine how objectives will be met.

“ *The purpose of AM policy is to establish a clear direction in which decision-makers want to go in planning future activities regarding assets and the services they provide.*

GIZ, p. 12⁶

There are many more principles that may help you achieve your objectives. The challenge lies in finding those that are the most relevant and important to your community and local government.

Once you have developed your principles, it is good practice to display them in a prominent place to demonstrate openness and accountability to the public. For example, the Tribhuwan Airport Customs Office in Kathmandu, Nepal has placed its principles on public display near the baggage area (see photo).

Finally, a good policy should:

- Comply with the legal requirements of the government and regulatory bodies.
- Reflect existing and expected customers' demand.



Photo © Linda Newton

- Have earned the agreement of key stakeholders.
- Be adopted by the organization (national department or local council) for a specified period.
- Be reviewed by your organization and stakeholders on a regular basis.⁷

2.2.2 Strategic asset management plan

2.2.2.1 Asset management strategy

The **asset management strategy** is a high-level, comprehensive action plan that guides *how* assets across the organization will be managed over time to ensure we meet our objectives. The asset management strategy needs to align with local economic, land use, development and other strategic goals.

The strategy does not get into details on the day-to-day operation and management of assets. Instead, it has a 15- to 20-year focus (perhaps even 50-100 years out given the lifespans of some assets) and should specify the following:

- Asset management vision, goals and objectives
- Identification of critical assets
- Forecast of future service delivery needs
- Summary of major initiatives and programmes with timelines
- Asset management resources, roles and responsibilities
- Asset management practices and processes to be used
- Systems to be used for performance measurement and monitoring

A good strategy should be simple and vivid enough that it could be represented by an image and possibly displayed in a prominent place such as on a billboard, bulletin board or flyer (see Figure 6).

Figure 5

Asset management principles



COMMUNITY-FOCUSED

- We will involve and inform the public on important decisions related to the acquisition, operation, maintenance, renewal or sale of our assets.
- We shall promote community benefits, that is, the supplementary social and economic benefits arising from an infrastructure project that are intended to improve the well-being of a community affected by the project (e.g. local job creation and training opportunities, improvement of public spaces within the community, promoting accessibility for persons with disabilities, etc.).

RISK-BASED



- We will strive to meet or exceed all national regulations, benchmarks and requirements related to the management of our assets.
- We will adopt a risk management approach in our planning to minimize the impact of climate change, public health crises and other systemic shocks.

SERVICE-FOCUSED

- We will designate a focal point for asset management who will prepare and convene regular stakeholder meetings to discuss how our asset management practices can be further improved to the benefit of our citizens.
- We will report regularly on our assets and our asset performance.
- We will provide the highest quality of service to citizens under the given circumstances, with the available resources and in line with relevant national and international laws and norms.



FORWARD-LOOKING

FUTURE



- We will focus on long-term solutions rather than short-term affordability or convenience.
- We will continue to improve our asset management practices and systems to ensure quality services for our customers.

VALUE-BASED

- We will provide value to our stakeholders and organization by adopting good financial asset management practice in our annual budget and medium- and long-term fiscal expenditure plans.
- We will undertake proper valuation of environmental assets, such as lakes, rivers and groundwater, and allow land and other assets to retain value.



TRANSPARENT



- Open and effective management and reporting of public assets is part of our civic duty.
- We will fight all forms of misuse, abuse or corruption related to the management of public property

Figure 6

Supertown asset management strategy



Photo © Linda Newton

2.2.2.2 Asset management plan

Asset management direction is provided through an asset management plan and supporting policies, procedures and processes. The **asset management plan** further details the activities necessary to manage assets and is often broken down by service area (e.g. water provision, roads) or asset category (e.g. land, equipment). In addition to the information contained in the strategy, the asset management plan will describe the asset portfolio and the required levels of service for assets. It also provides a more detailed forecast of future demand and describes key activities for the life cycle management of assets, including criteria for determining when assets are to be disposed of. Finally, the plan will forecast future investment and resource requirements and provide timelines for major initiatives.

Land use plans, master development plans and information technology (IT) plans are examples of supporting plans that must be considered and integrated into the overall asset planning process. They are critical to the

long-term vision. Common issues that arise when they are not taken into account include:

- “Infrastructure requirements and fiscal analysis are not linked and integrated into the land use planning process.
- Land use plans are prepared and approved without an understanding of the long-term implications of constructing and maintaining infrastructure and sources of financing.
- Competing interests for limited funds at the local government level make it difficult to put aside reserve funds essential for maintenance, upgrading, and replacement of infrastructure.
- Capacity issues challenge local government’s ability to access the tools necessary for effective integration of land use and infrastructure planning at both the policy and implementation levels.”⁸

2.2.2.3 Together in a SAMP

An asset management strategy is often combined with the asset management plan (or

plans), and the resulting document is called a **strategic asset management plan** (SAMP).

Figure 7 shows how a SAMP table of contents might look.

Figure 7

Strategic asset management plan—sample table of contents

Strategic Asset Management Plan

□	Executive Summary	□
□	Introduction (including assumptions and constraints in delivery service)	□
□	State of the assets	□
□	Expected levels of service	□
□	Asset management strategy	□
□	Financing strategy	□

Adapted from GIZ, p. 29⁹

2.2.2.4 Supporting policies and procedures

We also need supporting policies and procedures that provide specific direction to asset management staff on how to implement the activities needed to support asset management in our organization. If we do not have these, our approach to asset management will be ad hoc, inefficient and ineffective. Examples of these support activities include:

- Inventory management
- Data collection
- Condition and performance assessment
- Customer service
- Operations and maintenance

2.2.2.5 Asset management action plans

As you will have learned from the previous sections, developing an asset management framework takes time. So where do you begin?

An **asset management action plan** (AMAP) is a tool to help you compare an organization's present asset management knowledge, practice and documentation against good asset management practices, and to identify gaps and ways to close them. Developing an AMAP can therefore be a concrete start to your asset management journey and, by complementing other plans, can help you build out a complete SAMP for your organization.

The AMAP process is also a simple and methodical way to improve how you manage one or two of your priority assets. The result is an action-oriented plan that can be implemented in a relatively short time frame. The first AMAP you create will likely take the longest time as you have to carry out a thorough analysis of existing practices before honing in on a critical asset. Over the course of your asset management journey, you can then fill out additional AMAPs for other assets while referencing and updating your initial gap analysis.

We will look at how to create an AMAP in detail in Chapter 4. The steps follow the best practices from this chapter and incorporate guidance from the Diagnostic Tool in Chapter 3.

2.2.3 Portfolio management

As you will recall from Chapter 1, **portfolio management** is a basic tenet of asset management. Physical assets are part of the overall wealth of a government. We use the term '**asset portfolio**' to describe a related group of assets that contributes to this wealth—both financial and physical.

Assets are best managed using a portfolio management approach, meaning that assets are managed collectively and not as individual items. So, we do not just look at managing one vehicle; we look at what is best for our fleet of vehicles and indeed our overall stock of equipment. Furthermore, we do not just look at equipment; we look at equipment in combination with our other assets.

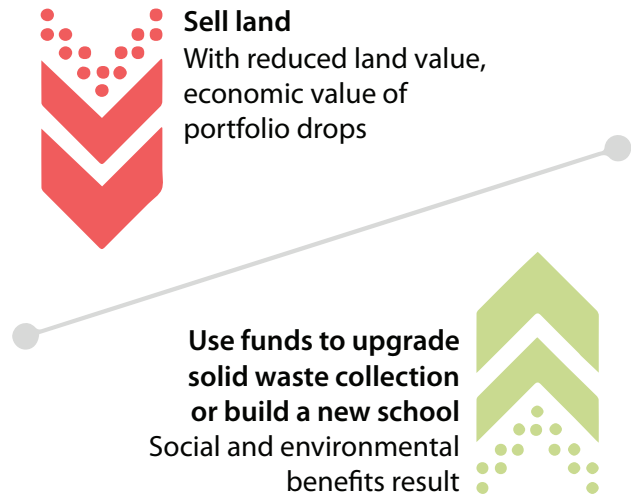
In this approach, a government can understand its assets in context—across multiple infrastructure systems—and can make decisions that better serve the community from an economic, social and environmental perspective. Decision-making would be based on comparing alternatives across these portfolios; thus, maximizing benefits and minimizing costs.

For example, Figure 8 illustrates a portfolio management approach that considers the benefits and costs of selling land to generate money with which to upgrade other assets such as our fleet of solid waste collection trucks or our schools. We are trading a financial asset (the value of the land) for a physical asset (improving equipment or infrastructure). We will have reduced the immediate financial value of our asset portfolio, but this will be offset by an increase in the social, environmental and possibly economic benefits derived from improved solid waste collection or more schooling. Thus, the overall value of our portfolio may end up increasing. At the same time, we would not want to sell assets to generate short-term revenue for operating expenses as this results in lost wealth.¹⁰

Sustainability considerations are central to effective portfolio management of assets (see box).

Figure 8

Comparing portfolio alternatives



Portfolio management is undertaken at the strategic and the tactical level. At the strategic level, we are looking at the best mix of assets to deliver the service in the most effective and cost-efficient way possible. Our example of selling land to generate financial resources to upgrade our solid waste collection fleet is an instance of strategic portfolio management.

Sustainability at the portfolio level

Portfolio management approaches should include the consideration of sustainability at the broader scale, beyond any single asset or infrastructure system. Especially when assessing the impacts of infrastructure on nature—and hence on nature’s ability to provide services—it is important to try and understand the cumulative effects of multiple infrastructure systems within a given area, and over the entire life cycle of the assets in question.

Similarly, the social costs and benefits of infrastructure development should be considered beyond the immediate project area. This is particularly important

when infrastructure constructed in a given location is providing services to people in other locations. In such cases, the distribution of the positive and negative impacts may not be equitably or inclusively distributed.

Early, inclusive and sustained stakeholder engagement and public participation are important tools for understanding the aggregate effects of infrastructure on communities and the environment. Identifying and addressing potential issues as early as possible in the planning process decreases the likelihood of conflict over a project and helps safeguard investments and ensure resilient service delivery.

Source: United Nations Environment Programme, *Good Practice Guidance Framework for Sustainable Infrastructure, Draft for Review* (May 2020).

Another strategic portfolio management consideration would be to assess if it is more cost effective for the private sector to deliver a particular service. What if we contract out waste collection rather than redistribute resources from land sales to buy new collection equipment (as considered in Figure 8)? Would there be net savings that could be used to improve other assets?

At the tactical level, a portfolio management approach to managing infrastructure assets (e.g. roads, sewers, water distribution systems) would see a road paving project done at the same time as the installation of new water distribution pipes or storm sewers, as opposed to two or three individual projects with different timelines.

2.3 Demand management

Pillar 1

Demand management

- Current and future demand
- Regulations
- Level of service

Demand management is critical to our asset management framework. **Demand** is a measure of how much customers use the services provided by the assets, e.g. clean water supply or sewage disposal over time. The ability to consistently predict demand helps governments plan and meet that demand. It also helps manage the impact and consequence (risk) of not meeting it.

We further need to define, through a robust community consultation process, the levels of service we intend to provide and the customer's willingness to pay for the service. We also need to know what national policies and regulations we need to follow. It is important to regularly monitor levels of service to ensure

that customer and technical performance targets (e.g. service disruptions and water leakage) are being met. These activities are not done sequentially. As we will see, understanding demand and levels of service is an iterative process.

2.3.1 Current and future demand

We need to know about current and future demand. To assess demand, we must answer these questions:

- What is our current inventory, and how does it meet our requirements?
- What trends have we observed?
- What assets will we need in the future?

Let us begin by looking at our current demand. The answers to the 'six whats' introduced in Chapter 1 will help us.¹¹ Knowing what assets we currently have, their condition and performance levels, and their remaining service life is vitally important to understanding if our current inventory is meeting current demand and will also meet future demand.

Future demand is a projection of what we think we will need. It can feel like looking into a crystal ball as we try to determine:

- Where will the community grow?
- How much will it grow by and when?
- Will existing assets meet the demand?
- Will there be enough money to buy or build new assets and increase levels of service in order to meet future demand?

Let us look first at a hypothetical example. Current demand is influenced by customer's usage of a particular service (e.g. litres of potable water per household per day) and by customer's expectations (e.g. that energy should be provided 24 hours per day). The community may require X litres of water per person per day, in terms of national guidelines, but only receive 50 per cent of X litres. Clearly, the assets and their managers are

Land, a universal yet unique asset

As far as assets go, land is universal and yet unique. Universal, because all local governments have it. Unique, because unlike a piece of machinery, land can be used in any number of ways, and its function can be changed.

Where a local government has control over its land, it needs to implement a well-designed strategy for land use. It should distinguish between land for mandatory or discretionary functions, and what is kept as surplus, i.e. how much vacant land will be needed for future public purposes. Managing this division will depend on the kind of development a government and the community envisions. For predominantly residential areas, for example, the general rule is that 28–35 per cent of the land should be publicly owned for use as roads and social infrastructure like schools and hospitals.



Families enjoying an afternoon in Simon Bolivar Park in Bogotá, Colombia on January 11, 2016. Photo © Dominic Chavez/World Bank

Land should be acquired if there is not enough for public uses in areas slated for new development. But if the local government owns enough land that some of it will remain unused, then a course of action must be determined: Is it better to sell the land now, spend the proceeds for current needs and buy land later to cover future development? Or is it better to hold the land? There is no universal answer, but it is useful to remember that in many growing urban areas, land can be a good asset to hold because its value can increase faster than inflation or returns on other investments.

Moreover, the value of an asset such as land need not fall over time—indeed, its use can be managed to increase value or revenue. Local governments can enhance the

value, price and revenue-generating potential of their surplus land in the following ways.

First, land to be sold to private developers can be offered not in ‘raw’ condition but as a prepared subdivision with basic infrastructure. The provision of internal and external roads and connections to water and sewerage grids makes the land ready to use when construction is completed and removes a source of uncertainty for investors. These preparations must incorporate environmental and social considerations. If cropland or homes will be lost in the process, for example, these negative social impacts must be detailed and specific actions laid out to compensate affected people or entities. The fair treatment of people, even if they are encroachers, is fundamental to any effective land project. (For more details, see English and Brusberg, 2002.¹²)

Second, broadening the definition of the land’s permitted uses can enhance its potential economic productivity and attractiveness to investors. Sales have failed or generated less revenue where the permitted use has been narrowly defined—for example, as “soft drink packaging” or “car repair shop” in an industrial zone or “hotel” in a commercial zone. Instead, in countries with developed market economies, it should suffice simply to exclude prohibited uses rather than to list what is permitted. Also, mixed uses are gaining in popularity. UN-Habitat recommends that no more than 10–15 per cent of urban areas be zoned for single-use functions, and that economic activities be allowed on at least 40 per cent of floor space in mixed-use zones.¹³ Many cities now also use flexible zoning, which allows them to extract public benefits—a public park, for example—in exchange for granting private landowners additional density.

Third, local authorities can relieve investors of some of the government-related risks and costs they face. The legal risks can be contained by making sure the local government has clean rights to the sites it seeks to sell. The financial risks can be lowered simply by disclosing in advance all of the costs that investors will incur in acquiring and developing a site. And the timing risks can be addressed by giving investors a predictable timeline for obtaining permits and infrastructure hookups. By eliminating these risks, local authorities can prevent investors from hedging against them.¹⁴

Contribution provided by Olga Kaganova for the purposes of this handbook. Adapted with the author’s permission. For more details, see Olga Kaganova and Mihaly Kopanyi, “Chapter 6. Managing Local Assets”, in *Municipal Finances: A Handbook for Local Governments*, Catherine Farvacque-Vitkovic and Mihaly Kopanyi, eds. (Washington, D.C., World Bank, 2014).

underperforming by not delivering an adequate level of service that meets customer demands. This supply versus demand gap can be addressed either by improving the performance and efficiency of the system or by introducing non-asset solutions that, for example, reduce the community's water usage. The asset managers must also keep in mind future demand for water that could grow with the population and require an expansion of the water supply system.

Many factors can influence demand and, consequently, the assets we will need to meet that demand. Among these factors are national or local government direction, population growth, economic development, demographics, regulatory changes and technology.

We need to consider what trends we have observed that may influence how strategic goals can be met. Are there areas where population growth is greater than others and puts a greater demand on services? Trends can be determined using such tools as historical data, maps, number and type of development permits and funding grants applied for. For example, in the town of Amudati, Uganda, the government

uses data from the population census and consumption trends to project demand.

We also need to look at national and local government strategies. What do our strategic plans tell us? Let us look at an example from Tanzania.

The Tanzania Development Vision 2025 has three targets for the country.¹⁵ The *Mwanza City Master Plan 2035* vision has one target and several asset-related goals that support the national vision.¹⁶ The goals associated with the targets that have a direct impact on demand for local assets are listed in Figure 9.

Let us look at how one of these goals impacts the planning of future demand in the city of Mwanza.

The national goal of "Universal access to safe water" is supported by the goals set out in Mwanza's plan: "Efficient distribution of public service and utilities" and possibly, "Protecting and enhancing the environment".

What information does Mwanza need about current demand to be able to plan for future demand? It will first need to define "universal access". Does it refer to piped water, access

Figure 9

Tanzania and Mwanza City goals

Tanzania Development Vision 2025	Tanzania Development Vision 2025 Goals	Mwanza City Master Plan 2035	Mwanza City Master Plan 2035 Goals
High-quality livelihood	<ul style="list-style-type: none"> • Universal primary education • Access to primary health-care for all • Universal access to safe water 	To have a more liveable and attractive city by year 2035	<ul style="list-style-type: none"> • Well planned residential, commercial and industrial areas • Efficient distribution of public service and utilities • Effective transport system • Protecting and enhancing the environment • Establishing clear procedures and implementation strategies
Good governance and rule of law	<ul style="list-style-type: none"> • Absence of corruption and other vices 		
A strong and competitive economy	<ul style="list-style-type: none"> • An adequate level of physical infrastructure needed to cope with the requirements of the <i>Vision</i> in all sectors 		

Photo © Linda Newton

Demand-based asset management in Guatemala City

The strategic management of public infrastructure in Guatemala City is demand-driven. Citizens can channel direct requests to the 22 decentralized district councils (Alcaldías Auxiliares) that compose the local government, which aims to respond to requests through asset management interventions.

The local government integrates asset management needs for infrastructure interventions in its *Future Vision* plan for the city. The district mayors meet 3–4 times a year to express their priorities within a changing environment, and each district prepares a local plan. The budget is assigned by district and by areas of intervention (e.g. roads, parks and schools). For each intervention, a Controller visits the area, assigns resources, checks that materials are available and monitors the impact of the intervention. The local government has also introduced more homogeneity in maintenance procedures, i.e. using the same type and quality of materials, to make interventions more cost-efficient and ensure adequate service delivery for all neighborhoods.

Mobilizing resources for asset management interventions remains a challenge. In the case of school maintenance, the local government has recently started receiving resources from the National Development Councils, an

extra-budgetary mechanism mostly used for rural areas. Most urgent interventions have been of a structural nature, e.g. new LED lighting and improvement of isolation to fight excessive heat.

Another priority has been to transform parks and open recreational areas into multi-use, covered spaces, i.e. for public gatherings and youth sports. For example, the local government has cooperated with Mercy Corps to refurbish 27 public parks, creating a sense of community as well as civil commitment to care for and respect existing infrastructure.

Contribution provided by Diana Lopez Caramazana from the United Nations Development Programme Cities and Urbanization Secretariat for the purposes of this handbook. It is based on an interview with the team at the Directorate of Social Development of the Municipality of Guatemala City. Adapted with the author's permission.



Photo © Municipality of Guatemala City

to community boreholes or something else? Once this is defined, it will need to know the current levels of access. Is the service efficient? Is the demand expected to grow and if so, where? Can the service be more efficient?

These are just a few questions that the asset management team needs to answer before they can forecast demand.

In other parts of the world, governments are also taking care to address the service demands of the communities that elected them. The box *Demand-based asset management in Guatemala City* summarizes the efforts of city to integrate community needs into asset management policies.

Now let us look at the other considerations that affect demand management.

2.3.2 Regulations

We have discussed the legislative framework—the overarching national laws with which we must comply—and its influence on asset management. There is also the regulatory framework. Regulations are most often associated with compliance, finance and auditing, but they can also define levels of service for technical provision of services. Infrastructure often has legislation concerning health and safety as well as environmental and socioeconomic impact in the form of codes, standards and by-laws. These aim to ensure a

high-quality delivery of services, and we must ensure to adhere to them as part of demand management.

Most service delivery regulations apply to public utility services such as water, wastewater and electricity. They typically define the types of services to be provided, system connections as well as roles and responsibilities between different levels of government and private service providers. In some countries, regulations are promulgated by the national government and in others, by local governments.

Typical rules and regulations regard:

- Drinking water and service charges
- Electricity
- Solid waste management
- Building codes
- Fire codes

Regulations affect demand management as we must ensure we comply with mandatory requirements. This can affect what other services we are able to provide. Regulations also affect demand itself when passed on the direct actions and activities of the private sector. For example, congestion pricing on roads affects driver behavior, thus reducing the volume of traffic. This lowers demand on roads and can extend their life cycle. It is therefore important to consider the incentives regulations create for the use of public assets and services.

2.3.3 Level of service (LOS)

As introduced in Chapter 1, the **level of service** (LOS) refers to the scale of service provided by an asset or group of assets to meet our goals. We have to consider what we must provide, what we want to provide and what we can afford to provide. *What* we can afford affects *how* we provide the service. A service delivery goal and related LOS might be mandated by the government or be based on the needs of service providers and the broader community. Universal access to safe water is

an example of a government-mandated goal.

LOS is based on one or more attributes or characteristics such as:

- Accessibility
- Availability
- Compliance
- Cost of service
- Physical condition
- Reliability
- Resiliency
- Responsiveness
- Suitability
- Sustainability

LOS can be customer-based—how the customer receives or experiences the service, such as appearance of facilities, response to customer requests or impact of service disruption. It can also be technical—a measure of how the government delivers the service, such as how garbage is collected or the frequency of collection, or a measure of physical asset condition. Figure 10 provides some examples of attributes and corresponding LOS that can be applied to different types of assets.

Adaptability is not a traditional attribute, but it will become more important as government organizations are faced with the impact of climate change and public health emergencies. Major health facilities are critical assets. The events that ensued from **coronavirus disease 2019** (COVID-19) demonstrated the need for buildings that can be adapted to augment overwhelmed health facilities.

The required assets and costs to provide a service that meets our goals will depend on the attributes we select and the level of service we choose or must adhere to. Consider some common assets laid out in Figure 11 and several LOS options related to ‘availability’ and ‘accessibility’. The highest LOS (listed first) provides the most available or accessible service, but it will cost the most to deliver and require the most assets to support it. The lowest LOS

Figure 10

Attributes and levels of service

Attribute	Level of service
Adaptability	<ul style="list-style-type: none"> • Asset is multifunctional • Asset is adaptable to support secondary function • Asset has single purpose
Availability	<ul style="list-style-type: none"> • Individual demand • 24 hours/day, 7 days/week, 365 days/year • 12 hours/day, 5 days/week, holidays excepted
Accessibility	<ul style="list-style-type: none"> • Barrier-free, accessible to all • Telephone, internet or in person service • In person service only
Condition	<ul style="list-style-type: none"> • Maintain critical assets in fair to good condition • Maintain other assets in fair condition
Compliance	<ul style="list-style-type: none"> • Comply with all legal and regulatory requirements • Comply with legal and regulatory requirements for critical assets only
Frequency	<ul style="list-style-type: none"> • Daily • Weekly • Monthly
Reliability	<ul style="list-style-type: none"> • Continuous service with no outages • Outages occur intermittently • Frequent outages
Responsiveness	<ul style="list-style-type: none"> • Requests responded within 24 hours • Requests responded within 48 hours • Priority for emergencies
Sustainability	<ul style="list-style-type: none"> • Recycling of multiple materials • Paper recycling only • No recycling

may have the lowest financial cost, but residents may bear costs in other forms, such as inconvenience or poor condition.

We do not have to provide the same LOS to all. We must balance the costs and benefits of providing the service to effectively manage demand. Sudden growth in demand for services that is not matched by growth in revenue to pay for the service could mean that we will have to scale down the LOS provided. The cost of LOS will also depend on population density, with more densely populated areas being less costly to serve than less populated ones due to economies of scale. Demographic trends can impact the adaptability, condition and sustainability of assets and put pressure on their existing levels of service (see *Brussels TFE: An inter-institutional framework for long-term asset planning*).

Figure 12 shows how we could apply what we have discussed to water provision.

Once we have determined the LOS to be provided, we need to know if we are meeting it. To do this, we have to identify performance measures for each attribute to help us determine if we are meeting our goals. Customer performance measures are related to customer service (e.g. a minimum pressure at the tap, 24 hours per day). Technical performance measures are related to organization effectiveness (e.g. a pipe break is fixed within 24 hours).

Sometimes the performance of a system is beyond the immediate control of the asset owner (e.g. the effect of a flood or earthquake). In such situations, we may need to seek non-asset solutions to address the demand versus supply gap. Effective customer consultation is essential in agreeing on solutions such as a temporary reduction in customer user charges. Asset performance measurement is part of asset operations and we will discuss it in Section 2.6.

Figure 11

Examples of levels of service

 Water provision	 Waste collection	 Land	 Equipment
<ul style="list-style-type: none"> • Piped directly to buildings • Piped to community access point • Community or individual boreholes 	<ul style="list-style-type: none"> • Direct collection from buildings • Collection from community waste points • Collection from central point • No local collection 	<ul style="list-style-type: none"> • Land fully serviced (water, electricity) • Services in close proximity • Unserviced 	<ul style="list-style-type: none"> • Available 24 hours per day, 7 days per week • Available 12 hours per day, 7 days per week • Available 8 hours per day, 5 days per week

Figure 12

Setting levels of service for water provision

National goal	Universal access to safe water
Performance goal	To provide safe and reliable basic water supply to 95% of population by 2025
Level of service	<ul style="list-style-type: none"> • Universal access to safe water based on population • Piped directly to buildings in the central business district • Piped to community access point for areas outside of the central business district but in the urban core • Community boreholes outside the urban core
Level of service attributes	<ul style="list-style-type: none"> • Reliability • Availability • Compliance • Responsiveness • Accessibility • Safety
Service area comprising the assets	Water supply and distribution system



Exercise 2

Consider your solid waste management vehicle fleet and answer the following:

- What is your current inventory, and does it meet your requirements?

b. What trends have you observed?

c. Which assets will you need in the future?

Brussels TFE: An inter-institutional framework for long-term asset planning

The Brussels Task Force Équipements (TFE) was set up in March 2018 to respond to the growing need to adapt the level of public services to demographic growth and the increasing risk of social exclusion for the population of Brussels.

TFE came up with a regional vision of how to most effectively use public space and assets of public interest. It analyzes whether the existing infrastructure is adequately used to continue providing urban services. It also coordinates and oversees the implementation of large infrastructure projects in line with its strategic vision.

The Task Force is composed of the Cabinet of the President of the Region, the Directorate for Urban Planning and Urban Renovation, the Society for Urban Planning, the Land Bureau, the Office of the Main Architect and the Mobility Authority, with the

participation of the metropolitan local government associations.

Some specific outputs of the Task Force in its first two years of existence have been:

- The identification and renovation of a building to house the School of Studies for Security, Prevention and Aid (Brusafe).
- The acquisition and repurposing of a space to locate Recyclart, a centre focused on waste recycling.
- The relocation of the Anderlecht Fire Brigade station.
- The identification and refurbishment of a building for the Serge Creuz Cultural Centre.
- The development of tools to assess community needs within the territory, including for equipment for schools, health facilities, and cultural and recreational activities.

You can find out more information about the Task Force on their website (<https://perspective.brussels/fr/enjeux-urbains/equipements-collectifs/task-force-equipements>) or in this document: https://perspective.brussels/sites/default/files/documents/bilan_tfe_fevrier2020.pdf.

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2.4 Life cycle management

Pillar 2

Life cycle management

- Asset portfolio
- Life cycle analysis
- Risk management
- Capital improvement plan
- Decision support

Life cycle management focuses on the specific activities we must undertake during all four phases of the asset life cycle discussed in Chapter 1. The four phases are: Plan, Acquire (or Build), Use and Dispose. Considering entire asset life cycles can ensure we make sound decisions that take into account present and future service delivery needs.

The overarching goal of life cycle management is to maximize the long-term benefits and services our assets deliver while minimizing the associated costs and risks in the long run.

Every asset has a **life cycle cost**, which is the total cost of all the activities undertaken throughout its service life. The costs in the 'Dispose' phase are often overlooked and can be significant, especially if assets are left to deteriorate, so they must also factor into the life cycle cost of an asset. We cannot fully or accurately predict such costs for every asset we own, but by considering the full life cycle, we are more aware that costs can stretch over long periods of time and can plan accordingly.

Assessing trade-offs is critical in life cycle management. We need to understand what we are giving up when we acquire a new asset or repair, renew or replace an existing one. Which choice is more cost-effective and can deliver more reliable levels of service in the long run? We would not want to acquire or build a new dam if the project costs more than — but may

derive the same benefits as — simply repairing the existing system.

In addition to costs, we need to evaluate and manage the short-, medium- and long-term risks associated with our decisions. The source of risk can be *endogenous* (arising from the asset itself) or *exogenous* (due to an external shock, such as flooding). Based on an assessment of trade-offs, we can develop a plan for when to invest in, or divest ourselves of, our assets. We look at how often this assessment should be done in Section 2.4.4.

When applying life cycle management across a wide asset portfolio, it is important to bear in mind that the larger or more complex the portfolio, the more it will cost to manage, the more risks it presents and the more decisions we have to make. Therefore, we need to decide which services are central and critical to our government and beneficiaries, and which assets we need (land, buildings, infrastructure and major equipment) to provide the services. If solid waste collection, for example, is outsourced to the private sector, this would reduce the government's need to own and maintain collection equipment.

Figure 13 shows how services, and therefore portfolios, can vary even within countries.

Remember that the effective management of an asset portfolio minimizes costs and maximizes its total service value to the community over the long term.

2.4.1 Life cycle analysis

Life cycle analysis (LCA) is an assessment of the total costs and benefits derived from an asset over its lifetime. It is also called 'whole life costing' and includes all the costs and benefits beyond just the direct costs associated with each of the four life cycle phases. Many intangible benefits flow from the proper management of assets, and these should be factored into the analysis, along with the potential unforeseen and indirect costs. LCA is at the heart of life cycle management and

Figure 13

Comparison of local government asset portfolios

Local government	Service provided by local government					
	Public transportation	Education	Health	Social housing	Parks	Emergency services
Tulisipur, Nepal	✓	✗	✓	✓	✓	✓ Fire
Hetuada, Nepal	✓	✗	✓	✓	✓	✓ Fire
Chandpur, Bangladesh	✓	✓	✓	✗	✓	✗
Kushtia, Bangladesh	✓	✗	✗	✗	✓	✗
Omoror, Uganda	✗	✓	✓	✗	✗	✓ Police
Gulu, Uganda	✓	✓	✓	✓	✓	✗
Arusha, Tanzania	✓	✓	✓	✗	✓	✗
Tanga, Tanzania	✓	✓	✓	✓	✓	✗

is a key step in the planning phase where decisions taken will affect all future costs surrounding an asset.

“ *It is often tempting to try and save costs through cheap construction methods or cutting back on operations and maintenance costs. Therefore, decreasing costs in short-term leads to increasing costs in long-term.* ”

GIZ, p. 22 ¹⁷

We know that too many decisions are based on the acquisition rather than the life cycle cost, and that 65–80 per cent of total costs occurs during the ‘Use’ phase.¹⁸ For instance, selecting materials or purchasing equipment without considering future **operating and maintenance** (O&M) expenses can have a significant impact on our ability to sustain an asset’s service delivery.

It is particularly easy to acquire a new vehicle or machine if its purchase is funded by another agency or level of government. But what happens if machine parts are unavailable

locally, too expensive to obtain or not familiar to local technicians who will have to maintain it? What about the cost to dispose of materials used to operate or maintain the asset, such as lubricants and batteries? Governments may suddenly find themselves with dysfunctional assets that are a drain on the O&M budget, all due to poor planning early on. The most important question to ask when faced with an infrastructure investment decision is not, “Can we pass up this opportunity?” but, “Can we afford the life cycle cost of this new investment?” and “Are we even able to afford what we have now?”

As hinted at above, LCA takes into account a wide range of costs and benefits by also considering asset sustainability (see Figure 14). In addition to economic considerations, there are social and environmental concerns surrounding the management of assets, but they may not represent direct, measurable costs. Costs can be considerable, and this underscores the importance of conducting rigorous LCA.¹⁹

Take, for example, a borehole. We might need to control usage so that it does not run dry. We might need to purchase or construct cisterns to store water from the rainy season

for use during the dry season. We might need to consider the cost of importing water if we cannot provide it from a ground source.

Figure 14

Sustainability costs

	Economic costs	<ul style="list-style-type: none"> • Business loss • Property damage
	Social costs	<ul style="list-style-type: none"> • Business disruption • Service disruption • Traffic delays • Gender-unequal impacts • Reduced accessibility
	Environmental costs	<ul style="list-style-type: none"> • Contamination • Pollution • Public health impacts

Or take the example of a local landfill:

- **What are the economic, social and environmental costs in addition to its direct life cycle cost? Can we quantify them?**

We have to consider these along with the financial costs.

- Businesses and properties near the landfill could lose land value.
- There may be increased traffic on the roads to the new landfill on days when waste is collected.
- Businesses along the route could be affected by unpleasant smells from the landfill site.

- **What about the benefits?**

- There will be fewer outbreaks of disease and thus reduced demand on health assets.
- Storm sewers will not get clogged with waste, and we will not have to send out teams to unplug them.
- We could redevelop our existing landfill site as a recreation area once it is decommissioned.

Water treatment in Cox's Bazar, Bangladesh

To reduce dependence on groundwater, the local government of Cox's Bazar has undertaken a project that uses more surface water for its water supply. Such diversification of water sources will lower the risk of shortages during weather events that affect the water supply.

2.4.2 Risk management

Owning assets is inherently risky for two reasons. First, most assets have significant acquisition or construction costs and need to be managed over lengthy life cycles. Associated risks are financial and result from assets' financial value. (Recall from Chapter 1 the types of value assets hold.)

Second, assets deliver critical services, the loss or disruption of which can have a major impact on the well-being of a community or national economy. These risks result from assets' service value.

Understanding risk and how we deal with it is a key component of life cycle asset management. We need to understand the specific short-, medium- and long-term risks associated with our assets, then develop a plan to manage them. This process is called **risk management**, and its primary purpose is to prevent, mitigate or adapt as best we can to undesired effects so that we can still achieve the desired objectives and outcomes, in this case, of asset management.

What is **risk**? Figure 15 provides a visual definition. There are many sources and types of risk, but they generally fall into four main areas of impact: safety, the environment, asset performance and organizational reputation. Managing risk involves a number of steps, which are outlined in Figure 16. Specific risks

Figure 15

Defining risk

Risk = Likelihood x Consequence



Probability or chance that an incident occurs

The result or effect of an incident occurring

associated with climate change and public health issues should be dealt with in a more strategic and dedicated manner. We will look at them in chapters 6 and 7, respectively.

2.4.3 Capital planning

Capital investment is needed to address community growth or changes, or to renew existing assets to maintain service levels. Since this can be expensive, asset managers should plan for the cost of long-term asset needs using LCA, or life cycle analysis, discussed earlier.

In addition, financial planning must allow for the possible effects of natural hazard and climate change impacts on the systems. For a critical asset (such as a single bulk water supply pipeline or a high-traffic bridge), do we upgrade it now to improve resilience to future hazards? The cost of asset replacement after the event often exceeds the mitigation costs. Budgets should also allow for unknowns, such as possible changes to climate change models. We call this process '**capital planning**', and the outcome is a capital plan or capital investment plan.

Regardless of their service life, all assets deteriorate over time. Most assets follow a typical pattern of deterioration, shown as a green curve in Figure 17. The process of deterioration is divided into three phases.

In the first phase, performance declines gradually. If our asset is a critical asset, we may set a high target (yellow line) for level of service or performance, and choose to maintain our asset in good condition. For example,

we regularly replace components we think might fail.

The next phase is characterized by a gradual loss of performance. We may set a lower LOS target (red line) and choose to intervene later in the asset's life cycle.

When we undertake a capital intervention (dashed green lines), we 'reset' the deterioration curve. The capital investment increases the value of the asset closer to its initial level of service, and it performs like a newer asset. The later we intervene, the more expensive this becomes.

There are long-term and medium-term capital plans. Some governments develop a long-term plan as part of their Strategic Asset Management Plan. The capital plan indicates what will be spent, by asset group, over a set period of time. It tends to focus only on costs. Figure 18 provides a simplified hypothetical example of a local government's 10-year capital plan.

The medium-term capital plan identifies the activities required to meet current and future demand, the cost of those activities and a financing approach. It is developed or renewed every three to five years and should coincide with national regulations on medium-term expenditure planning. This plan addresses three major investment areas:

- Upgrading or purchasing new assets
- Renewing existing assets
- Investing in assets that have a potentially higher value in the future (i.e. land)

The plan should cover as many critical assets as possible, including water and sewerage, streets and roads, sidewalks, buildings, streetlights, vehicles, land and natural assets.

A medium-term capital plan is a detailed document grounded in the five key activities described in Figure 19. Each activity is undertaken within each department or unit responsible for a group of assets. The output is a list of prioritized projects that are then further reviewed from a portfolio management perspective.

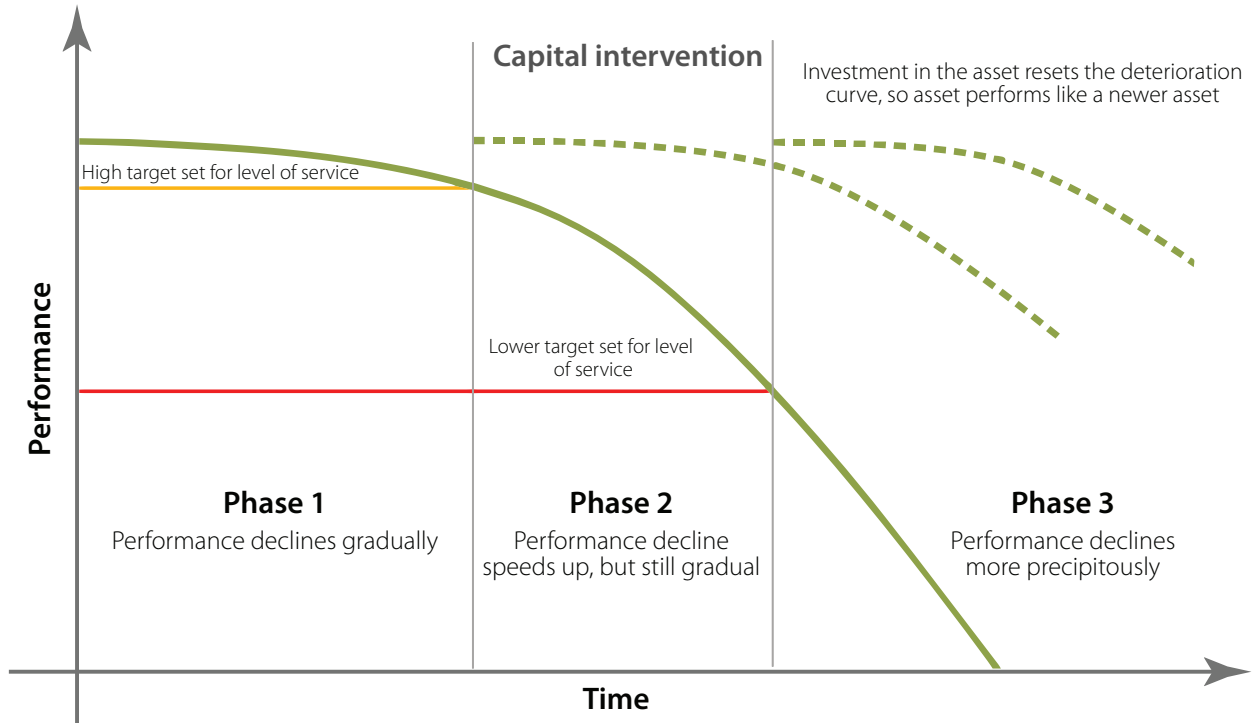
Figure 16

Risk management steps

<p>STEP 1 Understand the risk context</p>	<p>Is the risk strategic, tactical or operational? What is the potential outcome (or outcomes)?</p> <ul style="list-style-type: none"> • Strategic—compromises organization’s principles, e.g. corruption • Operational—leads to key services not being delivered or delivered adequately, e.g. power failure • Tactical—results in cost overruns and/or project delays 																
<p>STEP 2 Identify the risk</p>	<p>Is it natural, accidental or intentional? What does it impact on (safety, environment, performance)?</p> <ul style="list-style-type: none"> • Natural, e.g. risk of physical damage and long-term environmental impact due to weather events such as storms, earthquakes or volcanoes • Accidental, e.g. service disruption due to power failure or increased demand due to refugee influx • Intentional, e.g. social unrest, protests 																
<p>STEP 3 Evaluate</p>	<p>What is the likelihood an event will occur, and what are the consequences if it does? What and who will be affected?</p> <p>Consider public health and safety (e.g. hospitals, traffic lights) as well as financial implications for businesses. Also consider running different scenarios to understand how the impact of an event will scale, potentially causing cascading failure across multiple systems.</p> <p>You can score from 1 (low) to 3 (high) or expand the scale to factor in more considerations (i.e. 1 to 5). The resulting grid is used to determine the risk.</p> <p style="text-align: center;">Consequence</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Low <20% affected</th> <th>Moderate 20-50% affected</th> <th>High >50% affected</th> </tr> </thead> <tbody> <tr> <th>High >50% chance</th> <td style="background-color: #FFD700;"></td> <td style="background-color: #DC143C;"></td> <td style="background-color: #DC143C;"></td> </tr> <tr> <th>Moderate 20-50% chance</th> <td style="background-color: #FFD700;"></td> <td style="background-color: #FFD700;"></td> <td style="background-color: #DC143C;"></td> </tr> <tr> <th>Low <20% chance</th> <td style="background-color: #008000;"></td> <td style="background-color: #FFD700;"></td> <td style="background-color: #FFD700;"></td> </tr> </tbody> </table> <p>Remember that critical assets often have the highest risk levels.</p> <p>For example, what is the risk of a power failure? First, we assess the likelihood. If we have not been properly maintaining the system, it will be moderate to high. The consequence will depend on how widespread the failure is, how long it lasts, who is affected and how many we anticipate will be affected. For a hospital or local businesses, this will be high; for homes, moderate to low.</p>		Low <20% affected	Moderate 20-50% affected	High >50% affected	High >50% chance				Moderate 20-50% chance				Low <20% chance			
	Low <20% affected	Moderate 20-50% affected	High >50% affected														
High >50% chance																	
Moderate 20-50% chance																	
Low <20% chance																	
<p>STEP 4 Manage</p>	<p>How will you deal with the risk? (three options)</p> <ol style="list-style-type: none"> Avoid the risk Mitigate the risk by reducing or altering the consequences of a threat or hazard or, by reducing the likelihood of it occurring in the first place Accept the risk <p>For example, we can mitigate the consequence of a power failure by having backup generators. We can also mitigate the likelihood through proper maintenance and inspection of the power equipment.</p>																
<p>STEP 5 Measure</p>	<p>Did it work as well as hoped? What would you do differently?</p>																

Figure 17

Asset performance over time



Let us return to our landfill site and consider the following questions:

- What are our options? Can we expand our existing site, or do we need to close it and build a new one? Will we need additional transfer stations? What is the cost of each option?
- What will be the role, if any, of the private

sector, and how can we ensure the site serves the entire community?

- What will be the social and environmental impact for people living near the landfill?
- Is there an opportunity to generate income, for example, by partnering with the private sector on recycling?

Once we decide on the best option for our

Figure 18

Simple long-term capital plan

Asset group (or service area)	Financial costs (USD millions)			
	Own source revenue	National government transfer	Other	Total
Roads	10.5	10.0	3.5	24.0
Water provision	15.0	5.0	1.0	21.0
Wastewater	8.5	5.0	2.5	16.0
Equipment	4.0	0	1.0	5.0
Parks and forests	1.5	0	0.5	2.0

Figure 19

Capital planning process

IDENTIFY

Identify all potential (new and rehabilitation) projects and the requirements of each project.

DEVELOP

Consider all possible ways to meet the requirements of each project (e.g. construction, renewal, expansion).

EVALUATE

Evaluate the options for each project, cost each option and select the best one.

DOCUMENT

Prepare a short report for each project that outlines a time frame and specifies the objectives, benefits, costs, risks and risk mitigation actions.

PRIORITIZE

Rank the projects for each year of the capital plan using a prioritization framework.

landfill project, we then need to prioritize it against other projects. How does the replacement of a landfill site compare with major school repairs or upgrades to the main roads? Will we face challenges or constraints funding the projects?

2.4.4 Decision support

Establishing and using a consistent decision-making process is important in prioritizing assets. Let us revisit the 'six whats' from Chapter 1. Before knowing which assets need fixing first, we need to know how they are performing. This is why we should regularly collect data on asset condition and use that to gather information about asset performance. Let us explore some of the ways in which we make decisions based on asset condition.

The decision to refurbish or replace an asset might be based on some or all of the following factors: the cost of the current activities, changes in condition or performance rating, risk, value and usage. For example, if a building is using 40 per cent more electricity than the others, we need to investigate to see whether the use has changed (number of occupants, equipment used, hours of operation), whether the electrical system needs major

maintenance or whether someone has tapped into the power feed.

Several approaches can be taken to decide whether to repair, refurbish, renew or replace an asset.

Approach A: Cost of repair

A simple evaluation of repair costs can help determine cost effectiveness. If the asset can be repaired easily and at little cost, then the consequences of failure are low. If the cost of repair is higher, then the consequences of failure are greater, and renewal or replacement becomes more attractive. As a rule of thumb, an asset should be replaced if the cost of repairing it amounts to half or more of its value.

Approach B: Benefit-cost analysis

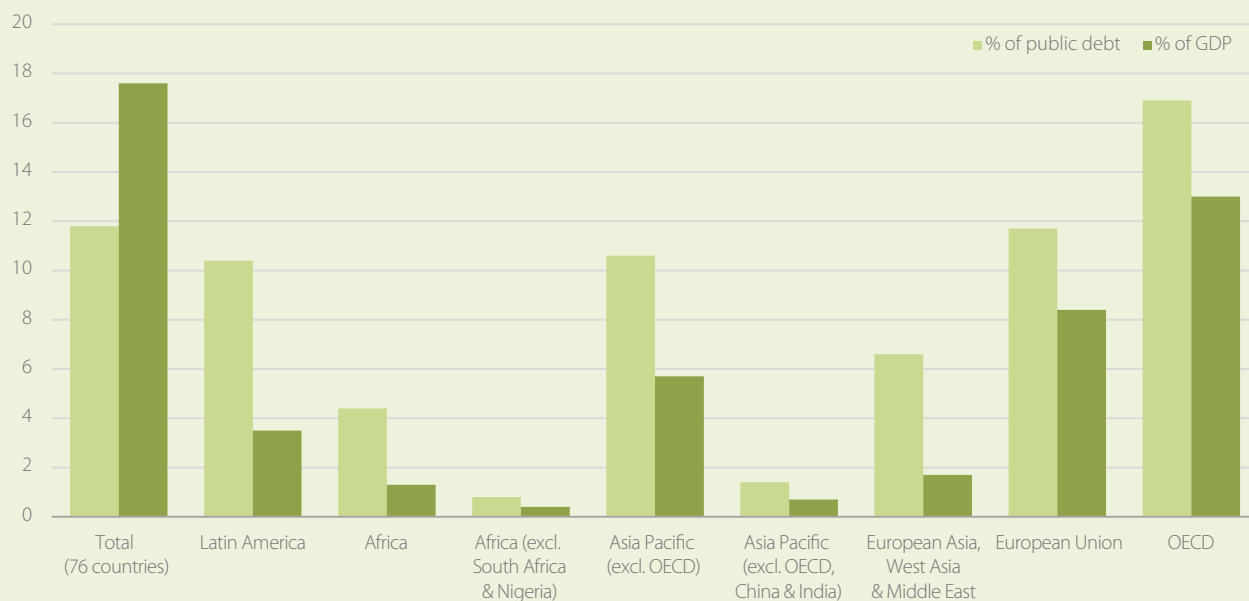
Benefit-cost analysis involves looking at the various options over a predetermined analysis period and estimating the associated **net present value** (NPV) of all life cycle costs and benefits. These are then compared either as a sum or as a ratio, and a decision is made based on the NPV or **benefit-cost ratio** (BCR). A BCR greater than one means that the benefits are higher than the costs.

The importance of local borrowing capacity and own source revenue generation for capital investments

Only a limited number of local governments in developing countries have access to credit and financial markets. The debt of local governments accounts for 13 per cent of GDP and almost 17 per cent of total public debt on average in OECD countries, but it is almost nil in most African countries except South Africa and Nigeria. In non-OECD Asia-Pacific countries, excluding China and India, it represents on average only 0.7 per cent of GDP and 1.4 per cent of total public debt (see Figure 20).

Figure 20

Local government debt as a share of GDP and total public debt



Source: Organisation for Economic Co-operation and Development, OECD-UCLG World Observatory on Subnational Government Finance and Investment (2012-2019). Available at https://stats.oecd.org/viewhtml.aspx?datasetcode=SNGF_WO&v_h=0000&vf=00&l&il=blank&lang=en&vcq=1111 (accessed on 9 November 2020).

The inability of local governments to access financial markets in most developing economies has multiple causes, ranging from low creditworthiness, legislative debt ceilings and other regulatory constraints, to the substandard technical and financial quality of projects submitted for financing. Combined with insufficient own source revenues, these structural limitations in access to financing constitute a major obstacle to the investment capacity of local governments. By curbing the ability of local governments to invest into infrastructure, equipment and services, these constraints also limit their financial viability as they cannot raise own source revenues from new, revenue-generating infrastructure investments.

Contribution provided by Serge Allou and Mathilde Penard from United Cities and Local Governments for the purposes of this handbook. Adapted with the authors' permission.

NPV and BCR are derived as follows:

$$\text{NPV} = (\text{PV of net benefits}) - (\text{PV of net life cycle costs})$$

$$\text{Benefit-Cost Ratio (BCR)} = (\text{PV of net benefits}) / (\text{PV of net life cycle costs})$$

By way of example, consider solid waste collection in the city of Cox’s Bazaar, Bangladesh.

The local government wishes to improve the LOS provided for solid waste collection. It would like to have regular vehicle collection in the core area and community collection points outside the core using dustbins. The community collection points need to be in areas that are accessible to all. A secondary transfer station is thought to be necessary as the landfill site is located outside the city’s boundaries. But is a secondary transfer station the best option to increase capacity to get waste to the landfill?

Cox’s Bazaar could consider three options:²⁰

1. Increase existing system — compactor trucks collect the waste and discharge it at the landfill.

2. Build one or two large transfer stations to reduce the distance travelled.
3. Build several smaller transfer stations in residential and downtown areas.

Figure 21 shows some of the costs and benefits associated with each of these options.

To decide on the best option, we would calculate the costs and benefits (value) of each option. We would select the option with the greater NPV or BCR. In our case, we will use BCR.

Figure 22 shows that although Option 1 has the lowest cost, the best option is Option 3 because it has the greatest BCR. Key benefits include less road congestion and greater employment in the local community.

Approach C: Multi-criteria analysis

As the name suggests, multi-criteria analysis involves using several criteria to decide which option or project to prioritize. Typical criteria and their measurements are shown in Figure 23.

Figure 21

Comparison of benefits and costs for improving solid waste collection

OPTION 1 Expand existing system	OPTION 2 Build large station	OPTION 3 Build smaller stations
<p>Costs</p> <ul style="list-style-type: none"> • Purchase, operate and maintain more vehicles • Additional operators • Damage to roads due to weight of vehicles • Fuel costs 	<p>Costs</p> <ul style="list-style-type: none"> • Construction, operation and maintenance • Additional vehicles and operators • Loss of property value near station due to odor and pest problems 	<p>Costs</p> <ul style="list-style-type: none"> • Construction, operation and maintenance • Handcarts and tricycles to collect waste • Equipment for station
<p>Benefits</p> <ul style="list-style-type: none"> • Increased capacity • Improved public health and sanitation 	<p>Benefits</p> <ul style="list-style-type: none"> • Increased capacity • Large vehicles removed from city • Improved public health and sanitation 	<p>Benefits</p> <ul style="list-style-type: none"> • Increased capacity • Large vehicles removed from city • More engaged community • Improved public health and sanitation

The scores are added up and those assets scoring the highest are considered the most

important and would normally be given the highest priority, as seen in Figure 24.

Figure 22

Benefit-cost analysis of solid waste collection options

Option	Cost (USD)	Benefit (USD)	BCR	Comments
1. Expand existing system	\$150,000	\$50,000	0.33	Benefit reduced by congestion costs
2. Build large transfer stations	\$350,000	\$200,000	0.57	Benefit reduced by lower land value near station
3. Build smaller transfer stations	\$200,000	\$150,000	0.75	Greater employment in local community

Figure 23

Sample scoring for multi-criteria analysis

Criteria	Sample scoring	
	1	5
Importance of asset to local government	Not important	Very important
Impact on community if asset is out of service	Very low	Very high
Condition of asset	Very poor	New
Replacement value of asset	< \$50,000 USD	> \$10 million USD

Figure 24

Multi-criteria analysis of projects

Asset	Age (years)	Value (USD)	Importance	Impact	Condition	Replacement value	Score	Rank
Elementary school	15	\$100,000	3	4	3	2	12	4
Water treatment plant	10	\$5,000,000	4	5	4	4	17	1
City office	40	\$1,000,000	4	3	3	3	13	3
Garbage collection fleet	10	\$100,000	5	4	5	2	16	2

If we had only considered value or condition, the ranking would be different.

In the example in Figure 24, all four criteria are given equal weight. But in some cases, some criteria may be more important than others.

You can apply weighting factors to the criteria themselves to reflect the importance of one over another.

For example, when comparing critical assets such as water supply systems or wastewater collection systems, the underlying assets must be in working order to deliver the level of service expected of the system by its customers. If the assets fail, the ability to deliver the desired LOS may be compromised. An asset that has a major impact on the ability to meet the LOS would be considered more critical to the system than an asset whose failure would not have a significant impact on the LOS.

You might therefore decide that condition and impact are more important in your analysis, and assign weighting to the criteria to reflect this.

How do we do this? All the criteria should add up to a value of 1 or 100 per cent. If we have four criteria and we decide they are all worth the same, each one will have a value of 1 divided by 4, or 0.25. If we decide that condition

and impact are more important and increase their values to 0.3 and 0.4, respectively, then we have to reduce the values of the other criteria so that our total value is still only 1. See Figure 25 for an example.

Note that weighting is applied to criteria, not to individual assets.

Approach D: Risk-based decision-making

In risk-based decision-making, we weigh a series of risk criteria, e.g. safety, service delivery, technical obsolescence, maintenance and financial. We then calculate a combined risk score and use it to prioritize projects. This is useful when trying to evaluate replacement projects for critical assets that are in poor condition.

Let us apply risk-based decision-making to the water treatment plant in our previous example. We have decided to upgrade the plant, but we have two options to consider:

Option 1: Upgrade existing plant with current treatment technology

Option 2: Upgrade existing plant with new treatment technology

Using risk management steps 1-3 from Figure 16 above, we identify the major risk criteria that apply to this project. We assign a score

Figure 25

Multi-criteria analysis of projects—unequal weighting

Asset	Age (years)	Value (USD)	Importance	Impact	Condition	Replacement value	Score	Rank
Weighting factor			0.1	0.4	0.3	0.2		
Elementary school	15	\$100,000	0.1 (3) = 0.3	0.4 (4) = 1.6	0.3 (3) = 0.9	0.2 (2) = 0.4	3.2	3
Water treatment plant	10	\$5,000,000	0.4	2.0	1.2	0.8	4.4	1
City Office	40	\$1,000,000	0.4	1.2	0.9	0.6	3.1	4
Garbage collection fleet	10	\$100,000	0.5	1.6	1.5	0.4	4.0	2

Note: weighting applies to criteria, not individual assets.

Figure 26

Risk-based options analysis

Risk criteria	Option 1: Old technology	Risk score	Option 2: New technology	Risk score
Service delivery	Understood by operators	1	Requires additional training that may impact on service delivery	2
Technical obsolescence	Could become obsolete before plant exceeds useful life	4	Should not become obsolete	1
Financial	Cost overruns likely; corruption	3	Cost overruns likely; corruption	3
Total risk score		8		6

Exercise 3

a. What sources of funding does your government rely on to deliver its capital programme?

b. If the following weighting factors were applied to the four given criteria, what would be the new score and rank of each project in the capital plan? How does it change from the rankings in figures 24 and 25?

Importance = 30 per cent

Impact = 30 per cent

Condition = 20 per cent

Replacement value = 20 per cent

Asset	Age (years)	Value (USD)	Importance	Impact	Condition	Replacment value	Score	Rank
Weighting factor			---	---	---	---		
Elementary school	15	\$100,000	Old: 3 New: ___	Old: 3 New: ___	Old: 3 New: ___	Old: 2 New: ___	---	---
Water treatment plant	10	\$5,000,000	Old: 5 New: ___	Old: 5 New: ___	Old: 5 New: ___	Old: 4 New: ___	---	---
City office	40	\$1,000,000	Old: 4 New: ___	Old: 4 New: ___	Old: 3 New: ___	Old: 3 New: ___	---	---
Garbage collection fleet	10	\$100,000	Old: 5 New: ___	Old: 5 New: ___	Old: 4 New: ___	Old: 3 New: ___	---	---

of 1 (low risk) to 5 (high risk) and use these to evaluate each option against the criteria, as shown in Figure 26.

Based on this evaluation, we would select option 2 because it has the lowest overall risk score.

2.5 Financial management

Pillar 3

Financial management

- Financial analysis (affordability)
- Benefit-cost analysis
- Funding plan

We have now explored demand management and life cycle management. Let us turn to the third and final pillar of our asset management framework: **financial management**. It involves financial analysis and reporting and leads to the organization's funding or financial plan.

The link between maximizing the financial value and the service value of our assets goes both ways. We cannot make good financial decisions without understanding asset portfolio requirements, and we cannot make good portfolio decisions without understanding the financial picture and implications. Therefore, it is essential that we integrate the financial management pillar with the first two pillars.

“Cities need to maximize traditional revenue sources such as tariffs, taxes, and transfers, and also learn how to mobilize innovative sources of finance such as land value capture, blended finance, crowd funding, infrastructure as an asset class and others, for ensuring sustainable asset management and quality urban service delivery.

Bambang Susantono, Vice President for Knowledge Management and Sustainable Development, Asian Development Bank ²²

2.5.1 Financial policies

Good financial management begins with good financial asset management policies.

All governments have national financial policies that stem from a set of financial laws. Financial *asset management* policies provide direction on how financial principles apply to assets to ensure that service goals are met. They guide analysis, reporting and planning and should give direction on key considerations such as valuation, allocation, use of proceeds and analysis, as detailed in Figure 27.²¹

We can now begin the process of analyzing our financial requirements to ensure our asset portfolio allows us to achieve our principles and objectives.

2.5.2 Financial analysis

How does your government project revenues and expenses? How does it plan for the funding of future expenditure and asset-related costs? The activities and analysis behind this planning also apply to asset management, and they center on two essential quantities: revenues and expenditures.

Revenues can come from many sources. Through asset operations, we can generate own source revenues from leases, rentals, licences, user fees, taxes, development charges, etc. Revenues also emerge in the form of capital, such as: (note that loans are also liabilities)

- Proceeds from the sale of assets
- Direct transfers from other levels of

Figure 27

Components of financial asset management

VALUATION <ul style="list-style-type: none">• Required before any allocation or disposition transaction regardless of entity involved• Allocation of any surplus property for private use should be done using fair market value
ALLOCATION <ul style="list-style-type: none">• Open, fair and transparent procurement process• Value for money achieved
PROCEEDS <ul style="list-style-type: none">• Revenue generated should contribute to maintaining or growing wealth of organization
PRIVATE SECTOR ACQUISITION <ul style="list-style-type: none">• Must be a justified requirement in capital plan
DEPRECIATION <ul style="list-style-type: none">• Assets depreciated in accordance with national direction
ECONOMIC ANALYSIS <ul style="list-style-type: none">• Economic life of assets defined• Financial analysis parameters to be used

government

- Commercial credit, including municipal bonds
- Loans from local, national, regional or international lenders

Meanwhile, expenditures are all the direct and indirect costs associated with planning, acquiring, using and disposing of assets.

But how do we know from one year to the next what revenues we can expect and what our expenditures will be? We make projections based on factors such as demand, industry trends, recent experience and historical revenue and cost data.

Consider the following hypothetical examples.

Expenditure example: To project the cost of replacing the roof on City Hall, we can look at historical revenues and costs. Here are some

simple calculations:

- Cost to replace roof in 2015 = \$100/m²
- Inflation = 3 per cent per year
- Estimated cost to replace roof in 2020 = \$100 x (1+0.03)⁵ = \$116/m²

Revenue example: To project revenues from user fees and permits, we can study the trends. For example:

- User fees/permit revenue for 2017 = \$20,000
- Revenue has decreased by 2 per cent per year for the last three years
- Estimated revenue for 2020 = \$20,000 / (1+0.02)³ = \$18,825

In the revenue example, we would look into why revenues have decreased. Is it due to poor

A UN-Habitat initiative to enhance local revenues in Kiambu County, Kenya

UN-Habitat, supported by SIDA, has worked with the county government of Kiambu in Kenya on a local finance initiative to help identify bottlenecks in its financing frameworks, cut public expenditures and eventually increase revenues. The county has faced a myriad of challenges in revenue generation. For instance, authorities had little information about the local property landscape. With 40 per cent of county residences and commercial properties being informal and unregistered, property taxes provided a limited source of revenue. In addition, accounting challenges sometimes resulted in the misappropriation of county funds, which also gave the electorate a negative perception of corruption within the county government.

As part of the initiative, UN-Habitat designed and implemented a methodology for a revenue analysis exercise. UN-Habitat's intervention included land re-

zoning policies and a transformation of the government's valuation roll to boost property taxes. Remote devices helped automate the county's accounting and billing processes to enhance tax compliance. Further, the county staff consulted experts on how to improve overall financial capacity and integrate finance principles into local economic development initiatives.

The results of the intervention were encouraging, with the county's revenues doubling from \$12 million to \$24 million USD within three years. Seeing positive results, the county government, in collaboration with UN-Habitat, developed a policy and law to attract private investment in local county-owned infrastructure. The Government of Kenya has upgraded this initiative to a national policy and extended it to several projects in the areas of local finance, planning, and law and regulations. UN-Habitat also facilitated the development of a local urban infrastructure fund to narrow the gap between local infrastructure needs and financing through private sector engagement.

Contribution provided by Marco Kamiya from UN-Habitat for the purposes of this handbook. Adapted with the author's permission.

service, or are we providing a service that is no longer needed? Can we offset the lost income by reducing other expenses? We may have to increase fees or find other sources of income to continue with the same level of service since the decrease in revenues means we have to reduce the level of service. We could undertake a financial assessment of the change and then another of the impact of increasing fees or reducing the level of service.

Financial analysis also helps us calculate the variables needed for benefit-cost analysis introduced above. Assessing the financial implications supports us in our decision-making when there are competing priorities and trade-offs between projects. We need financial analysis to give us a better picture of how to fund our capital plan and make critical decisions about service delivery.

Let us say our capital plan includes a major road maintenance project. To generate revenue for this project, we are debating between selling land or renting it out through a long-term

lease. What are the pros and cons of each option? Some of these are listed in Figure 28.

Financial analysis is also important in understanding the impact of our capital plan on service delivery. We will never have enough funding to meet all our capital planning needs. Therefore, we need to prioritize on the basis of which options will provide the greatest benefit for the community at the lowest cost.

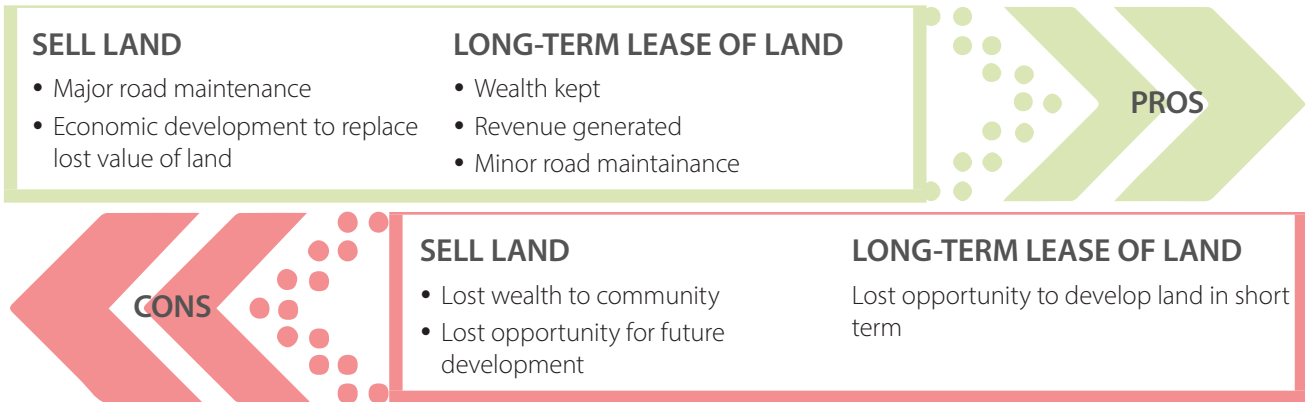
2.5.3 Financial reporting

Financial reporting, and the system used to support it, is vital to asset management. Asset managers must be able to explain what financial information they need and why. Consequently, there must be agreement and understanding on the definitions of key terms, such as *capital asset*, *operating costs*, *capital costs*, *recapitalization*, *renewal and repair*, so that the appropriate reports can be generated.

The chosen accounting method (cash or accrual) should follow national and international

Figure 28

Pros and cons of selling or leasing land to generate revenue



standards, and everyone involved in financial reporting should understand how it works. The method in use directly impacts on asset value, depreciation and capital expenditures. In addition, the financial system must be compatible and interlinked with the asset inventory system, not only to avoid duplication and errors but to streamline the efforts of financial and asset managers alike. The hierarchy and structure of the inventory system should work for both asset managers and financial managers.

In addition, financial reporting needs to be timely and transparent so that data can be used for investment planning. The checklist in Figure 29 is a good example to follow to make sure financial management and reporting aligns with asset management.

Cash basis accounting: revenues are recorded when cash is received, and expenses, when they are paid.

Accrual basis accounting: revenues and expenses are recorded when they are earned, regardless of when the money is actually received or paid.

Source: Cameron McCool (Bench), "Cash Basis Accounting vs. Accrual Accounting", 19 November 2020.

2.5.4 Investment planning

The final stage in financial management is to develop the funding or investment plan. Whereas the capital plan discussed in Section 2.4.3 covers *what* needs to be done, the investment plan details what you can *afford* to do.

The investment plan should answer the following questions:

- How will you pay for operational expenditures and capital investments (own source revenues, intergovernmental transfers, grants, other funding entities)?
- How will the revenues and expenditures be linked to effective asset management and feed into the medium-term budget?

Like the capital plan, the investment plan is a medium-term planning instrument that is typically produced every three to five years. An annual budgeting exercise should take place to ensure that annual budgets are in line with the investment plan.

The investment plan should feed directly into the local budget and include:

- *Key financial policies*— these may relate to financial management, tax, general revenue, development charges, asset management, debt and surplus management, etc. Key

Figure 29

Financial management checklist

- ✓ Is the current practice of financial management conducive to higher efficiency in asset management?
- ✓ What is the current system of accounting? What are the accounting methods?
Do they correspond to national regulations, international practice and recommendations?
- ✓ Is the financial asset management and reporting system audited and credible?
- ✓ Is financial reporting compatible with the inventory system and methods of valuation? Are links and references provided from one report to the others?
- ✓ Is the financial asset management and reporting system transparent, clear and timely?
- ✓ Does financial analysis assist in the evaluation of options?

Adapted from Fernando Fernholz and Rosemary Morales Fernholz, p. 42³

financial policies might include goals or guidelines for critical fiscal management metrics, such as the percentage of the annual budget to be committed to capital improvements, metrics to limit the size of annual debt service and limits on total outstanding debt.

- Meanwhile, governments can also explore how to leverage private finance for infrastructure investments by encouraging investors to treat infrastructure as an asset class. They can increase investor confidence with improved asset management, such as detailed asset data collection, for better decision-making and more accurate risk-return-profiling.²⁴
- A *fiscal capacity assessment*, in which the city estimates future revenues, future operating expenditures and the amount of funds available to transfer to capital reserves. Sources of funds for a city's capital plan might include:
 - Own source revenues (or 'pay as you go' capital reserves)
 - Grants or transfers from other levels of government
 - Grants from external sources

- Long-term debt (for example, general obligation bonds backed by the full faith and credit of the issuing government)
- External finance from the private sector through commercial loans or in the context of public-private partnerships (PPP)
- *Financial strategies* that aim to minimize the gap between the fiscal capacity and the projected operating and capital expenditures for asset maintenance, renewal and acquisition.
- *Financial indicators* as a means of reporting the government's financial condition as determined by the financial forecast.

During times of economic instability, such as the 2020-2021 COVID-19 response and recovery period, it can be tempting for organizations to divert income from one asset portfolio to another where funding is lacking. For example, diverting revenues from a five-year-old thriving community market with sound assets — even if their use drops temporarily — would leave insufficient funds to cover operations, maintenance and renewals once the economy restabilizes and the market resumes its normal levels of business. Over time, the level of service drops, and the assets

deteriorate until major funding is required to rehabilitate or replace the assets altogether.

2.5.5 Asset valuation

How do we determine asset value so that we can answer the second of the 'six whats': What is it worth? Some assets depreciate in value (e.g. equipment), and others appreciate (e.g. land).

There are three main approaches to asset valuation, as outlined in Figure 30. When and where to use each depends on the type of asset and the purpose of the valuation.²⁵

While *book value* is of interest to an accounting team, the land-use management or development team needs to know *market value*. Since the rule of thumb for investment planning is that 2 per cent of the replacement value of our portfolio should be spent annually on asset recapitalization and maintenance, the teams tasked with capital planning and maintenance planning, respectively, need to know *replacement value*.

Once land has transferred from public to private ownership, it can become an important source of revenue from property taxation. There are four methods to assess the values of private land for property taxation purposes, as outlined by the Asian Development Bank:

Capital market assessment is based on sales of similar pieces of land and properties, such as residential, agricultural, or industrial land, or on the cost of the buildings' construction for immovable properties in isolated locations. The assessment requires data on land and property sales, as well as related attributes to capture the true taxable value.

Although this method typically results in higher accuracy, its collection, maintenance, and analyses of required data on market transaction information on characteristics of plots are costly and require trained staff. The method is inherently less transparent and needs significant

investment in public awareness to mitigate appeals from taxpayers against the value assessment.

Rental value assessment establishes the typical rent required to occupy a particular land or property. Although it requires a significant amount of data, information on rental values is usually easier to obtain. This assessment method is not applicable to non-rentable or industrial properties that are commonly not on the rental market. As this assessment identifies the current rental value, it disincentivizes the sale of land for more efficient uses than for renting. Also, rental controls can distort the true value of land and property.

Area and location-based assessment values land taxes based on land area, location and land use, whereas property taxes are assessed based on the building area or volume. This method does not require huge amounts of data and is more transparent and comprehensible to communicate to taxpayers. It is also easier to administer.

While the assessment method has shown to improve property tax collection rates significantly for different areas of a municipality, it does not accurately reflect the actual value of land and property, potentially undervaluing the land/property, leading to unequal distribution of taxation.

Points-based assessment is a hybrid between an area-based and market-based valuation system. It uses the surface area of land and observable characteristics such as access to paved roads, electricity access, or criminal records of the neighborhood. The characteristics — if affecting market value — are given negative or positive points based on a rough judgement. This method is less precise and more complex than the capital market or rental value assessment. However, it is less data-intensive, easier to administer, has high potential to be automated, is more transparent,

Figure 30

Approaches to asset valuation

Valuation approach	Description	How to calculate	Applications
Depreciated book value	<p><i>Original asset cost depreciated over the economic life of the asset.</i></p> <p>It is used to reflect the historical cost of acquisition and has no bearing on the price a buyer is willing to pay if the asset is sold.</p> <p>Assets can be bought from the private sector then sold back at the end of their useful lifespans.</p>	<p>Take the known purchase price of an asset and depreciate it according to government accounting policy.</p> <p>Acceptable depreciation methods include:</p> <ul style="list-style-type: none"> • Straight line • Declining balance based on a per cent of the book value from the previous year 	<p>Equipment</p> <p>Vehicles</p> <p>Computers</p>
Replacement cost (or value)	<p><i>Estimated cost to replace the asset with one that meets current codes and standards.</i></p> <p>This is primarily used for physical infrastructure, such as roads, bridges, water and wastewater assets and landfill sites, as these assets are not typically sold by a government to the private sector.</p>	<p>Estimate construction cost of new asset that considers all elements of the existing asset, including:</p> <ul style="list-style-type: none"> • Changes required to meet current codes and standards • Technological changes • Redundancy in existing asset • Resilience <p>Replacement cost can be depreciated to reflect remaining service or economic life.</p>	<p>Buildings</p> <p>Infrastructure</p>
Market value	<p><i>What the asset will sell for based on the current market, typically based on sales of similar assets.</i></p> <p>Factors that can affect market value, include economic conditions, type of land (serviced or unserviced), zoning and contamination.</p>	<p>Sales comparison (for land or buildings)</p> <ul style="list-style-type: none"> • Compare prices of similar assets recently sold on the open market. • Adjust for differences (e.g. size, location, age) if no comparable assets. <p>Income capitalization</p> <ul style="list-style-type: none"> • Rental property: estimate value of property from current revenue stream. • Redevelopment: estimate value of property based of future revenue potential. <p>The cost approach</p> <ul style="list-style-type: none"> • Estimate the price a buyer should pay for a piece of property as equal to the cost to build an equivalent building. • The property's value is equal to the cost of land, plus total costs of construction, less depreciation. 	<p>Buildings</p> <p>Land</p> <p>Can also be used for equipment that holds value, such as some vehicles, trucks and heavy equipment.</p>

The importance of proper valuation for local revenue generation: the example of land

Quite often, local governments are ‘land rich, money poor’. They do not have the resources to provide basic public infrastructure, but they do possess substantial wealth in the form of urban land that they own or control. Some local governments sell or lease this land for housing, commercial or industrial uses at prices well below market value—even in prime locations and despite strong demand for market-priced land. As a result, the local government loses out on revenues that might even compare to its annual budget. Meanwhile the users of the land essentially receive a hidden subsidy: the difference between the true market value of land and the below-market price they pay.

This mismanagement of public wealth occurs for a variety of reasons. Local governments might treat land

as a free resource and not recognize its market value, or corruption might result in the underpricing of local land. In some cases, ill-guided land policy might supply subsidized land, even at prices below cost recovery, for homes and condominiums that are geared towards the middle class. The poor are shut out and forced to seek informal housing options. A more nuanced and diversified policy would combine several pricing mechanisms for land allocations, including open auctions, limited-access auctions and allocations at or below cost recovery.²⁷

Evidence shows that properly generated land-based revenues can pay for urban infrastructure and even produce surpluses with which to fund social programmes such as subsidized housing. For example, China has paid for urban infrastructure with revenues from land auctions.²⁸

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and can be communicated fairly easily to the public.²⁶

In conclusion, good financial management ensures that the asset management work of your government or organization is affordable and makes financial sense in the long term. You have to gather the right financial information, which comes from proper and periodic financial reporting. This information can be supported by national financial policies, historical revenues, industry trends, asset valuation, etc. Effective demand and life cycle management also requires investment planning to specify what you can actually afford to do. Infrastructure projects that are based on sound financial planning can ultimately

improve your financial capacity for more projects in the future that will serve your community.

2.6 Asset operations

Asset operations refer to the day-to-day activities associated with planning, acquiring, using and disposing of an asset. They also comprise the people and equipment necessary to ensure that assets deliver the services that have been promised to the community at the expected performance levels.

“The objective of financial management is to ensure that efficiency gains of asset management [lead] to larger social and economic gains for the municipal population.

A Toolkit for Municipal Asset Management, p. 18 ²⁹

Figure 31

Elements of operational planning

EMERGENCY MANAGEMENT

How we deal with immediate service disruptions due to natural disasters or unusual events.

BUSINESS CONTINUITY

How we maintain critical services over the longer term when the functions that support them are disrupted. For example, the main transmission grid is damaged due to a major storm or vandalism.

ENERGY MANAGEMENT

How we minimize energy usage by our assets, such as electricity, water and fuel. For example, our policy is to turn lights off in government buildings in the evenings.

UTILIZATION

How we maximize the use of our assets so that they are close to capacity and we get the best return on our investment. Underuse costs us money and time. Even if a building is only partially occupied, we still pay to operate and maintain it as if it were fully occupied. Overusage will result in additional costs or possible early failure of an asset.

SUSTAINABILITY

How we operate our assets so that we don't compromise service delivery through overuse. For example, overuse of a borehole could result in it running dry. Recycling is also an element of sustainability. We need to determine what we will recycle and how.

2.6.1 Operational planning and delivery

Some 65–80 per cent of life cycle costs occur during the 'Use' phase.³⁰ These cover the costs of operating and maintaining an asset. O&M plans and strategies enable us to keep assets in adequate condition, meet service delivery needs and minimize costs. It is especially important here to know which are your critical assets and how to minimize their risk of failure.

Operations plans and strategies focus on service delivery. The five key elements in operational planning are detailed in Figure 31.

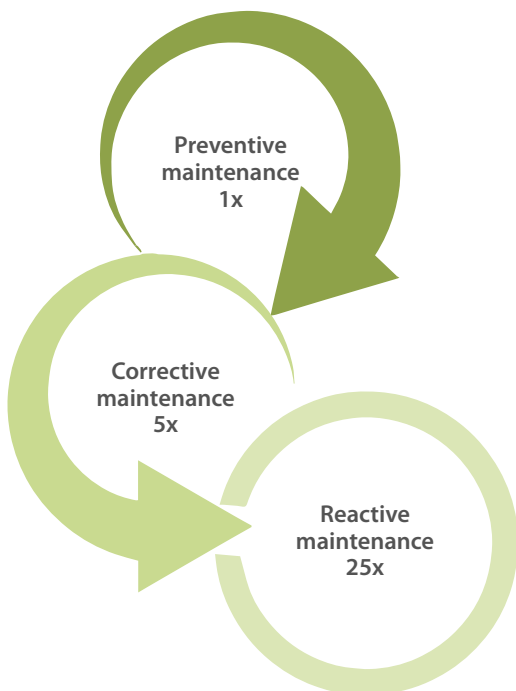
Maintenance plans and strategies, on the other hand, focus on how to keep assets functioning as required to meet service objectives. They can address one asset or a group of related assets.

For a given task, **preventive maintenance** (regularly scheduled inspections and minor maintenance activities, such as changing filters, lubricating equipment or cleaning sewers) costs less than **corrective maintenance** (repairs to defects or failure of minor components) and significantly less than **reactive maintenance** (responding after something has broken).

Unfortunately, we do not see the immediate impact of *not* undertaking preventive and minor maintenance. Consider a garbage collection vehicle. It needs regular oil changes, tire rotation and lubrication of moving parts. If we do not do any of these things, the vehicle will not break down today or tomorrow. We might start to see an increase in fuel consumption, we may not be able to drive it over poor roads, but it will not fail outright. Nevertheless, its service life is being shortened. The

Figure 32

The 'law of fives'— Deferred maintenance will cost you



major components will eventually fail—the gearshift or an axle could break. Instead of lasting another ten years, it will last only five.

Indeed, the cost of deferring maintenance is subject to de Sitter's 'law of fives' (see Figure 32).³¹ The rule states that if you wait to perform minor repairs as part of preventive maintenance, they will become moderate repairs costing five times more, and if still left unattended to, will turn into major repairs costing another five times more. Maintenance turns from preventive to corrective to reactive.

In reality, few if any local governments can afford to undertake preventive maintenance on every asset. So, a balance must be struck between preventive, planned and scheduled maintenance (e.g. inspections) on the one hand, and unplanned, reactive maintenance often arising from unexpected failures on the other. To achieve this balance, we first need to have a maintenance strategy that:

- Identifies our critical assets based on the risk to service delivery if the asset were not available.
- Identifies all statutory and regulatory compliance requirements.
- Identifies roles and responsibilities for asset maintenance.
- Identifies intervention levels— at what point will we consider major maintenance or replacing assets?

We then need to develop a maintenance plan to implement our strategy. What activities will we undertake when and at what estimated costs?

The following key maintenance activities are included in the plan:

- Actions to be taken for critical and non-critical assets to keep up with normal use:
 - Inspecting, testing and monitoring for safety and compliance
 - Preventive maintenance
 - Corrective maintenance
- Programme of scheduled maintenance activities
- Delivery mechanisms to be used, whether in house, through the private sector or a combination
- Performance indicators to signal when major maintenance, rehabilitation or renewal is needed

Let us consider a maintenance plan for street lighting. Here are some areas our strategy will need to consider:

- Type of power source (solar or electric)
- Type of lamp
- Actions on lamp failure (e.g. replace individually upon failure, scheduled replacement of all lamps)
- Cleaning requirements (essential for solar panels)
- Performance indicators, such as response time to address faults for hazardous

or non-hazardous events or to repair power outages

- Performance monitoring protocols, such as inspection and reporting frequency
- Replacement criteria
- Qualifications and skills of maintenance personnel
- Stock levels and equipment needed

“ ***Our operational planning is reactive. We fix on failure—the user informs us that there is a problem. We don’t have enough resources to keep up so it’s a financial and human resource challenge to take care of everything.*** ”

A local government official of Tanga Municipality, Tanzania³²

The maintenance plan balances the total costs

Community-based rural road maintenance by women ethnic minority groups in Western Yunnan, PRC³³

Traditionally, rural road maintenance in Dehong Prefecture in Yunnan Province was carried out through voluntary contributions from communities along the road, typically 1–2 days per year, with maintenance tools purchased through provincial and local maintenance subsidies. Due to limited labor inputs and a lack of skills training, maintenance quality was suboptimal and roads continued to deteriorate.

Through a \$250,000 USD technical assistance project from the Asian Development Bank (ADB), the provincial transport department allowed more flexible use of provincial maintenance subsidies. This made it possible to finance the remuneration of 28 women maintenance groups that work year-round under a performance-based routine maintenance contract to keep the roads

of doing the activities with the total risks of not doing them, i.e. the impact on service delivery. For each asset included, the plan identifies and prioritizes the activities to be done and the costs associated with them. From there, we can aggregate the costs to get a total maintenance cost for all assets in the plan, i.e. how much we need to spend to maintain street lighting throughout the city in a given period of time. We can further aggregate maintenance costs for all public assets (not just street lighting), and these costs become a part of the overall investment plan discussed earlier.

Investing in the maintenance of assets can also bring positive socioeconomic benefits such as gainful employment and female empowerment. Check out the box highlighting the key role of women’s groups in the upkeep of rural community roads in Yunnan Province, People’s Republic of China (PRC).

open and in good condition. 129 women, mainly ethnic minorities, were provided with technical and managerial training and employed in rural road maintenance with a flexible schedule to carry out other household and farm responsibilities.

As a result, not only have the roads improved, but wages obtained from the maintenance work have provided a major boost to women’s household incomes, raising them beyond the country’s official poverty line and providing them with greater decision-making power in their households. This project has demonstrated potential for wider application in PRC and other developing countries.

Strategy 2030 of the Asian Development Bank (ADB) identified “making cities more livable” as one of its seven operational priorities. It aims to improve coverage, quality, efficiency and reliability of services in urban areas; strengthen urban planning and financial sustainability of cities; and improve urban environment, climate resilience and disaster management of cities. Learn more at <https://www.adb.org/documents/strategy-2030-op4-livable-cities>.

Contribution provided by the Asian Development Bank for the purposes of this handbook. Adapted with the authors’ permission.

2.6.2 Setting goals and performance measures

We must review the goals and levels of service we set as part of demand management to ensure we are meeting them. If not, we need to figure out why. Is the asset not performing as expected for technical reasons? Or have the goals and LOS become irrelevant due to demographic or other changes? If there are performance issues, are they customer-related or technical, i.e. are they due to a sudden increase in demand, for example, or are they due to the condition of the asset?

Using performance measures will help us determine these answers.

Our goal and our measures must be 'SMART'—Specific, Measurable, Achievable, Relevant, Time-bound (see Figure 33).

Let us apply 'SMART' to our example from earlier on water provision. In Figure 12 of

Section 2.3.3, we established the national goal, performance goal, levels of service, LOS attributes and the service area. Now, we need to identify relevant performance targets for each attribute. Figure 34 categorizes the specified attributes as either technical or customer-based and lists 1-2 performance measures for each.

Let us return to our goal: to provide safe and reliable basic water supply to 95 per cent of population by 2025.

Is it 'SMART'? Yes!

Now let us look at our performance measures. Are they 'SMART'?

Perfect performance may not be attainable and, even if so, not all of the time and not along every measure (attribute). This is why we specify performance targets that are more within reach, while still satisfying attributes such as reliability, availability and responsiveness.

Figure 33

SMART goals



Specific

What exactly do you want to accomplish and why? What are the expected results?



Measurable

What are you measuring and how? Is it simple and repeatable?



Achievable

Set realistic goals and targets for achieving them. Unachievable goals may discourage people.



Relevant

Align goals with broader national government goals and performance measures.

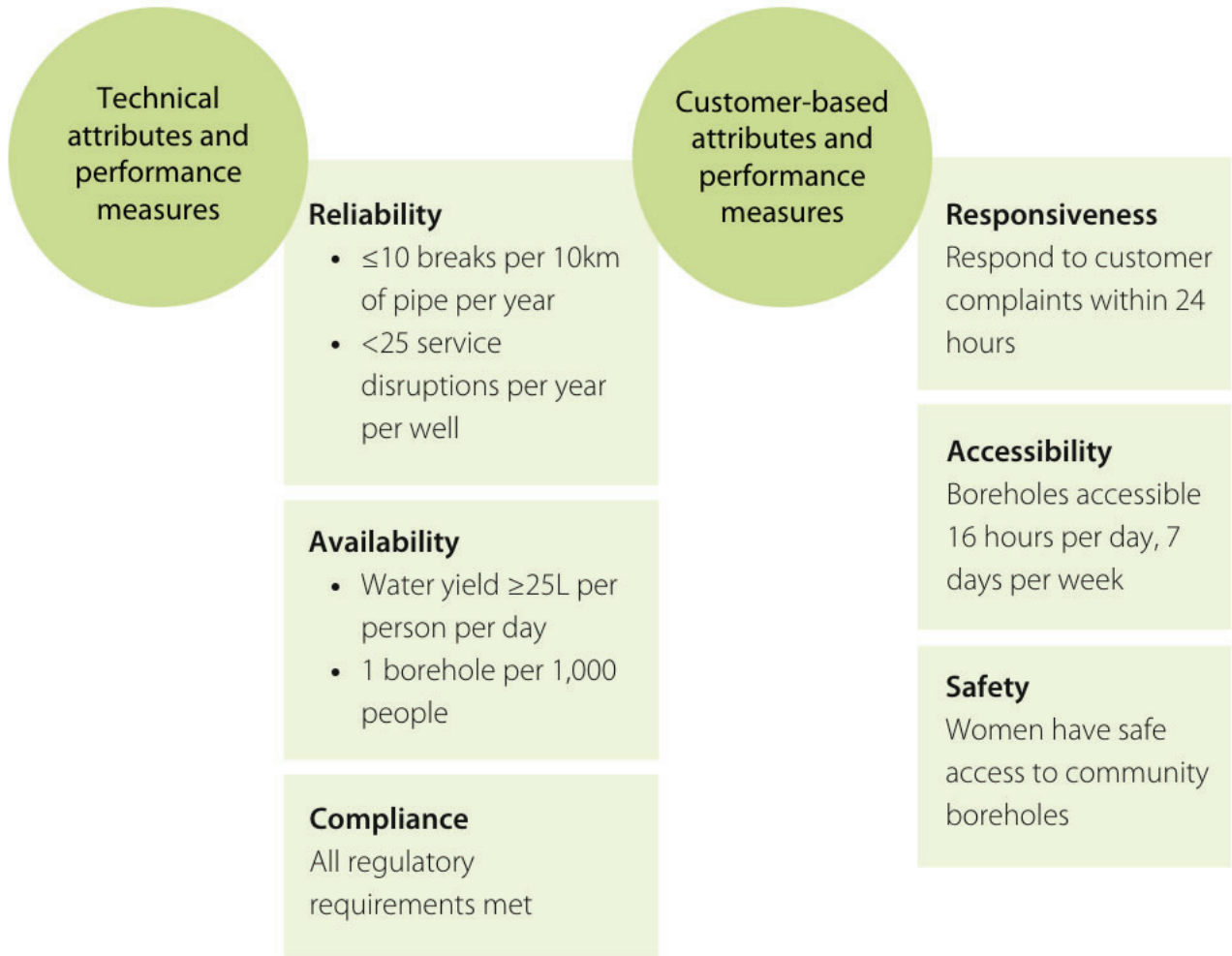


Time-bound

Set a deadline for each goal. Otherwise, there is no urgency to achieve it. Goals should frame concrete activities, not become aspirations or ideals that cannot be lived up to within a reasonable time frame.

Figure 34

Performance targets for technical and customer-based LOS attributes—water provision example



For example:

- Less than 25 service disruptions per year per well, 95 per cent of the time.
- Water yield ≥ 25L/person/day, 90 per cent of the time.
- Customer complaints will be responded to within 24 hours, 95 per cent of the time.

There may be instances where we do want to achieve 100 per cent performance, such as attributes related to compliance and safety. For example, safe access to the water supply is especially important for women and girls in

places where they are primarily responsible for water collection.³⁴ This job is time-consuming and potentially dangerous. A more appropriate SMART performance measure for the attribute could read as follows: Women have safe access to community boreholes *at all times*.

It is not enough to have performance targets. We must check our progress towards these targets and also record our findings over time so that we can monitor any changes, particularly drops, in performance. If we are not meeting our targets, we need to figure out

why and how to fill the gaps.

2.6.3 Measuring performance

Information about asset performance is essential for managing assets throughout their life cycles. Measuring asset performance (and monitoring it, which we cover in the next section) helps us know whether the implementation of our asset operations and maintenance plans is meeting the goals and performance targets we set.

Before collecting any data, we need to determine what asset information is critical for decision-making and how we will go about obtaining it, including the necessary expenses

(e.g. salaries of maintenance personnel). Chapter 5 looks at the data collection process in more detail, including how to collect data on asset performance.

Performance measurement methods must be clearly defined and replicable. Anyone with the appropriate level of training should be able to get the same result from the same method. Where possible, we need to quantify words such as ‘consistently’, ‘routinely’, ‘occasionally’ and ‘sometimes’. Without any numeric measures, we cannot compare performance from one year to the next or between assets. Measurement methods should also be as simple as possible to collect the

Figure 35

Comparison of performance and service life condition ratings

Condition rating	Service life-based	Performance-based
1–Excellent	>90 per cent of service life remaining	Asset is like new, only preventive maintenance required.
2–Good	75-90 per cent of service life remaining	Asset is showing minor deterioration, with minimal need for minor repairs.
3–Fair	50-75 per cent of service life remaining	Asset is showing normal signs of deterioration, with ongoing need for minor repairs.
4–Poor	25-50 per cent of service life remaining	Asset is showing rapid deterioration, with ongoing need for replacement of major components.
5–Failing	<25 per cent of service life remaining	High risk of failure/breakdown, with excessive maintenance required and repair costs incurred.

Figure 36

Performance-based reliability rating

Reliability rating	Performance measures
1–Excellent	Always (100 per cent of time) meets performance measures
2–Good	Consistently (95 per cent of time) meets performance measures
3–Fair	Routinely (75 per cent of time) meets performance measures
4–Poor	Occasionally (50 per cent of time) meets performance measures
5–Failing	Seldom or no longer meets performance measures (<25 per cent of time)

necessary data.

Let us look at how to do this for two of the service attributes we discussed earlier: condition and reliability.

Condition rating tools do not have to be complex. Here are two simple methods we can use. The first is based on remaining service life, and the second is based on observed performance (see Figure 35).

Just as we cannot afford to maintain everything, we cannot afford to inspect everything. The service life method can be a paper or desktop exercise to help us quickly determine the overall age-based condition of our portfolio. As long as we know when we acquired our asset and its service life, we can determine its condition. We can then use this information to set up a more detailed assessment for those assets in fair or lower condition.



Photo © JC McIlwaine/UN Photo

We can assess reliability based on how our asset meets the performance targets we set for it (see Figure 36).

2.6.4 Monitoring performance

Information is of no use if it does not help us track asset performance. This activity is called 'performance monitoring'. The information we measure and monitor at the operational level tells us how well we are managing service delivery. An asset may not be performing as expected, and monitoring this can lead us to take corrective action.

Let us continue with the water provision example to see how performance metrics can help us understand performance issues and the importance of monitoring performance.

Our target for availability is a water yield of $\geq 25\text{L/person/day}$, but recent testing indicates that the yield has dropped to 20L/person/day for five of the days in the past month. There could be a range of reasons for the lower yield, so we need to investigate.

- Is it due to reliability?
 - Are there service disruptions?
 - Are there breaks in the pipe?
 - Is the pumping equipment functioning?

If we have been monitoring service disruptions and their cause, we will know if it is due to equipment or flow.

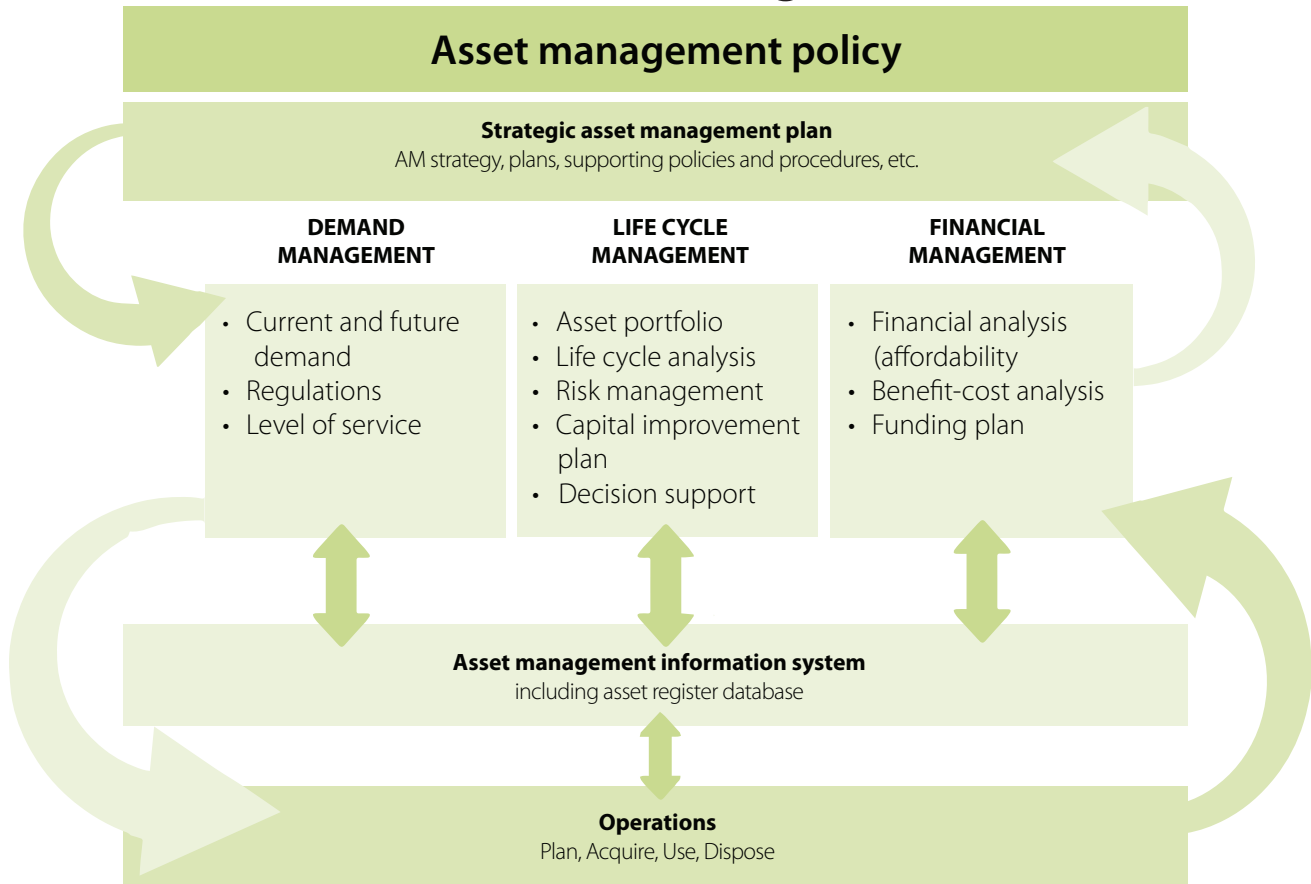
- Is it due to condition?
 - Is our pump getting old?
 - Are there breaks in the pipe?
 - Is the pumping equipment functioning?

If we know the age of our equipment and have been monitoring maintenance activities, we will know if this is our cause. If not,

- Is it due to functional performance?
 - Are we seeing reduced flow at other boreholes that would indicate a problem with the source?

Figure 37 (Figure 4 revisited)

Information and the asset management framework



- Is there a drought and a drop in the water table?
- Is there increased demand, exceeding the capacity of the borehole?

If we have been monitoring weather patterns or the number of people using the borehole, we will know if this is the problem.

Once we establish what, when and why, we can determine our options for how to improve service delivery.

It should be clear by now that asset management is not static. We need to change and adapt as our organizational and community needs change. The information we learn from measuring and monitoring the performance of our assets feeds back into our asset management framework. It informs policy and can lead us to modify our strategy and direction.

These links were shown by the upward green arrows in Figure 4, reproduced here as Figure 37.

In addition to monitoring asset performance, we need to periodically review the performance goals and targets themselves to ensure they are still 'SMART'. An asset may be performing exceedingly well, so we can set a higher goal and adjust our targets upwards (and vice-versa). These adjustments will also impact on our O&M strategies and plans, i.e. we may be over-investing resources for the same performance outcomes.

We need to define the procedures for monitoring assets and also for reporting the results, as information will eventually be fed up to the strategic level where it is checked against our broader, organization-wide goals and objectives. These activities rely on personnel with

specific responsibilities and skills that they may need to acquire through training. Who will undertake this activity—internal staff, external experts or both?

Let us now look at what we need to implement asset management in our organization.

2.7 Organizational factors that enable asset management

Within every organization, there are human and technological factors that enable asset management. This section is designed to help you identify the people and things that can facilitate your work as an asset manager or, if these are lacking, to identify and demonstrate the need for them to the relevant decision makers.

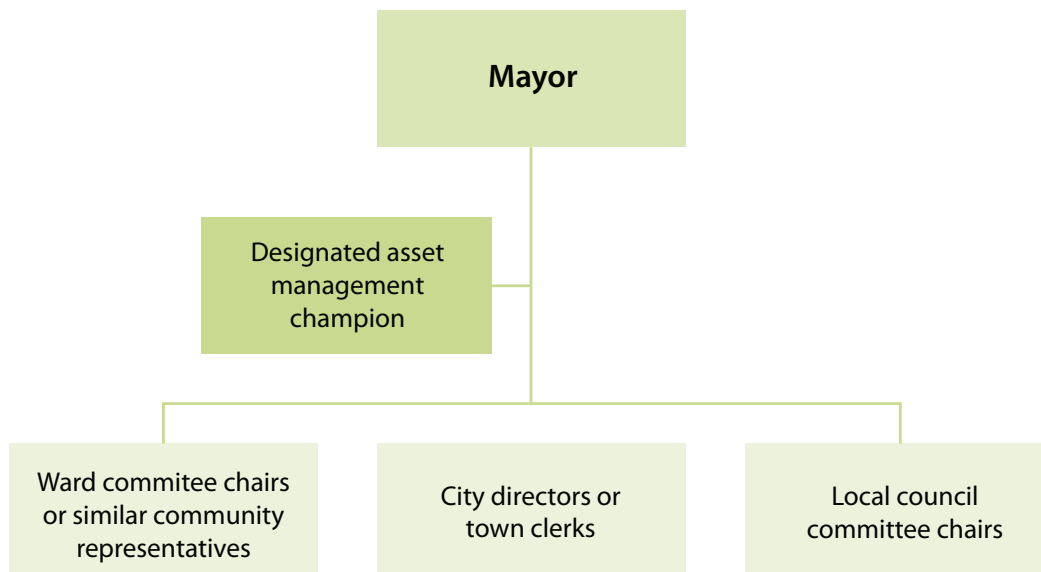
2.7.1 Human factors

Organizations that are successful at asset management should have:

1. An **asset management champion (or focal point)**, meaning a senior-level individual tasked with promoting asset management internally and helping to coordinate interactions with external stakeholders. In the beginning, this need not be a new position. A highly motivated local government official with relevant expertise could champion asset management alongside their routine portfolio. As the benefits of asset management materialize over time, the local government should entertain establishing a new senior-level, full-time position for an asset management focal point.
2. An asset management team comprising key personnel from, or qualified to engage with, the finance, engineering/works and planning departments.
3. The third factor is support from the local council and senior management team. This ensures the champion and team can advocate for asset management both in principle and in practice. This relationship is crucial in developing an asset

Figure 38

Asset management champion's position within an organization



management 'culture' within government and ultimately ensuring accountability and transparency to the electorate. Do not feel discouraged as it can take time and effort to convince staff and community members of the benefits and to get their buy-in. Without political support and visibility though, the champion's mission is unlikely to be accomplished.

Figure 38 shows where the asset management champion might sit in relation to the local government's corporate and strategic planning team.

The specific organizational structure of the local authority and its departments can vary between localities and countries. Regardless of the specifics, it is important that asset management roles and responsibilities are clearly defined for all stakeholders who actively manage assets, and that they have the skills and tools needed to do their jobs. This may require additional support through mentoring or training.

Can you wait 30 minutes?

My asset management team had arrived to speak to the technical and financial staff of a council but were asked to wait. It turned out that with everyone in the room, they were embarrassed to admit that they did not actually know each other and wanted the chance to introduce themselves before they met with us.

Moral: Asset management is teamwork and many are involved—so know your team!

Anecdote provided by Penny Burns, Chair at Talking Infrastructure (<https://talkinginfrastructure.com/>), for the purposes of this handbook. Adapted with the author's permission.

2.7.2 Technological factors

We have discussed the critical role of information in asset management and looked at some of the data we need to capture, particularly for performance measurement and monitoring.

How to actually capture data can vary: electronically in some places and on paper in others, for example.

In any case, asset management information systems enable local governments to capture, share and manage asset information efficiently and effectively (see Chapter 5). This information can then be analyzed to help make decisions on asset operations, budgeting, planning and other asset management activities. The information system does not need to be complex but appropriate for the organization given its goals, needs and available resources.

For example, a map with pins can display the location of critical assets and use color coding (like red, yellow, green) to communicate each one's condition to decision makers. For reasonably sized asset portfolios, such a map can be easily updated and as effective as **geographic information system** (GIS) software, which has become popular but is still not accessible everywhere. Other tools might include asset record books, logs or spreadsheets.

A basic asset management information system should record the core asset data we discussed in Chapter 1 (e.g. size, material, location, age) and be linked to the financial system. Asset information reports can then be manually generated as needed. A more sophisticated asset management information system would also capture performance data and enable some standardized electronic reporting. Regardless of how much information is captured, it must be accurate and timely. Otherwise, it will not be useful and can lead to poor decisions and outcomes. Chapter 5 specifies the criteria for validating data.

“Asset management is a business practice, not a software solution. Many communities find that a spreadsheet is all they need to get started.

Technical Working Group of FCM's Municipal Asset Management Program³⁵

Before designing or acquiring an asset management information system, there are important factors to consider. These are outlined in Figure 39.³⁶ The second step cannot be stressed enough: if you do not know what information is needed and why, no system can help.

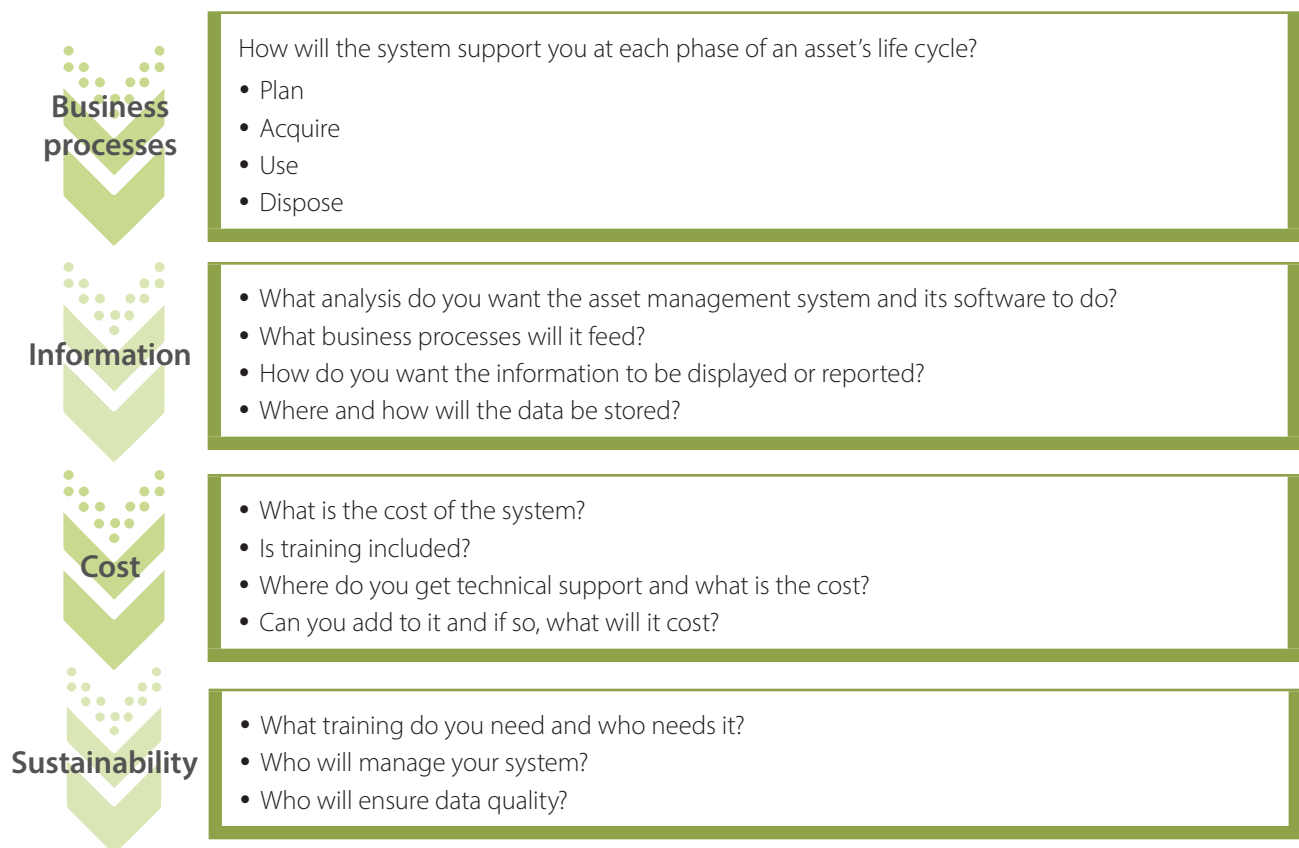
As will be obvious from the preceding sections of this chapter, while a good asset management information system aids decision-making, it is not a substitute for an asset management strategy and plan. Information processes should be effectively incorporated into the entire asset management framework.

2.8 International standards and guidelines

International and national accounting organizations around the world have created standards for how physical assets should be valued and reported. The *Conceptual Framework for Financial Reporting* was issued by the International Accounting Standards Board in September 2010 and revised in March 2018.³⁷ It defines assets from financial and economic perspectives and identifies what information we need to capture to meet financial reporting standards. These standards, like those discussed below, are designed to advance accuracy, transparency and comparability, and thereby to facilitate evaluation and to guide policymaking, investment and resource allocation.

Figure 39

Asset management information considerations



Exercise 4

Consider your solid waste management vehicle fleet and answer the following:

- a. Draw the organization chart for your organization. Do you have an asset management team? If not, where do you think the team should be in the chart?



- b. Do you have any technology tools to help you with asset management? If so, what are they and what issues do you have with them?



2.8.1 ISO standards

Since 2014, local and national authorities have been able to use standards developed by the International Organization for Standardization (ISO) to link the pillars of asset management.

The ISO is a non-governmental international standards development organization headquartered in Geneva, Switzerland. It has 164 members who are represented through national standards bodies, such as the Bangladesh Standards and Testing Institution,

Standards Council of Canada, Nepal Bureau of Standards & Metrology, Tanzania Bureau of Standards and Uganda National Bureau of Standards.³⁸

The most common ISO standards in use include those covering quality management, environmental management, health and safety, energy, information-technology security, food safety and risk management. We now turn to those that address asset management.

Figure 40

ISO 5500x asset management series

ISO standard	Content
ISO 55000:2014 “The Principles” <i>Asset management—Overview, principles and terminology</i> ³⁹	An overview of asset management, the principles, standard terms and definitions applicable and the attainable benefits.
ISO 55001:2014 “The System” <i>Asset management—Management Systems—Requirements</i> ⁴⁰	What is required to set up, execute, maintain and improve a “management system for asset management”, in other words, requirements for the development of an integrated, effective management system for assets. However, the document does not specify how to do this.
ISO 55002:2018 “The Guideline” <i>Asset management—Management Systems—Guidelines for the application of ISO 55001</i> ⁴¹	Guidance on the design of the asset management system as well as on the implementation of the requirements in ISO 55001.

2.8.1.1 ISO 5500x series of standards

The ISO 5500x series evolved from a British standard first published in 2004 and comprises the three standards outlined in Figure 40.

The series was developed to be used by any organization for the management of any type of asset, for example:

- “Infrastructure and industrial sectors (energy — production, transmission and distribution, water and wastewater services, telecommunications, railways, urban transit)
- Infrastructure-oriented “public services” (airports, hospitals, roads)
- All economic sectors where production or services are regulated by government agencies
- Capital-intensive industries and high value-added companies (mining, petrochemical, manufacturing)
- Real estate sector (residential, commercial, cultural)
- Service organizations (software, consulting, professional services).⁴²

The benefits of adopting ISO 5500x include:

- Improved asset performance

- Better return on investment
- Improved risk management
- Supporting business growth and improvement
- Reliable decision-making linked to organizational goals and objectives
- Enhanced stakeholder confidence and organizational reputation

In 2019 the ISO published *ISO/TS 55010:2019 Asset management—Guidance on the alignment of financial and non-financial functions in asset management*. This addressed the disconnect between asset management and the financial functions noted earlier in this chapter.⁴³ This new standard gives advice on how organizations can achieve effective and efficient interaction between asset management, finance and accounting functions. This can result in improved internal controls; more transparent, complete and timely reporting; a more efficient measurement of key performance indicators; and enhanced availability and accuracy of information for decision makers. In total, these can contribute to the achievement of an organization’s strategic objectives.

2.8.2 International infrastructure management manual

One of the most widely used guidance documents published to date is the *International Infrastructure Management Manual* (IIMM). Published by New Zealand Asset Management Support (NAMS), a not-for-profit company owned by the Institute of Public Works Engineering Australasia (IPWEA), the fifth edition of the document, published in 2015, incorporates the ISO standards.⁴⁴ If the ISO standards outline *what* to do, then the IIMM provides guidance on *how* to do it.

Although the manual is focused on infrastructure, the general guidance can easily be adapted to all categories of physical assets we have discussed in this chapter.

2.8.3 Communities of practice

We are not alone on our asset management journey. There are many **communities of practice** that can be engaged to provide support and additional guidance. These include the Institute of Asset Management (IAM), a UK-based international professional body for whole life management of physical assets that,

in addition to providing guidance, offers several levels of asset management qualification. Other communities of practices also provide guidance documents and templates that are readily accessible from the Internet.

Examples of national communities of practice are shown in the Figure 41.

A community of practice (CoP) is a group of people who share a common concern, a set of problems, or an interest in a topic and who come together to fulfill both individual and group goals.

Source: Edmonton Regional Learning Consortium, "Creating Communities of Practice", accessed 24 November 2020.

Figure 41

Examples of national communities of practice

 AUSTRALIA	 CANADA	 SOUTH AFRICA
<ul style="list-style-type: none"> • National Asset Management Strategy Australia • Asset Management Council • The Asset Institute • The Australian Water Association • The Water Services Association of Australia • Institute of Public Works Engineering Australasia (IPWEA) 	<ul style="list-style-type: none"> • Federation of Canadian Municipalities • Canadian Public Works Association • Canadian Society for Civil Engineering • Canadian Institute of Planners • Government Finance Officers Association • Canadian Network of Asset Managers 	<ul style="list-style-type: none"> • Construction Industry Development Board • Institute of Municipal Engineering of Southern Africa • South African National Treasury • Southern African Asset Management Association

Exercise 5

- a. Which ISO standards are you familiar with?

- b. What is the name of your national standards body? Name one standard that your country has participated in the development of.

- c. Which communities of practice exist or, if they do not exist, are needed in your country or locality?

To become a middle-income country by 2040 and to achieve the Sustainable Development Goals require a concerted effort by authorities at the national and sub-national levels to formulate, implement and adjust coherent development strategies that place at the forefront of their political agendas the delivery of essential services and associated investments into small- and large-scale infrastructure. This effort also requires serious steps by national and local governments to prioritize the management of physical and publicly owned assets in key decision-making processes. Such assets (land, buildings, health and education facilities, infrastructure like roads, water and sanitation systems, solid waste disposal facilities and electricity grids) are the backbone of improved delivery of essential public services.

Joel Mundua, UNCDF LEAD Specialist in PML Daily⁴⁵

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Chapter 3

Assessing asset management needs and capacity

Key takeaways

- ▶ A successful start to asset management requires a comprehensive assessment of current needs and challenges. The UN/DESA-UNCDF Asset Management Diagnostic Tool offers a simple way to do this.
- ▶ The three-part assessment takes into consideration the many factors and stakeholders involved in asset management. An evaluation against set criteria (defining 'Basic', 'Elementary', 'Progressing' and 'Advanced' levels) results in a summary of recommended areas for policy intervention.
- ▶ The main aim of the Diagnostic Tool is to measure and raise governments' awareness of asset management techniques. It is only the first step towards better asset management and should be followed by a concrete plan of action.

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The terms in **bold** can be found in the Glossary.

In order to apply the principles and dynamics of asset management discussed in chapters 1 and 2, an organization needs to take stock of its asset management needs and capacity. In this chapter, we explore a proven method to identify and understand those needs and, in the process of doing so, to stimulate the organizational awareness and capacity needed for effective asset management.

The method consists of applying the UN Asset Management Diagnostic Tool (hereafter referred to as, “Diagnostic Tool” or simply, “tool”), which is based on international best practices and has been refined through practical experience. Although the Diagnostic Tool is primarily intended for local asset management, it can be adapted for use by national authorities. This chapter examines the Diagnostic Tool and applies it to the fictional locality we call “Supertown”.

The Diagnostic Tool has four prime objectives:

- To introduce the concept of asset

management to government organizations.

- To provide a simple means to assess awareness.
- To assist government organizations with developing actions to improve local asset management.
- To provide a basis for developing Asset Management Action Plans (AMAPs), the focus of Chapter 4.

Now we will explore the UN Asset Management Diagnostic Tool. Let us begin by looking at the components of the tool before focusing on how to start applying it in more detail in Section 3.2.

3.1 About the UN Diagnostic Tool

The Diagnostic Tool is available as an Excel® spreadsheet, which you can download from <https://www.un.org/development/desa/>

A note on diagnostic tools and how to use them sensibly

Diagnostic tools are increasingly being designed to support objectively verifiable, comparable assessments of system set-ups and functioning in a wide range of areas, including public financial management. They are an effective means to get an initial, comprehensive overview of the situation at hand. Based on commonly agreed upon indicators, they allow for a broader classification, comparison, ranking and benchmarking. In that sense, they can be a useful first step for supporting a dialogue on the strengths and weaknesses of a system and informing approaches for improving performance. However, when using diagnostics, it is important to keep a few things in mind:

- Achieving high scores is not an end in itself. The aim should always be to develop a system that performs better, not one that scores better. Thus, any measures taken in response to an identified problem should be geared towards improving the

functioning of the system rather than just meeting the criteria required for the next higher score.

- The underlying reasons for a low score are rarely revealed in standard diagnostics and require further investigation. Seemingly similar problems do not necessarily have similar solutions. Possible response measures need to be adapted in light of the existing framework conditions rather than adopting the ones that worked in a very different context.
- Some important elements of the system may be underexposed by the diagnostic tool as they cannot be easily measured. It will be important to be aware of these blind spots and make sure to explore them using different approaches.

For these reasons, diagnostic tools are best used with other analytical approaches that dig deeper into the issues identified, e.g. by examining political economy factors and organisational capabilities. Such approaches help identify responses that will strengthen the system at hand by considering the specific context it is operating in.

Contribution provided by Gundula Löffler, Research Fellow at the Overseas Development Institute, for the purposes of this handbook. Adapted with the author's permission.

financing/capacity-development/topics/infrastructure-asset-management. The spreadsheet has a series of tabs for each part of the tool (see Figure 1).

Differences in appearance aside, the substance of the Diagnostic Tool is the same and comprises three parts.

Part 1 is a self-assessment. The purpose of Part 1 is to get a government organization to think about its goals, assets and challenges with regard to four main categories of physical assets: land, equipment, buildings and infrastructure. The self-assessment should be completed before proceeding to parts 2 and 3.

Part 2 is an on-site assessment using a series of 14 asset management questions that guide the assessment team and the organization. The questions, which are accompanied by explanations and examples, are grouped into three areas:

- *Understanding and defining requirements* (four questions)
- *Life cycle decision-making* (five questions)
- *Asset management enablers* (five questions)

Part 3, which aims to pinpoint strengths,

weaknesses and areas of potential improvement, is to be completed last and consists of evaluating the responses from Part 2. Each response is given a score reflecting the level of current awareness within the organization, as laid out in Figure 2. Scores can be assigned in half-point increments. For example, a '2.5' reflects the view that the organization exceeds the minimum criteria for level 2 but has not reached level 3.

Part 3 also provides an option to identify target scores considered by an assessment team to be appropriate for the organization to achieve within 2-3 years, and to recommend actions to achieve them.

The Diagnostic Tool concerns itself with awareness because it is the necessary starting point: one must be aware of what asset management activities need to be done before one can undertake them. If the organization's implementation capacity is constrained, this will become evident and will need to be addressed so that the ability to implement asset management is at least equal to the need. Conversely, even unlimited capacity will be of no use to an organization if it lacks awareness of what must be done.

Figure 1

Diagnostic Tool spreadsheet tabs

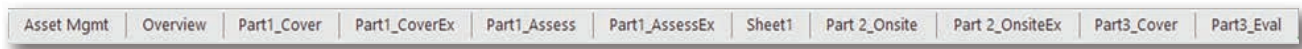


Figure 2

Diagnostic Tool awareness levels

Basic (Level 1)	The government is aware of the need for asset management but has not been able to do so.
Elementary (Level 2)	The government is aware of the need for asset management and has started to implement some of the activities.
Progressing (Level 3)	The government has implemented all of the asset management activities in at least one of the categories of assets.
Advanced (Level 4)	The government has implemented the asset management activities in all of the categories of assets under its jurisdiction.

Exercise 1

Can you think of an aspect or activity of asset management about which your awareness exceeds your implementation capacity? Explain.

Before we look at how to apply each part of the Diagnostic Tool, let us get an overview of the general assessment process. We will also briefly examine how to engage and consult stakeholders to ensure that we get the right information to complete the assessment.

3.1.2 General assessment process

Your government or organization can apply the Diagnostic Tool however it sees fit. In the beginning, you might invite an external assessment team (e.g. experts from UN DESA, UNCDF, UNOPS or other development partners) to implement the tool in a few target local governments and provide Training of Trainers to national government officials, who can then themselves train more officials in the application of the tool. No matter the type of assessment, your government or organization will first carry out a self-assessment, which can serve as a 'health check'.

In this chapter, we will act as external consultants visiting Supertown to conduct the Diagnostic Tool alongside local officials and stakeholders.

3.1.3 Stakeholder consultation

The first step in applying the Diagnostic Tool is to ensure that the most relevant stakeholders in the organization are identified and informed that they will be part of the assessment.

Figure 3

Diagnostic Tool process

Identify assessment type

- Specify the purpose and what you hope to achieve.
- Is it a formal or more casual assessment? Will the findings be reported or presented and if so, to whom?
- Will it be conducted internally or externally?

Part 1: Self-assessment

- Focal person appointed by organization to coordinate responses with assessment team.
- Assessment team sends Part 1 to Chief Administrative Officer or equivalent within organization.
- Organization completes Part 1.

Part 2: On-site assessment

- Assessment team arranges visit to organization through focal point.
- Assessment team reviews Part 1 with organization.
- Assessment team interviews key stakeholders.

Part 3: Evaluation

- Assessment team sends Part 2 findings to organization for review.
- Assessment team completes evaluation, recommends interventions and lays out next steps.
- An 'asset management profile' prepared and provided by assessment team to organization.

Part 1 is targeted particularly at elected and executive-level officials. The questions are general and designed to provide an understanding of the government organization, its philosophies, priorities, constraints and any previous asset management activities. These individuals do not need to know the details of individual assets or how asset inventory information is gathered. They should know what types of assets the organization has and what departments are responsible for them. They should also know what national legislation and policies apply to assets in general.

Key individuals or positions that should be consulted to complete this part include:

- Mayor and Deputy-Mayor (of local government)
- Chief Administrative Officer (CAO)
- Chief Finance Officer
- Senior Procurement Officer
- Chief Engineer
- Senior Urban Planning Officer
- Senior Community Development Officer

The questions in Part 2 are more specific to

key asset management practices and are intended to be answered by local staff in discussion with the assessment team. The names of specific departments vary from country to country but generally fall into the following areas:

- Planning and Development
- Finance
- Procurement
- Engineering and Works
- Community Development
- Technical Services

It is important to have a balance of stakeholders from these areas as they provide critical information for their departments while also absorbing information from, and exchanging experiences with, other departments.

The positions and titles of individual officials involved in the diagnostic process also vary between countries. Figure 4 provides examples of titles from four countries in which joint UN/DESA-UNCDF assessments were conducted.

Let us now look at how to apply each of the three parts of the Diagnostic Tool.

Figure 4

Who participates in the Diagnostic Tool process?

Examples from Bangladesh, Nepal, Tanzania and Uganda

 Bangladesh	 Nepal	 Tanzania	 Uganda
<ul style="list-style-type: none"> • Secretary • Accounts Officer • Medical Officer • Slum Development Officer • Sanitary Inspector • Assistant Water Engineer • Assistant Civil Engineer 	<ul style="list-style-type: none"> • Finance Chief • Revenue Chief • Information Officer • Internal Auditor • Procurement Assistant • Planning Chief • Infrastructure Chief • Community Development Officer 	<ul style="list-style-type: none"> • Valuer • Town Planner • City Engineer • City Water Engineer • Community Development Officer • Statistician • Head of Procurement • City Treasurer • City Environment and Sanitation Officer 	<ul style="list-style-type: none"> • Town Clerk • Municipal Engineer • Chief Finance Officer • Environmental Officer • Principal Health Inspector • Senior Procurement Officer • Municipal Land Surveyer • Municipal Planner • Assistant Inventory Officer

3.2 Part 1—Self-assessment

Part 1 of the Diagnostic Tool consists of a cover sheet and a questionnaire.

As shown in Figure 5, the cover sheet records the name of the local municipality or jurisdiction along with the name of the person responsible for submitting the assessment. This person serves as the contact or focal point for organizing the on-site visit and any necessary follow-up.

The cover sheet provides us with basic information on the local land area, population and the local officials involved in asset management. There are two population numbers, both selected from drop-down menus, one

each for the daytime and nighttime populations. Both are recorded because there may be a significant difference between the numbers of people using local infrastructure (daytime) and those also contributing to local taxes or revenues (nighttime). For example, the population can increase significantly during the day due to an influx of tradespeople, commuters working in the city and visitors.

It is also important to note whether the population numbers recorded are actual or based on the last census, as some time might have passed since the last census and the local population might have seen an influx of refugees or immigrants.

On the cover sheet, we also need to list the individuals actively involved in asset

Figure 5

Diagnostic Tool self-assessment cover sheet

Part 1 - Asset Management Self-Assessment: Cover sheet

Instructions
Please complete the blank sections on this form. See the next tab for an example.

Comments

Country: _____
 Local government municipality/jurisdiction: _____
 Daytime population: _____
 Nighttime population: _____
 Person submitting assessment:
 Title: _____
 E-mail: _____
 Telephone: _____
 Date completed: _____

Asset management assessment participants
List all individuals involved in asset management

Name	Title	Email/contact info

Navigation: Overview | **Part1_Cover** | Part1_CoverEx | Part1_Assess | Part1_AssessEx | Part 2_Onsite | Part 2_OnsiteEx | Part3_Cover

management (or those who should be going forward). Many of them will be involved in completing the self-assessment as well as Part 2 of the Diagnostic Tool.



Tips for Part 1 of the Diagnostic Tool

If you are completing Part 1 of the Diagnostic Tool:

- Provide a complete list of participants.
- Meet as a team and answer the questions as best you can.
- Allow 3-4 hours to complete.

If you are reviewing Part 1 prior to conducting a visit:

- Ensure key stakeholders are represented and contact information is accurate.
- Review the completed questions.
- Identify where information is missing or incomplete.

The Part 1 questionnaire comes after the cover sheet. It comprises 11 questions and does not need much explanation. The questions are general and designed to provide an understanding of the organization or administration — its philosophies, priorities, constraints and any previous experience with asset management.

The amount of time required to complete Part 1 will depend on how many stakeholders are involved. Three to four hours is typically enough time to answer all the questions.

If you are part of the team completing the questionnaire, this might be the first time you have met as a group to discuss these questions. The intent is to have a good discussion of the issues facing your organization. You should not be concerned if some of the questions do not apply or if you are unsure how to answer them. You will have the opportunity to discuss your responses and fill any gaps

during the on-site assessment.

Let us look at how the team from Supertown completed the self-assessment.

From the cover sheet (in Figure 6), we see that Supertown has a daytime population of 52,000 people and a nighttime population of only 25,000. Going into the actual self-assessment (in Figure 7), we learn from the responses to questions 1 and 2 that Supertown's predominant challenges relate to population, traffic and flooding. We see these reflected in the organization's medium-term goals, two of which are linked to traffic and population growth.

Next, the organization is asked which types of physical assets it owns and which of these are critical assets. The questionnaire is prefilled with different types of assets to select as appropriate. There is also space to write in any assets not listed. It is important that critical assets be only those that have a direct impact on service delivery. We are not interested in individual chairs, desks or filing cabinets. Instead, major assets that have significant reputational or functional value, such as a council chamber, could be included.

Figure 8 shows Supertown's physical assets highlighted in yellow, with additional information provided in blue by the assessment team. We see that Supertown has no surplus land, and it is responsible for educational and health facilities. It also has many equipment assets that are managed at the local level. Most of its major infrastructure assets are managed by the national government, as seen, for example, by the "under Ministry" comments, but Supertown does have a bus terminal and is responsible for community roads. The team also indicates that Supertown must transfer funds to the Road Authority to maintain all non-community roads.

The next seven questions are intended to prompt officials and staff to think about critical assets, how asset performance affects the delivery of services and asset management

Figure 8

Sample self-assessment for Supertown (b)

Part 1 - Asset Management Self-Assessment: Overall context			Example
3. Please indicate which of the following main physical assets are in your local government's inventory (Check/circle/highlight all that apply). Add comments and list other assets as needed).			
Land	Buildings	Equipment (list only critical assets)	Infrastructure
<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None
<input type="checkbox"/> Surplus/ Available for disposal	<input type="checkbox"/> Cultural (e.g. museums)	<input checked="" type="checkbox"/> Garbage collection trucks	<input checked="" type="checkbox"/> Cemeteries
<input type="checkbox"/> Unoccupied/ Available for use	<input checked="" type="checkbox"/> Educational (e.g. schools, universities, libraries)	<input checked="" type="checkbox"/> Cars, lorries (trucks), tractors, graders, caterpillars	<input type="checkbox"/> Energy supply (generation and distribution) - under Ministry
<input checked="" type="checkbox"/> Public markets	<input type="checkbox"/> Emergency services (e.g. fire, police) - under Ministry	<input checked="" type="checkbox"/> Computer systems	<input checked="" type="checkbox"/> Street lighting
<input checked="" type="checkbox"/> In use	<input checked="" type="checkbox"/> Government offices	<input checked="" type="checkbox"/> Office furniture	<input checked="" type="checkbox"/> Parks and public spaces
<input type="checkbox"/>	<input type="checkbox"/> Housing	<input type="checkbox"/> Safes	<input checked="" type="checkbox"/> Roads - Community roads only (those roads not upgraded - neighbourhood roads) Transfer funds for other roads to Road Authority
<input type="checkbox"/>	<input type="checkbox"/> Judicial (e.g. jails, courts) - under Ministry	<input type="checkbox"/>	<input checked="" type="checkbox"/> Solid waste collection and disposal
<input type="checkbox"/>	<input checked="" type="checkbox"/> Health (e.g. hospitals, clinics)	<input type="checkbox"/>	<input checked="" type="checkbox"/> Transportation network (e.g. bus terminals)
<input type="checkbox"/>	<input checked="" type="checkbox"/> Public lavatories	<input type="checkbox"/>	<input type="checkbox"/> Wastewater utilities (including sanitary and storm water collection and treatment) Money not transferred
<input type="checkbox"/>	<input type="checkbox"/> Recreational facilities	<input type="checkbox"/>	<input type="checkbox"/> Water utilities (including treatment and distribution)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Port facilities (e.g. wharves, docks, terminals, etc.)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Flood protection (e.g. storm water retention ponds, dykes, levees, etc.)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. What is the most critical asset that you are managing? (A critical asset is an individual asset that is critical to the agency for the delivery of its services and has high consequences in case of failure or loss.)			
<ul style="list-style-type: none"> • Trucks (4) used to carry waste to dump - also, excavator for waste removal (health and safety consequences if no service) • Financial system to collect own source revenue (OSR) - electronic point of sale (have about 200 handheld devices) and mainframe • Software used to track revenue collection 			

responsibilities (see Figure 9). When we look at these questions, we see that Supertown’s biggest problem is solid waste collection. Another challenge are the local assets that are managed at a higher level—roads, energy, water supply and sanitation. The local authority has no control over the management of these assets, yet they must deal with user complaints when service is interrupted or inadequate.

We also learn from Supertown’s self-assessment that it needs help moving beyond annual planning and budgeting. The staff cannot do this without external support

and mentoring.

From these responses, we start to get an understanding of Supertown, the assets it has, the challenges it faces and the processes that staff members follow to manage their assets. As the assessment team, we will want to review these questions during Part 2 of the assessment. We may need to probe a little deeper and ask additional questions to get a good understanding of the organization before we move on to the formal assessment. These responses can be added when the on-site assessment takes place.

Exercise 2

- a. If your organization has undertaken the UN Asset Management Diagnostic Tool, which stakeholders were consulted? Was there anyone who was not included but should have been? If so, who and why would their role be important? If you have not had an assessment, which stakeholders do you think should be consulted in your organization?

- b. Discuss the population of your municipality or district and its impact on asset management. Does it change from daytime to nighttime? If it changes, who are the main users during the day? Does this discrepancy create a problem and if so, what is it?

- c. Review the information provided so far by Supertown. What additional questions would you ask the town’s officials?

Figure 9

Sample self-assessment for Supertown (c)

Part 1 - Asset Management Self-Assessment: Overall context	Example
<p>5. How does the performance of your critical assets affect the delivery of services in your local government? (For example, poor roads affect the ability to deliver goods to market and thus have an economic impact.)</p> <ul style="list-style-type: none"> • Can't collect waste - streets dirty, complaints, disease, clogs drainage systems • OSR is major source so need revenue 	
<p>6. Who manages the different classes of physical assets in your city? Which assets are managed locally and which are managed at a higher level (e.g. district or nationally)?</p> <ul style="list-style-type: none"> • Department of Works (city) → municipal roads • Anyland Road Authority (ARA) → major roads • Anyland Water and Sewage Company (AWSC) → water supply and sanitation • Department of Health → health centres • Department of Education → schools • Sanitation Department → waste collection & management; cemeteries • Department of Finance & Trade → markets • Department of Urban Planning → parks • Anyland Energy Limited (AEL) → energy 	
<p>7. Who is involved in the acquisition, operations and maintenance and disposal of assets? Is there a documented decision making process? If so, please provide a copy.</p> <ul style="list-style-type: none"> • Acquisition → Department responsible for asset does the planning and defines requirements, then prioritises and sends budget to Council; Department of Civil Engineering helps with design, once done so; several stages to create budgetary request for new project: <ul style="list-style-type: none"> (1) Community requests are shared with ward executive committees who will rank projects. (2) Priority projects are shared with Council; management team will scrutinize projects and share with counselors. (3) Budget goes to regional, ministry and assembly levels for approval; project requests are also scrutinized at local level to ensure budgetary means of implementation are present; at the departmental level, user, finance and procurement departments work together in budget and acquisition process. • Operation and Maintenance → Individual departments with assistance from Department of Civil Engineering are involved. • Disposal → Guided by Finance Act and Procurement Act, approved by Minister; Finance Department prepares value of assets to be disposed; disposal through auction and money goes back to city. 	
<p>8. Have you had any external review of your asset management practices or plans previously? If so, what was the outcome?</p> <ul style="list-style-type: none"> • International aid project has created revenue collection system for local government • No other external support 	
<p>9. Briefly describe any asset management improvement initiatives currently in progress or already planned for the next year (e.g. implement a GIS, improve inventory data, etc.).</p> <p>We are planning to adopt a Geographic Information System (GIS) which will help map the location of many of our assets. We have already designated a 'GIS focal point' for the Land Department.</p>	
<p>10. Please list the major national laws, regulations and policies that govern how you manage your assets. Considerations include: laws, regulations and policies regarding the management of municipal assets; the authority given to the municipality over municipal assets; legal provisions for the municipal authority on land management, acquisition, disposal, lease, contract, etc.; and policies for documented classification of fixed assets, such as a standard inventory policy for the municipalities.</p>	
<p>Local Government Act, Public Finance and Management Act, Public Procurement and Disposal of Public Assets Act, Land Act</p>	
<p>11. Where do you need the most support/help to improve? How can we help you?</p> <ul style="list-style-type: none"> • Develop expertise in managing an asset database, i.e. GIS implementation, inputting data, etc. • Capacity building • Create awareness around asset maintenance; teach people what the assets are, what's involved in their management, the impact of losing them, etc. → what's the best means to do so? (e.g. 1:1 mentoring, in-person workshops) • Help developing local policies 	

3.3 Part 2—On-site assessment

Now that we have a general picture of Super-town, we need to know more about how it implements asset management. Part 2 allows the assessment team to examine implementation through 14 categories of questions. These cover three areas of inquiry—*Understanding and defining requirements*, *Life cycle decision-making* and *Asset management enablers*, which we will see shortly. In the tool, each category includes an explanation and some examples to guide organizations' thought process as they come up with answers.

These questions are best administered through on-site interviews during which we ask officials and staff to describe in detail how they manage physical infrastructure and real estate, such as land and buildings.

An interview typically takes three to four hours and additional time might be needed to review supporting information. It is a good idea to allow a day to complete the on-site assessment.

Before we explain how to best conduct this interview, let us go over each area of enquiry, starting with *Understanding and defining requirements*.



Tips for Part 2 of the Diagnostic Tool

Time allocation:

- Allow 3–4 hours to complete the interview.
- Allow one day for the full assessment.

The interview:

- Conduct group interview with lead person from each of the key groups present.
- Subject matter experts are interviewed later to provide supporting data and information.
- Ask probing questions.
- Document evidence to support answers.

3.3.1 Understanding and defining requirements

The first four questions in Part 2 look at how well the organization understands and defines its requirements. These are linked to demand management. Recall from Chapter 2 that this is the first of three management pillars in the asset management framework.

The first two questions in Part 2 of the Diagnostic Tool address three of the 'six whats':

- *What do you own?*
- *What is it worth?*
- *What is its condition?*

Take a look at Figure 10.

As we learned in Chapter 2, demand management requires us to identify current and future demand based on the levels of service we intend to provide. Questions 3 and 4 (in Figure 11) are intended to assess the organization methods of demand management.

3.3.2 Life cycle decision-making

The next five questions address life cycle decision-making and are designed to help us determine what to fix first.

As we can see from Figure 12, Question 5 asks about general decision-making processes. Questions 6 and 7 focus on operational and capital planning, namely, how to make decisions about the maintenance and replacement of physical assets. Question 8 looks more closely at financial planning, and Question 9 prompts the organization to scrutinize how it applies sustainability principles across the asset management framework.

3.3.3 Asset management enablers

The first nine questions in Part 2 of the Diagnostic Tool helped us assess the asset management activities in effect within the organization or administration and how they are being undertaken. The final five,

Figure 10

Diagnostic Tool on-site assessment (a)

Question number and name	Questions	Answers (Assessors to complete this column during site visits)	Explanation & examples
Understanding and defining requirements			
1	<p>Asset inventory data</p> <p>What asset inventory information does the local government collect? How is it classified? How does the local government ensure the information is accurate, consistent and usable?</p>		<p>Basic building and land information to be collected:</p> <ul style="list-style-type: none"> • Street address • Cadaster number • Current use(s) • Total floor/land and associated areas • Construction material (e.g. wood, concrete, steel, etc..) • Year of construction • Cost <p>Basic infrastructure information to be collected:</p> <ul style="list-style-type: none"> • Municipality/Region • Type of asset (e.g. water, wastewater, power, etc.) • Identification number • Size/capacity (e.g. diameter, height, volume, flow, etc.) • Total Length (pipes, transmission lines, roads, etc.) • Construction material (e.g. cast iron, steel, wood, etc..) • Year of construction <p>More advanced information:</p> <ul style="list-style-type: none"> • Condition • Current occupancy (i.e. % of usable space occupied) • Inspection date • Construction cost • Annual depreciation amount • Depreciated book value • Combined estimated market value of building & land site • Annual operating and maintenance costs • GIS / digital map of location • Associated assets e.g. manholes, pumping stations, etc.

(cont'd)

<p>2</p>	<p>Asset performance</p>	<p>How does the local government measure and manage the condition and performance of its assets? Are the records updated? When?</p>	<p>Asset performance information (condition, use, and suitability or meeting customer needs) supports good decision-making and allows a local government to estimate how much longer an asset will be of service (remaining service life).</p> <p>E.g. Condition rating/description:</p> <p>1 - Excellent: Asset is like new, fully operable, well maintained and performs at or above current standards. No further action needed.</p> <p>2 - Good: Asset is well maintained but showing some signs of wear. Full performance is delivered. Mostly maintenance is planned and preventive in nature. Minor repairs may be needed.</p> <p>3 - Moderate: Asset is functional but showing normal signs of wear due to age. Many have minor failures or reduced efficiency with increased need for maintenance and/or operating costs.</p> <p>4 - Fair: Asset functions but needs high level of maintenance to remain operational. Major deterioration in performance expected in near term. Rehabilitation needed.</p> <p>5 - Failing: Effective service life exceeded and excessive maintenance costs. High risk of failure. Immediate replacement or rehabilitation needed.</p>
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Figure 11

Diagnostic Tool on-site assessment (b)

<p>3</p>	<p>Levels of service</p>	<p>How does your local government determine an appropriate level of service for the services it delivers to its customers? How does it ensure that asset performance meets those service levels for all its citizens?</p>	<p>Assets provide a service to the local community. Definition of expected level of service is based on some form of performance measurement that is defined by:</p> <ul style="list-style-type: none"> • Analysis of legal requirements – legislation determines what must be provided • Survey of customers' expectations <p>For example, levels of service for a water system could include:</p> <ul style="list-style-type: none"> • X breaks per 100 km of watermains per year are acceptable • Watermain breaks will be repaired within X hours of initiation of repair, 95% of the time • Customer complaints will be responded to within 24 hours • Meeting of all regulatory requirements <p>OR</p> <ul style="list-style-type: none"> • Water will be piped to all houses in urban areas with a population of X • Community water points will be provided every 300 metres • Water will be provided by community wells
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(cont'd)

4	Forecasting demand	How does your local government forecast demand for its services and the impact this demand will have on its assets? How reliable are the methods that are used?	Demand is a measure of how much customers use the services provided by the assets, e.g. clean water supply or sewage disposal over time. The ability to consistently predict demand helps a local government plan ahead and meet that demand, or manage the impact and consequence (risk) of not meeting it. For example, use of historical trends, maps, number and type of development permits, previous funding grant applications, etc. can help answer the following: <ul style="list-style-type: none"> • Where will the community grow? • How much will it grow by and when? • Will existing services meet future demand? • Will there be enough money to build on existing assets and increase levels of service to meet the demands of citizens?
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Figure 12

Diagnostic Tool on-site assessment (c)

Life cycle decision-making			<p>An asset must be in working order to deliver the level of service desired. If the asset fails, the ability to deliver the desired level of service may be compromised. An asset that has a major impact on the ability to meet the LOS would be considered more critical to the system than an asset whose failure would not have a significant impact on the LOS.</p> <p>Establishing and using a consistent decision-making process is very important to help make decisions on what assets take priority. Cost/benefit analysis can be used to determine when to replace, refurbish or renew investment. Among others, cost of activity, change in condition or performance rating, risk, value of the asset, usage, or depreciated value of the asset may all be used as a trigger to determine if refurbishment or replacement is needed.</p> <p>For example: risk-based decision-making considerations:</p> <ul style="list-style-type: none"> • Cost of repair: If the asset can be repaired easily and without a tremendous cost, then there is a lower consequence. If the cost of repair is higher, then the consequence of the failure is also greater. • Environmental costs related to the failure: Some types of asset failures can cause environmental impacts. The costs related to these impacts may not always be easy to assess in monetary terms. However, some attempt should be made to establish some type of monetary value to the environmental consequences.
5	Decision-making	How does your local government go about making decisions on the replacement, refurbishment or disposal of existing assets or investment in new ones?	

(cont'd)

<p>An example of an environmental cost related to a failure would be a sewer pipe that leaked sewage into a waterway or onto land. A value, either monetarily or qualitatively, would need to be placed on this type of consequence.</p> <ul style="list-style-type: none"> • Reduction in level of service: The assets must be in working order to deliver the level of service desired by the water system and its customers. If the assets fail, the ability to deliver the desired level of service may be compromised. An asset that has a major impact on the ability to meet the LOS would be considered more critical to the system than an asset whose failure would not have a significant impact on the LOS. <p>The factors discussed above can be taken together in assessing the consequence of failure. The rating scale should be kept simple, e.g. rating from 1 to 5.</p> <p>The next step is to multiply the ranking of likelihood with the ranking of consequence of failure, obtaining the final score of asset's criticality to create a matrix.</p>				
<p>A major asset management challenge is finding the appropriate balance between planned maintenance (inspections and scheduled maintenance etc.) and unplanned or reactive maintenance (arising from unexpected failures). Examples of documented processes and procedures that should be in place include: maintenance, cost and budget management, health and safety management, and security of the assets.</p> <p>For example: Condition rating/maintenance Level</p> <p>1 - Excellent: Normal preventive maintenance</p> <p>2 - Good: Normal preventive maintenance/minor repairs</p> <p>3 - Moderate: Normal preventive maintenance/major repairs</p> <p>4 - Fair: Major repair/rehabilitation</p> <p>5 - Failing: Replace</p>		<p>How does the local government plan and manage its assets to keep assets in service and meet local needs?</p>	<p>Operational planning</p>	<p>6</p>
<p>Capital investment is typically needed to address community growth or changes, or to renew existing assets to maintain service levels. Since this can be expensive, agencies need to plan for the cost of long term asset needs. Capital Investment Plan items can include: major rehabilitation, system expansion, technology, new assets.</p> <p>The Capital Investment Plan is a medium-term financial planning instrument and typically done every three to five years, essentially coinciding with the national regulations on medium-term expenditure planning. This type of plan would identify anticipated public infrastructure and investment projects, as well as a financing approach. It should cover as much critical assets as possible (Water & Sewerage, Streets & Roads, Sidewalks, Buildings, Street Lights and Fleet assets).</p>		<p>How does the local government plan and prioritise investment in upgrading or acquiring/purchasing new assets?</p>	<p>Capital planning</p>	<p>7</p>

(cont'd)

8	Financial planning	How does your local government project revenues and expenses, and plan for the funding of its future expenditure and asset-related costs?		<p>A capital investment plan would describe:</p> <ul style="list-style-type: none"> • The city's policies and financial abilities to manage the investment needs associated with its spatial development and built environment • Identified priority areas/strategic themes and investment requirements • Arrangements for coordinated decision making • CIP outcomes • Projects vs. Programs as well as a general investment schedule • Risk Management <p>Again, we can prioritize using cost/benefit analysis.</p> <p>For example: What will the investment cost? How much will it improve service? What are the benefits (reduced travel time, fewer accidents)? What are the risks? e.g. Investment priority = 50% asset lifecycle cost + 30% condition/suitability + 20% risk</p> <p>If a formal cost-benefit analysis is applied for project prioritization, it should be based on a discounting technique and specify economic NPV and IRR. For this, CBA should define: which items to include (relevance); computing the value of the items (shadow prices and spillover effects); and arriving at a conclusion that provides informed advice to the decision-maker (constraints).</p> <p>Assets can bring revenue such as lease payments, user fees, or sale proceeds. Potential revenue sources, operating and maintenance costs, and capital expenditure needs must be identified.</p> <p>A municipal strategic financial plan (SFP) should include:</p> <ul style="list-style-type: none"> • Key financial policies (for financial management, tax, general revenue, development charges, asset management, debt and surplus management, etc.). Key financial policies might include goals or guidelines for critical fiscal management metrics, such as the percentage of the annual budget to be committed to capital improvements, metrics to limit the size of annual debt service, and limits on total outstanding debt. They will also include the basis for accounting (cash or accrual). • A fiscal capacity assessment, in which the city estimates future revenues, future operating expenditures, and the amount of funds available to transfer to capital reserves.. Sources of funds for a city's capital plan might include: <ul style="list-style-type: none"> - own-source revenues (or "pay as you go" capital reserves) - grants or transfers from other levels of government - grants from external sources
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	<ul style="list-style-type: none"> - long-term debt (for example, general obligation bonds backed by the full faith and credit of the issuing government) - external finance from the private sector through PPPs • Financial strategies that aim at minimizing the gap between the fiscal capacity and the projected operating and capital expenditures for increasing funding for asset maintenance, renewal and acquisition. • Financial indicators as a means of reporting the city's financial condition as determined by the financial forecast. <p>Revenues and expenditures can be projected using historical revenues/costs, demand, experience, industry trends, etc. An annual budgeting activity takes place to reflect the SFP in municipal annual budgets.</p> <p>Example 1: It costs \$100/m² to replace a roof in 2015. Inflation has been 3% per year so we adjust this cost to \$116/m² [$\\$100 \times (1+0.03)^5$] to estimate the cost of replacement in 2020.</p> <p>Example 2: We received \$200,000 in user fees/permit revenue in 2017, but revenue has decreased by 2% per year for the last three years. We will have to increase fees or find other sources of income to continue with the same level of service or reduce the level of service.</p>	<p>Sustainability includes economic, social and environmental factors. Assets must be financially sustainable, i.e. affordable; they must be socially sustainable, i.e. equally benefit all citizens; and they must be environmentally sustainable, i.e. they will preserve or improve the quality of the natural environment and will not destroy it. These factors apply when considering the refurbishment, replacement of existing assets or investing in new ones.</p> <p>For example: well water – usage is controlled so that it will not exceed capacity; otherwise, the well will run dry; cisterns are used to store water in the rainy seasons for use in dry seasons.</p> <p>Asset management must also adapt to the challenges of climate change, like increased flooding, rises in sea levels, and migration from adversely affected areas. In addition to adaptation, management and protection of land that holds natural resources (e.g. municipal forests, lakes, river basins) can help mitigate the effects of climate change.</p>
	<p>How does your local government incorporate principles of sustainability into managing its assets?</p>	
<p>9</p>	<p>Sustainability</p>	

Figure 13

Diagnostic Tool on-site assessment (d)

Asset management enablers		
<p>10 Asset management leadership and teams</p>	<p>What is the level of local governmental awareness of and commitment to asset management? How is this reflected in existing local government structure and responsibilities?</p>	<p>Effective asset management requires a committed and coordinated effort across all sections of a local government. Asset management is most effective when roles are clearly defined and specifically allocated to people and teams. It is more than having policies and procedures; it is actively implementing them throughout the organisation. For example: A simple structure may have an asset management 'champion' or dedicated AM position responsible for promoting AM in the organisation. A more advanced organisation will have an AM department responsible for directing and overseeing AM activities. AM responsibilities will be written into position descriptions.</p>
<p>11 Asset management policy and process</p>	<p>How does your local government ensure that its asset management policies and processes are appropriate and effective?</p>	<p>Asset management policies and processes enable a local government to operate consistently and reliably, i.e. show that what was planned was delivered. The policies and practices should be appropriate, consistently applied and understood. For example: undertaking satisfaction surveys, assets meet the needs of the stakeholders, internal audits & reviews</p>
<p>12 Asset management information systems</p>	<p>How does your local government meet the information needs of asset managers, customers and the community?</p>	<p>Asset information can be captured in many ways. It can be electronic or paper-based. Asset management information systems enable a local government to capture, share and manage asset information efficiently and effectively. This information can then be analysed to help make decisions that support operations, budgeting, planning and asset management. System examples include: asset record books/logs, maps, spreadsheets, GIS, maintenance management systems</p>
<p>13 Service procurement</p>	<p>How does your local government procure asset-related services e.g. equipment parts, real estate appraisal, construction services for different assets? How does the local government exercise control over any outsourced asset management services?</p>	<p>Local governments need to consider the costs, benefits, risks and transparency of procuring outsourced services. Consistency in the processes used saves the government money and builds community confidence in local officials. For example: Services can be procured competitively, sole-sourced or from a list of qualified providers. Good control over outsourced activities includes regular inspections, good procurement regulations, a contract management team, etc.</p>
<p>14 Transparency</p>	<p>How does your local government ensure transparency in its management of assets?</p>	<p>Transparency is necessary to demonstrate that the local government is spending funds wisely, in a manner that benefits the public and is fair and open. This builds trust in the local government making the community attractive for more financial investment. Transparent procurement includes: <ul style="list-style-type: none"> • Open and competitive bidding on contracts • Clear scope of work or transaction details • Clear bid evaluation, tender and award criteria • Accountability of procurement officials • Public notice of name of person / entity who won contract and value </p>

Questions 10-14, can help us understand the people, technology and resources being used to support asset management.

As Figure 13 shows, Questions 10 and 11 look at the organizational leadership, personnel and policies that are in place to support asset management. Question 12 examines how the organization meets its information needs so as to support sound decision-making. Finally, Questions 13 and 14 examine procurement processes and organizational transparency— aspects critical to efficiency, effectiveness and public confidence.

3.3.4 Conducting interviews

The interview is the most important part of the assessment as it is our opportunity to discuss the answers from Part 1 with the local team. It is also when we gather all the information needed to complete the

evaluation in Part 3. Before we begin, we need to ensure that we will be interviewing the right people.

You already identified key stakeholders prior to the assessment (see Section 3.1.3). Some should have participated in Part 1, others will participate in Part 2. On the cover sheet of Part 3 (see Figure 14), we now need to list the names of those we wish to interview. We also need to indicate each individual’s current roles and responsibilities.

If a key person is missing, such as the engineering officer or community development officer, we need to ensure that they are included now in order to achieve a balance of stakeholders from all groups that actively manage the physical assets.

Returning to the example of Supertown, Figure 15 displays the Part 3 cover sheet with individuals whom we want to interview in

Figure 14

Diagnostic Tool evaluation cover sheet—interviewees

Asset management interviewees:		
Name	Title	Asset management roles/responsibilities

Figure 15

Sample cover sheet (Part 3) for Supertown

Asset management interviewees: Example		
Name	Title	Asset management roles/responsibilities
Charlie Delta	Senior Economist	Five year economic forecasts, responding to Ministry of Local Government.
Echo Foxtrot	Senior Accountant	Annual budget, financial reporting and auditing. Reporting to Council.
India Juliet	Senior Urban Planning Officer	Development planning and meeting with local communities
Kilo Lima	Procurement Officer	Overseeing all procurement and contracting functions
Mike November	Community Development Officer	Liaising with local communities to determine needs. Reporting to Council.
Oscar Papa	Treasurer	Supporting Senior Accountant, making payments and managing local government finances.





Part 2. They are the same as in Part 1, so we take each individual's contact information and replace it with their roles and responsibilities.

Next, we need to decide how to organize the interviews. We can meet with all key stakeholders in one meeting. Alternatively, we can meet with individual departments or participants. Each approach has its advantages and disadvantages, as shown in Figure 16.

As the intent of the Diagnostic Tool is to get a snapshot of asset management in the organization, the most efficient method is to have the head person from each of the key groups present. If necessary, individuals who have specific information can be interviewed or consulted later to provide supporting information or to validate what was gathered from the interview(s). Regardless of the interview

Figure 16

Interview methods for on-site assessments

Interview method	Advantages	Disadvantages
All stakeholders 	<ul style="list-style-type: none"> • Everyone would be present at the same time and could have equal opportunity to contribute to the discussion • Opportunity to network, share information and learn from each other • Shortest interview time 	<ul style="list-style-type: none"> • Could be difficult logistically to get everyone together at the same time • Individuals might be reluctant to participate in such a large group that may include high-level officials • Not everyone may get to contribute
In groups 	<ul style="list-style-type: none"> • Can focus on one group at a time • Opportunity to network, share information and learn from each other • More flexible time commitment for stakeholders 	<ul style="list-style-type: none"> • Could be difficult logistically to get all stakeholders from a department together at the same time • Individuals might be reluctant to participate in front of others • Will need to compile information between departments afterwards • More time-consuming for the assessment team than first option
Group representatives 	<ul style="list-style-type: none"> • Can more or less focus on one group at a time • Opportunity to network, share information and learn from each other • More flexible time commitment for stakeholders • Can spend less time compiling information afterwards 	<ul style="list-style-type: none"> • Could be difficult logistically to get one rep per group together at the same time • Individuals might be reluctant to participate in front of others • Representative may not accurately express the entire group's views
Individual participants 	<ul style="list-style-type: none"> • More flexible time commitment for stakeholders • Individual may be more willing to discuss freely and openly any issues and concerns 	<ul style="list-style-type: none"> • No opportunity to network, share information and learn from others within and outside the department • Will need to compile information afterwards • Most time-consuming option

method, the organization should commit three to four hours for this part of the tool.

For Supertown, let us interview the staff as a group and conduct additional interviews as required. Now, we have decided whom we will interview and how. It's time to conduct the interview.

We are not looking for perfect answers. We want the stakeholders to answer the questions as best they can. It is not unusual for a local government to focus on some categories of assets more than others. These could be the assets in which it makes the most effort to manage and could likely be what the organization or administration considers its critical assets.

At the same time, we need to dig deeper to identify any assets that are not being adequately managed or given enough attention. It is very important to probe the responses to ensure you fully understand what is being done (or not). It is also important to ask for physical evidence to support the responses as this will be needed to complete Part 3.

Probing works best with open questions, that is, those that cannot be answered with 'yes' or 'no'. To do this, we begin our probing with words such as:

- *Tell me about ...*
- *Describe how ...*
- *Explain how ...*

Let us consider how we would do this for Question 1, repeated in Figure 17.

During the interview, the organization might indicate that it has an asset inventory but that it is incomplete or inaccurate.

We could ask, "Is your asset register database accurate?", but this is not really helpful as it would draw a Yes/No answer. We do not know if there really is a register or what information it contains. Instead, we could ask:

- *Please explain how you ensure that the information in your asset register database is accurate.*

- *Please tell me how often you record and validate asset information.*
- *Tell me about your level of confidence in your data.*

We should find out the various types of data being captured and whether the database is paper-based or electronic. Asking the organization to walk us through parts of the inventory (database or information system) will allow us to confirm these answers. It also gives us a sense of the assets included and how they might be classified.

Figure 17

Diagnostic Tool on-site assessment—Question 1

Question number and name		Questions
Understanding and defining requirements		
1	Asset inventory data	<p>What asset inventory information does the local government collect?</p> <p>How is it classified?</p> <p>How does the local government ensure the information is accurate, consistent and usable?</p>

Finally, it is important for us to encourage interviewees to add any comments or clarify how specific assets are managed, including any systematic or standardized approaches their organization follows. Remember that the next part of the Diagnostic Tool is the evaluation, so we want to gather enough information to be able to score the level of awareness for each of the 14 question categories. We can always refer to the "Explanation & examples" column of the worksheet (the rightmost column in figures 10-12 above) as a guide through Part 2.

3.3.5 Documenting responses

The next step is to document our responses to the Diagnostic Tool questions. It is important to take good notes during interviews because we will use the notes to complete the evaluation in Part 3.

If the assessment was done by a team, each team member will have taken notes on the responses, which we then consolidate into one complete set of answers. In addition, we need to specify how we received supporting evidence: did we see it and take a picture, obtain a physical or electronic copy, or simply accept a verbal explanation? Even if you are using the Diagnostic Tool as an internal health check for your organization, you should still gather evidence and record how you gathered it.

Once we have collected all the responses, we record them in the “Answers” column for Part 2.

Let us look at our team’s notes on Question 1 for Supertown.

From these answers, we gain a deeper understanding of what the inventory is used for as well as the type of information Supertown gathers, what is missing, how much has been entered into the system, how assets are organized and the individuals responsible for certain management activities. We document answers to each of the 14 categories in the same way throughout this column.

Once the answers are all in, we should review them to ensure that we have captured all the important information needed in the next step. It is useful to send completed Parts 1 and 2 back to the organization under assessment, so that it can correct any inaccurate information or misunderstandings. The organization can also take this opportunity to provide additional inputs or elaborate on answers that we did not have enough time for during the on-site visit. The person responsible for completing Part 1 should be our contact point.

When we have collected and verified our responses in Part 2, we can move on to Part 3: Evaluation.

Figure 18

Sample response in on-site assessment—Question 1

Question number and name	Questions	Answers (Assessors to complete this column during site visits)
Understanding and defining requirements		
1	Asset inventory data	
	What asset inventory information does the local government collect?	<ul style="list-style-type: none"> • New asset management system used to plan maintenance and repair and to prepare reports • Basic data is collected and recorded, including: asset value and depreciated value, year of construction and location. It was previously collected manually and logged into a fixed asset register. • Inventory records asset value, size, construction year and location, but materials (concrete/wood/etc.) and dimensions are not assessed, which is often a consultant's job • Approximately 80% of assets have been entered - done by a consultant but no data quality control or assurance (QC/QA). • Condition - Civil Engineering Department undertakes physical assessment using a template, but it is a personal assessment by engineer (no established metrics) • Engineering department assesses condition of buildings through visual inspection and captures condition in asset management system; building inspectors also inspect private buildings • The purchase cost or cost of construction is used for the asset value, not the market value.
	How is it classified?	
	How does the local government ensure the information is accurate, consistent and usable?	

Exercise 3

- a. Refer to Figure 15 with the list of interviewees from Supertown. Are there any roles missing that you think should be consulted? If so, who and why?

- b. Review the information provided by Supertown in response to Question 2 below. Is there missing information? What additional questions would you ask Supertown’s officials? What evidence would you want to see to support their answers?

2	Asset performance	How does the local government measure and manage the condition and performance of its assets? Are the records updated? When?	<ul style="list-style-type: none"> • Inspect buildings and prepare a report - but inspections only happen on request • Need more tools for proper quantitative inspection • Value fixed assets every three years
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- c. Which of the following are examples of basic inventory information? Which are examples of advanced information? On the line next to each item, write either “B” for basic or “A” for advanced. You can refer back to Figure 8 in Chapter 1 for guidance.

- Construction material (wood, concrete, steel, etc.)
- Annual operating and maintenance costs
- Year of construction
- Depreciated book value
- Combined estimated market value of building & land site
- Condition
- Current occupancy (percent of usable space occupied)
- Inspection date
- Construction cost
- Street address & Cadaster number
- Current use(s)
- Annual depreciation amount

- d. Think about your organization and answer Question 3 of the on-site assessment as if you were being assessed.

How does your local government determine an appropriate level of service for the services it delivers to its customers? How does it ensure that asset performance meets those service levels?

3.4 Part 3—Evaluation

Now, we should have gathered all the information and evidence we need to evaluate where the organization lies on the asset management awareness scale. Here, we use the scoring sheet in Part 3 of the Diagnostic Tool. We evaluate awareness as “Basic”, “Elementary”, “Progressing”, “Advanced” or anywhere between these four levels (see Figure 19). Columns C to F of the Excel tab provide an explanation of what an organization needs to demonstrate for each level of awareness when being evaluated against the 14 question categories in Part 2.

Starting with the awareness levels for Question 1, we can see how an organization or administration might progress from a basic (1) to an advanced (4) level of understanding of asset inventory data. At level 1, an organization grasps why information is important and has some asset data. At level 4, data is available for all assets and includes asset valuation. Data is also accessible to those who need it to forecast demand and manage assets over their life cycles. An organization understands the importance of data and how to use it to

make informed decisions and provide value to stakeholders.



Tips for Part 3 of the Diagnostic Tool

- Review notes and request additional information if needed.
- Include any additional thoughts or observations in the 'Comments' column.
- Make sure the target score is achievable in under three years.
- Follow the 'Recommending Interventions' process to identify specific and realistic interventions.

In the next portion of the worksheet (Columns G-L), we refer to the answers and notes from Part 2 to assign a level of awareness or ‘score’ for each of the 14 question categories. We also need to add comments, provide reasoning and specify evidence for our scoring. Finally, we are asked to recommend actions the organization can take to advance from the assessed score to the target score.

How do we take the information from Part 2 and complete the worksheet using our

Figure 19

Diagnostic Tool evaluation scoring guide—the four levels

Question number and name		Awareness level			
		Basic 1	Elementary 2	Progressing 3	Advanced 4
Understanding and defining requirements					
1	Asset inventory data	The local government understands the need to collect asset data and may have started to collect it.	Basic physical information (e.g. location, size, type) is recorded manually or electronically in a spread sheet. The date and time of collection, who it was collected by and how is also recorded. All assets are valued by historical book value.	Information is collected electronically. In addition to physical information, information such as replacement costs, approximate age, asset land value, etc. is also gathered. Assets are classified by groups, classes, service provided, by holder or a combination thereof. The asset inventory should specify where land holds natural resources, monitor condition and design, and implement plans for protection, inspection and maintenance of natural assets.	Complete and accurate data is available for all assets, including new assets. Data is easily accessible to all who require it. There is a high level of confidence in critical asset data. Valuation of all assets is based on market value, in-use value or replacement cost.
2	Asset performance	Asset condition and performance are understood may not be quantified or documented.	Asset condition, use, and/or suitability data and information are gathered and used to monitor asset performance.	Condition and performance information is used to plan maintenance and renewals over the short term.	Condition and performance information is used to estimate future demand and long-term needs.
3	Levels of service	The local government recognises the benefits of defining levels of service, but they may not be documented or quantified.	Basic levels of service have been defined and agreed. Customer needs are understood for critical assets. Measures are taken to ensure equal access for all.	Levels of service and appropriate performance measures are in place covering a wide range of services for most assets. Customer needs are analysed and levels of service determined on a needs, gender and affordability basis.	The cost associated with meeting higher level of service is understood and used in financial planning.

Columns C-F in Excel tab 'Part3_Eval'

(cont'd)

Life cycle decision-making

4	Forecasting demand	Future demand is considered but may not be documented or quantified.	Estimates of future demand are based on staff experience and knowledge.	Estimates of future demand are documented based on historic trends and population growth estimates.	Estimates of future demand are used in asset management planning to best meet future needs.
5	Decision-making	Asset management decisions are based largely on staff judgement and vary with the individual manager.	Formal decision-making techniques (e.g. cost/benefit analysis) are used by some managers.	Formal decision-making techniques (e.g. cost/benefit analysis) are used and consistently applied to major projects and programs.	Community planning and strategic priorities of local and national governments are incorporated into decision-making and considered by all managers.
6	Operational planning	Operating and maintenance decisions are made by each individual manager on an as-needed basis.	Operating procedures are established and documented for critical assets, and specific staff are assigned to manage the operations.	Operating procedures are established and documented for all major asset categories, with accountable staff in place.	Operating procedures are established, staff is assigned, and operations are tracked to ensure service levels are met.
7	Capital planning	Most capital investments are done on an as-need basis and funds are available.	Capital investment projects are identified during an annual budget process.	There is a schedule of the proposed major capital projects and associated costs for the next 3-5 years, based on staff judgement of future requirements.	There is a complete schedule of proposed capital projects for the next 3-5 years. A prioritisation framework is used to rank the importance of capital projects.
8	Financial planning	Financial resources are hard to identify and predict, and vary a lot from year to year so the current financial focus is on current operations rather than long-term planning and asset values. Accounting is 'cash-based'.	Financial planning is largely done through an annual budget process based on previous experience and broad assumptions about the future. Accounting is 'accrual-based' and corresponds to national regulations and international standards.	In addition to an annual budget, 3- to 5-year financial forecasts of asset revenues, costs and expenses are made. Financial reporting is fully compatible with the asset inventory system and is transparent and timely.	Financial forecasts (3-5 years out) are done based on well-reasoned assumptions/reliability factors. Managers know what resources they have available to operate and upgrade the assets under their control. Audits occur annually and include the financial management and reporting of municipal assets.
9	Sustainability	The need for sustainable service delivery is understood by policy makers but may not be considered in decision-making by local government staff.	The need for sustainable service delivery is understood by policy makers, and local government staff consider it in decision-making.	Policies are in place related to sustainable service delivery for critical assets (i.e. climate change adaptaion), but decisions are not always consistent with the policies. Measures are in place that recognize the importance	Sustainable practices are a high priority for both staff and policy makers. Policies adopted by local government are widely understood and provide clear direction on how the local government will achieve sustainable

(cont'd)

Asset management enablers

					of natural resources (municipal forests, lakes, river basins) for municipal climate change adaptation and mitigation.	service delivery. Policies are a regular reference for guiding decisions.
10	Asset management leadership and teams	The local government recognises the benefits of an asset management function within the local government, but has yet to implement a structure to support it.	The local government recognises the benefits of an asset management function within government and is working towards implementing a structure to support it.	Policies and processes are in place for management of critical assets.	Asset management functions are performed by some departments, and roles reflect asset management responsibilities, e.g. position descriptions and duties for operations staff.	There is ownership and support of asset management by local government leaders. Asset management responsibilities are coordinated across the organisation.
11	Asset management policy and process	The local government has an awareness of the need to formalise asset management policies and processes.	Policies and processes are in place for management of critical assets.	Asset management plans contain basic information on assets, service levels, planned works and financial forecasts (3-5 years out). Future improvements are being developed.	Asset management policies, processes and plans are aligned to community needs, financial plans and resources.	Asset management policies, processes and plans are aligned to community needs, financial plans and resources.
12	Asset management information systems	Local government does not yet track asset information.	Asset information is tracked manually, but the local government has the intention to use electronic means.	The asset management information system can record core asset data, e.g. size, material, location, age, etc. Asset information reports can be manually generated for various needs.	The asset management information system also captures performance data and enables some standardised electronic reporting. There may be a spatial relationship capability (GIS).	The asset management information system also captures performance data and enables some standardised electronic reporting. There may be a spatial relationship capability (GIS).
13	Service procurement	Individual manager procures services based on own best judgement.	Standard processes are in place for procuring services across key departments.	Procurement policy in place. Competitive tendering practices are applied to some services.	Risks, benefits and costs of various outsourcing options have been considered and determined. Competitive tendering practices are applied with integrity and accountability.	Risks, benefits and costs of various outsourcing options have been considered and determined. Competitive tendering practices are applied with integrity and accountability.
14	Transparency	The local government is committed to transparency in its operations.	Some local government information is accessible to the public.	Local government information, including decisions, audited financial statements, policies and processes, are accessible to the public but may not be current.	There is community involvement in decision-making and consistent application of asset management policies and procedures. Local government information, including decisions, audited financial statements, policies and processes, are current and easily accessible to the public.	There is community involvement in decision-making and consistent application of asset management policies and procedures. Local government information, including decisions, audited financial statements, policies and processes, are current and easily accessible to the public.

assessment of Supertown? Let us review Supertown’s answer to Question 1.

On the evaluation sheet under “Assessor score”, we use our notes from the on-site interview and the scoring guidance to score each of the questions Supertown has answered. These scores indicate current levels of awareness. Next, we complete the “Reasons” column with an explanation for the assigned score and the “Evidence” column with supporting evidence also gathered in Part 2. We then set a “Target score” that we feel is appropriate for the organization to aim towards. We can make additional comments in the “Comments” column as needed.

The last column leaves space for recommended interventions. We will look closely at how to fill this out in Section 3.5.

Based on our notes and a review of the scoring guidance for asset inventory data, Supertown falls between levels 1 (“Basic”) and 2 (“Elementary”). The local government collects basic information using an asset management system, but assets are valued by purchase or construction cost, not historical book value. So, the scoring is close to 2 but not quite.

What about the target score?

The target score must be achievable in a reasonable period of time. Supertown is doing a lot of things right. An asset management system exists and is in use, even if it has errors. It will not be difficult to add more advanced information for one or two critical assets. For this reason, we decide that Supertown could achieve a score of 3 within 2-3 years. This is the recommended time period for setting and reaching any target score.

Once all of this information is entered, the evaluation sheet should look like what you see in Figure 21.

As you fill in the “Assessor score” and “Target score” columns, the values will be automatically presented in a table and a series of charts in the Excel version of the Diagnostic Tool. They can be viewed in the “P3Summary of Results” tab.

Based on our evaluation of Supertown, the summary table indicates an overall awareness score of 1.6 and a target score of 2.6. The overall awareness score is an average of the 14 scores. In the table, we can analyze exact scores and aggregates (see Figure 22).

Figure 20

Sample response to Question 1, revisited

Question number and name	Questions	Answers (Assessors to complete this column during site visits)
Understanding and defining requirements		
1	<p>Asset inventory data</p> <p>What asset inventory information does the local government collect?</p> <p>How is it classified?</p> <p>How does the local government ensure the information is accurate, consistent and usable?</p>	<ul style="list-style-type: none"> • New asset management system used to plan maintenance and repair and to prepare reports • Basic data is collected and recorded, including: asset value and depreciated value, year of construction and location. It was previously collected manually and logged into a fixed asset register. • Inventory records asset value, size, construction year and location, but materials (concrete/wood/etc.) and dimensions are not assessed, which is often a consultant's job • Approximately 80% of assets have been entered - done by a consultant but no data quality control or assurance (QC/QA). • Condition - Civil Engineering Department undertakes physical assessment using a template, but it is a personal assessment by engineer (no established metrics) • Engineering department assesses condition of buildings through visual inspection and captures condition in asset management system; building inspectors also inspect private buildings • The purchase cost or cost of construction is used for the asset value, not the market value.

Figure 21

Sample score evaluation sheet—Question 1

Comments	Assessor score	Target score	Reason for scores	Evidence to support score
<p>Approximately 80% of assets have been entered - done by a consultant but no data quality control or assurance (QC/QA).</p> <p>Condition inspections done by engineering but no evidence of data being entered into asset management system at this point.</p> <p>There is motivation to use asset management system.</p>	1.5	3	<p>Basic data is collected and recorded, including asset value and depreciated value, year of construction and location, using the new asset management system.</p> <p>It was previously collected manually and logged into a fixed asset register. The purchase cost or cost of construction is used for the asset value, not the market value.</p> <p>Asset management system has a data structure that allows for asset classification and reporting options.</p>	<p>Review of asset management system and asset registers</p> <p>Inventories provided</p>

Figure 22

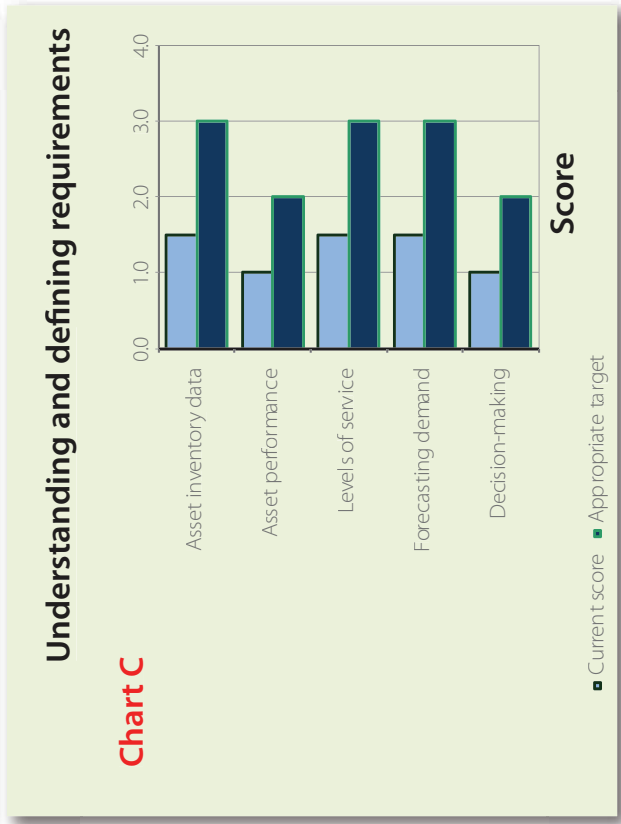
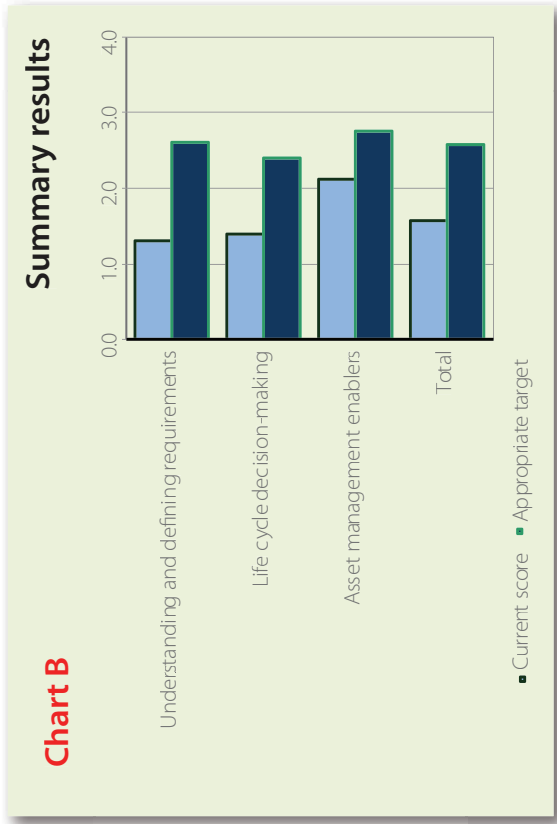
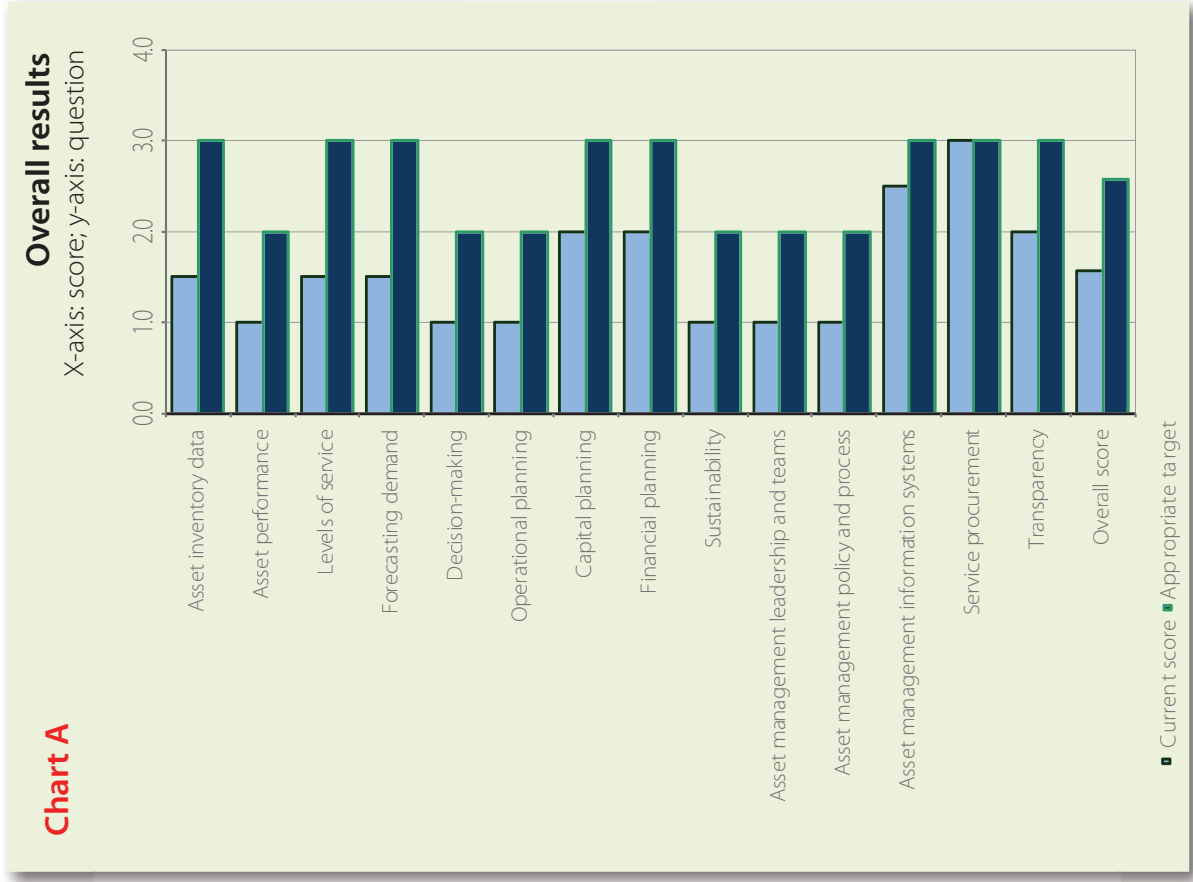
Sample results table for Supertown

Part 3 - Summary of Results

Question	Summary of results	Current score	Appropriate target	Difference
1	Asset inventory data	1.5	3.0	1.5
2	Asset performance	1.0	2.0	1.0
3	Levels of service	1.5	3.0	1.5
4	Forecasting demand	1.5	3.0	1.5
5	Decision-making	1.0	2.0	1.0
6	Operational planning	1.0	2.0	1.0
7	Capital planning	2.0	3.0	1.0
8	Financial planning	2.0	3.0	1.0
9	Sustainability	1.0	2.0	1.0
10	Asset management leadership and teams	1.0	2.0	1.0
11	Asset management policy and process	1.0	2.0	1.0
12	Asset management information systems	2.5	3.0	0.5
13	Service procurement	3.0	3.0	0.0
14	Transparency	2.0	3.0	1.0
	Overall score	1.6	2.6	1.0
Summary results				
	Understanding and defining requirements	1.3	2.6	1.3
	Life cycle decision-making	1.4	2.4	1.0
	Asset management enablers	2.1	2.8	0.6
	Total	1.6	2.6	1.0
			% variance from target	39%

Figure 23

Diagnostic Tool results graphs



Bar charts provide helpful visuals. In the Excel file, charts are also automatically generated from the assessor and target scores. Let us take a visual look at the results for Supertown.

In Figure 23, Chart A presents the scores for each of the 14 categories of questioning. Chart B averages the scores in each of three areas of inquiry — *Understanding and defining*

requirements, Life cycle decision-making and Asset management enablers. You can also zoom into a particular area for a scoring breakdown of just those questions. Chart C depicts results for the questions related to *Understanding and defining requirements*.

Before we conclude the application of the Diagnostic Tool, there is one last step in Part 3: we need to recommend interventions.

Exercise 4

- a. Return to Exercise 3b and look at Supertown’s response to Question 2 of the on-site assessment related to asset performance. What assessor and target scores would you give Supertown? Why?

- b. Return to Exercise 3d and complete the evaluation sheet for Question 3 of the on-site assessment related to levels of service. This should pertain to your own organization or administration.

Scoring and evaluation					
Comments	Assessor score	Target score	Reason for scores	Evidence to support score	Recommended interventions

3.5 Part 3— Recommending interventions

As we saw in Figure 20, the final column of the Part 3 evaluation sheet allows the assessment team to make recommendations for the local authority to achieve its target scores and improve asset management practices.

These interventions can be ‘quick wins’ or more strategic. Quick wins require neither additional understanding of asset management concepts nor significant resources, and they can usually be implemented in less than three months.

Strategic interventions, however, are more systemic changes requiring a longer time frame and additional resources to implement. The organization will typically gain a deeper understanding of asset management concepts, such as those encountered in Chapter 2. An organizational culture around asset

management may start to evolve as concepts translate into concrete plans and practices.

So how do we make good short- and long-term recommendations based on our evaluation?

We begin by looking at the problems, what the organization is currently doing and which actions we think are needed to get to the next level—their target score. This involves four steps, as laid out in Figure 24.

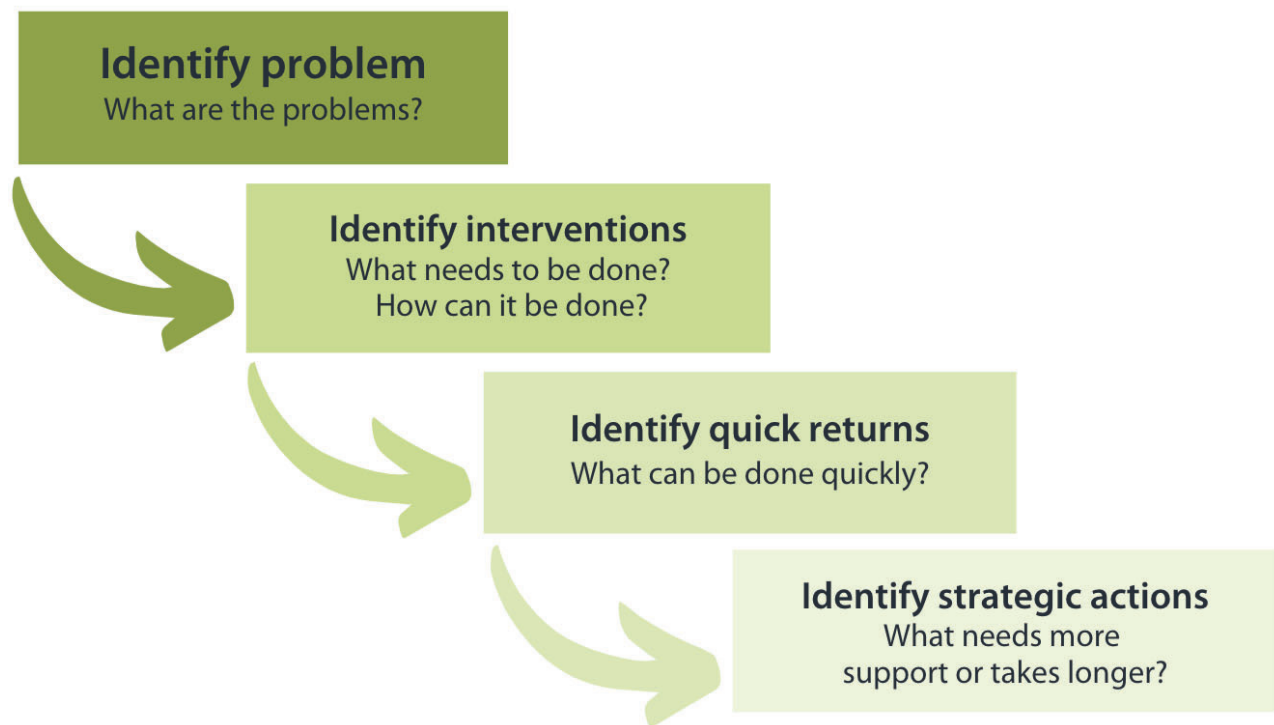
Let us apply these steps to Supertown.

We know from our evaluation that Supertown collects and records the following basic data: asset value and depreciated value, year of construction, location. We also know they have problems with the quantity and quality of their data as it was entered into the new asset management system by a consultant.

In this part of the assessment, we develop a series of specific actions to address these problems. We identify which of the recommended interventions are quick wins, in other

Figure 24

Steps to recommend interventions



words, those Supertown should be able to start and complete in less than three months with existing resources. We then list the actions requiring more resources and a deeper shift in organizational practices and mindset.

The box shows the actions that have been identified for Supertown based on existing gaps, and organizes them by quick wins or strategic interventions.

Interventions may require coaching and educational support provided by UN DESA, UNCDF, UNOPS or similar organizations. The organization could also to hire additional local

staff to implement them.

Now that we have completed all sections of the Diagnostic Tool, we need to prepare a concise summary that can be shared with the organization.

3.6 Preparing an asset management profile

The asset management profile is the last step of the Diagnostic Tool. We should compile all the information gathered throughout the assessment into a report of key findings,

What problems does Supertown face with its asset inventory data?

- Not enough data to make decisions
- Poor quality of existing data

What does Supertown need to do? Collect more data and improve overall data quality.

What actions can Supertown take to address these problems?

1. Establish a process for data validation and determine the roles and responsibilities involved. Identify one person to:
 - a. Be in charge of ensuring data is entered correctly and reviewing a sample of the data periodically (bi-weekly, monthly, etc.) to check for errors.
 - b. Create a simple checklist of what must be entered and how (i.e the formatting) to ensure data is correct. This will include the correct government departments, asset categories, types and subtypes to be used in the asset management system.
 - c. Train others on how to enter data and use the checklist.
2. Develop a plan to verify and correct data errors, beginning with critical assets.
 - a. Implement a plan for critical asset data.
 - b. Complete verification of all asset data.
3. Identify the most critical assets in each category by determining which assets are most likely to fail and have the greatest implications of failure for the community.
 - a. Select one asset and prioritize the relevant data to be collected for it. It is not necessary to collect all data for all assets.
 - b. Using the training provided, collect basic data for that asset and ensure it is correct by following the checklist and confirming what has been entered according to the checklist.
4. Complete basic data collection and validation for other critical assets.
5. Complete advanced data collection for critical assets.

Which actions are quick wins?

Steps 1a, 1b, 1c, 2a, 3a, 3b

Which actions are strategic interventions?

Steps 2b, 4, 5

Exercise 5

a. Building on Exercise 4a for Question 2 of the on-site assessment, what recommended interventions would you make for Supertown? Which actions can be done relatively quickly, and which will require significantly more time and resources?

b. Think about the evaluation you made in Exercise 4b of levels of service and complete the following table with recommended interventions. Organize them as quick wins or strategic actions.

Quick wins (short term, requiring fewer resources)	Strategic (systemic, long term, requiring greater resources)

recommended interventions and insights gained. These comprise the 'asset management profile', which can be structured along the sample table of contents provided in Figure 25.

In the *Introduction*, we could give an overview of the Diagnostic Tool and a rationale for its application to the organization or administration of interest. We may mention the meetings that were held and with whom. If the assessment is part of a larger programme or initiative, we should explain that here for context.

The next section, *Assessment*, presents the results of all three parts of the assessment. The graphs from the Diagnostic Tool can be inserted into the profile to provide a quick visual comparison of the current and target levels of awareness.

A third section, *Recommended Areas of Intervention*, provides a menu of options for the 14 categories of questioning, with the interventions identified as quick wins or strategic actions. It is important to provide an explanation of our proposed interventions so that when local officials are deciding on their

Figure 25

Sample table of contents for Supertown’s asset management profile

Contents

Introduction

- Programme overview
- Anyland mission
- National government meetings.....
- Local government authority meetings
- Introducing the concept of asset management
- Applying the Diagnostic Tool.....

Supertown assessment

- Strategic overview—part 1
- Current asset management practices—part 2.....
- Assessment of current practices—part 3.....
- Overall assessment
- Assessment by asset management area and components

Recommended areas of intervention

- Interventions—understanding and defining requirements.....
- Interventions—life cycle decision-making
- Interventions—asset management enablers.....

Next steps

Annex A – National government participants.....

Annex B – Strategic overview responses

Annex C – Current practices responses.....

Annex D – Levels of awareness

capacity development priorities, they can have a clear, well-structured discussion of the proposals. A table is a simple way to do this.

It is important that we also provide guidance on what the organization should do next. Therefore, the final section of the profile is *Next Steps*. The key stakeholders and departments that participated in the on-site assessment will need to identify their priority areas for technical assistance based on the recommended interventions. They will need to secure local buy-in and ownership of further technical assistance activities.

Below are some actionable next steps that an assessed organization can take, to be included at the end of the profile as guidance:

- Review the profile and provide feedback and comments to the assessment team.
- Identify which of the 14 categories of questioning take priority for the organization or administration.
- Identify which recommended interventions take priority for the organization or administration.
- Determine where external support is most required, e.g. to help create awareness, teach asset management best practices or help develop asset management policy.
- Narrow in on one or two assets that will become the focus for improved asset management.

Some of the interventions may be the focus of an Asset Management Action Plan, which we will learn about in Chapter 4.

Exercise 6

How might an 'asset management profile look' for your organization (whether done by an external or internal assessment team)? What would you add, change or remove from the sample table of contents in Figure 25?

The following documents were used as the basis for creating the UN Asset Management Diagnostic Tool:

Olga Kaganova, *A Self-Assessment and Benchmarking Tool for Local Governments* (Chicago, Illinois, University of Chicago, 2015).

The Institute of Asset Management, *The Self-Assessment Methodology Plus—Version 2.0* (Bristol, 2015).

The Treasury, *Investor Confidence Rating - Asset Management Maturity* (Wellington, New Zealand Government, 2017).

Institute of Public Works Engineering Australasia (IPWEA), *International Infrastructure Management Manual (IIMM) 2011* (Wellington, IPWEA, 2011).

Asset Management British Columbia and Urban Systems, *AssetSMART 2.0—A Local Government Self-assessment Tool* (British Columbia, Province of British Columbia).

Federation of Canadian Municipalities, *Asset Management Readiness Scale* (Ottawa, Ontario, 2018).

Chapter 4

Taking action with asset management action plans

Key takeaways

- ▶ Governments can use the UN/DESA-UNCDF Asset Management Action Plan (AMAP) to lay out a clear and comprehensive map of actions and measures to improve the performance of priority assets.
- ▶ Creating an AMAP entails a series of steps, including stakeholder analysis, performance projections, gap assessment and corrective actions, to ensure follow-through and sustainability of improvement efforts.
- ▶ Having AMAPs in place for priority assets is an indication of a transparent and financially responsible government and can help attract additional public and private investment in sustainable development.

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The terms in **bold** can be found in the Glossary.

In previous chapters, we learned about the basics of asset management and how to use the Asset Management Diagnostic Tool to identify areas where we can improve our asset management practices. Now that we know what we need to do and why, we need to develop an action plan to implement change. This chapter will take you through the process, step by step.

4.1 What is an asset management action plan?

An **asset management action plan** (AMAP) is a way to compare your organization’s present asset management knowledge, practice and documentation against good asset management practices. It helps you identify gaps in your asset management practices and pinpoint specific actions to close those gaps, thus, improving your asset management.

The AMAP process is a simple and methodical way to improve how you manage one or two of your priority assets. The five AMAP steps follow the best practices we learned in

Chapter 2 and incorporate guidance from the Diagnostic Tool (Chapter 3) to help you create a plan that can be implemented in a relatively short time frame. The AMAP is a concrete start to your asset management journey.

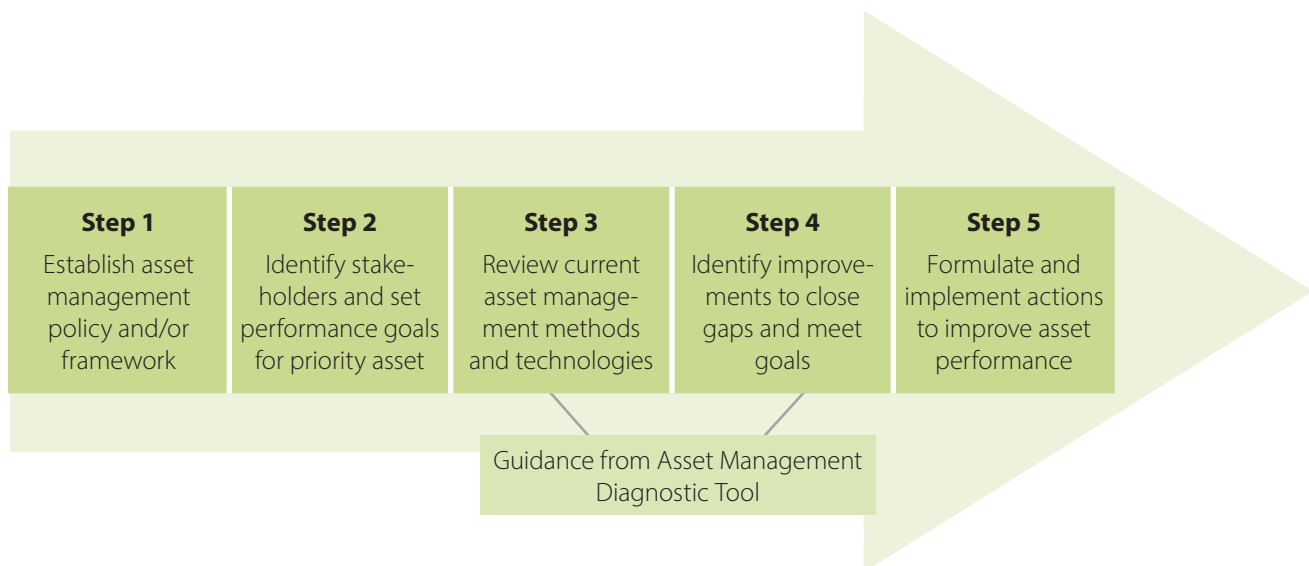
A successfully implemented AMAP is a significant step in the development of a sound asset management system that will help any organization. It is especially designed to help local governments best invest funds and provide the best service to their stakeholders and communities. However, it can be easily applied by central governments for assets managed at the national level.

There are five key steps (see Figure 1) to developing an AMAP:

1. Establish a national or local asset management policy and/or framework.
2. Identify stakeholders in managing priority asset(s) and set performance goals for priority asset(s), in line with the asset management framework and national guidelines.
3. Review current methods and technologies used to manage assets.

Figure 1

Asset management action plan (AMAP) steps



4. Identify areas where current practices can be improved to meet performance goals.
5. Formulate and implement a concrete set of actions for all stakeholders to improve asset performance.

Each step is intended to guide you towards a set of specific actions that will:

- Address the gaps you have identified in your asset management practices.
- Link proposed asset management improvements to the current and medium-term local government budget.

You can use the guidance from the Diagnostic Tool to identify the level of organizational awareness, significant gaps and suggested approaches to closing these gaps. The recommendations from the Diagnostic Tool analysis should play a prominent part in the actions identified in your AMAP.

We will look at how to do this in this chapter. The key is to start with one priority asset and use the guidance from the Diagnostic Tool to help you identify areas for priority action. This asset will typically be a critical asset.

4.1.1 How does an asset management action plan help?

An AMAP provides your organization with a map showing how to get from where you are now in managing your assets to where you want to be. It can also be used (via steps 2-5) to address unforeseen requirements for assets that might arise as a result of natural disasters, climate change or public health emergencies such as those described in Chapters 6 and 7.

When AMAPs are in place for most critical assets, this is an indication of sound asset management practices and a transparent and financially responsible local government. This, in turn, builds trust and confidence among local stakeholders and helps to raise money from sources further afield. The ultimate objective of implementing AMAPs and comprehensive asset management systems is to

build the capacity of each local jurisdiction to be more prosperous and provide a better quality of life for people.

Consider an example.

A local government wants to increase food security in the community and decides to build a new public market. To build, operate and maintain the asset, it needs to generate revenue. If it cannot build the asset, it may consider securing investors (national government, donor agencies or third-party investors) to help build the market. This is a high-risk strategy. The investors will want assurances that their investment is protected. Market vendors will only pay higher fees if they can be assured that there will be better services and more customers than at the old location.



Photo © Linda Newton

The market must be well maintained so that it will continue to provide a benefit to investors, vendors and customers and generate revenue for the local government over many years. An AMAP would demonstrate to stakeholders that the local government has a sound plan to ensure the market will continue to generate revenue over its life cycle.

4.1.2 Developing your asset management action plan

Before you begin to develop your AMAP, you should ideally have in place an asset management champion or focal person. Chapter 2 discusses the responsibilities of the champion, which include convening regular meetings to ensure asset management is seen as an

ongoing activity. It is critical that this focal person be approved by senior management and the local council.

The focal person for an AMAP can be anyone at the working level who has an interest in asset management. Since the AMAP ultimately focuses on one priority asset, this focal point can be either the asset management champion or an expert in the service area for the priority asset who has both a high-level and technical understanding of the related management needs.

An AMAP is written by a team of senior local government staff with asset management responsibilities in one or more of the following three areas: demand management, life cycle management and financial management. This should include key individuals from engineering, finance, planning and, depending on the asset chosen, public health, community

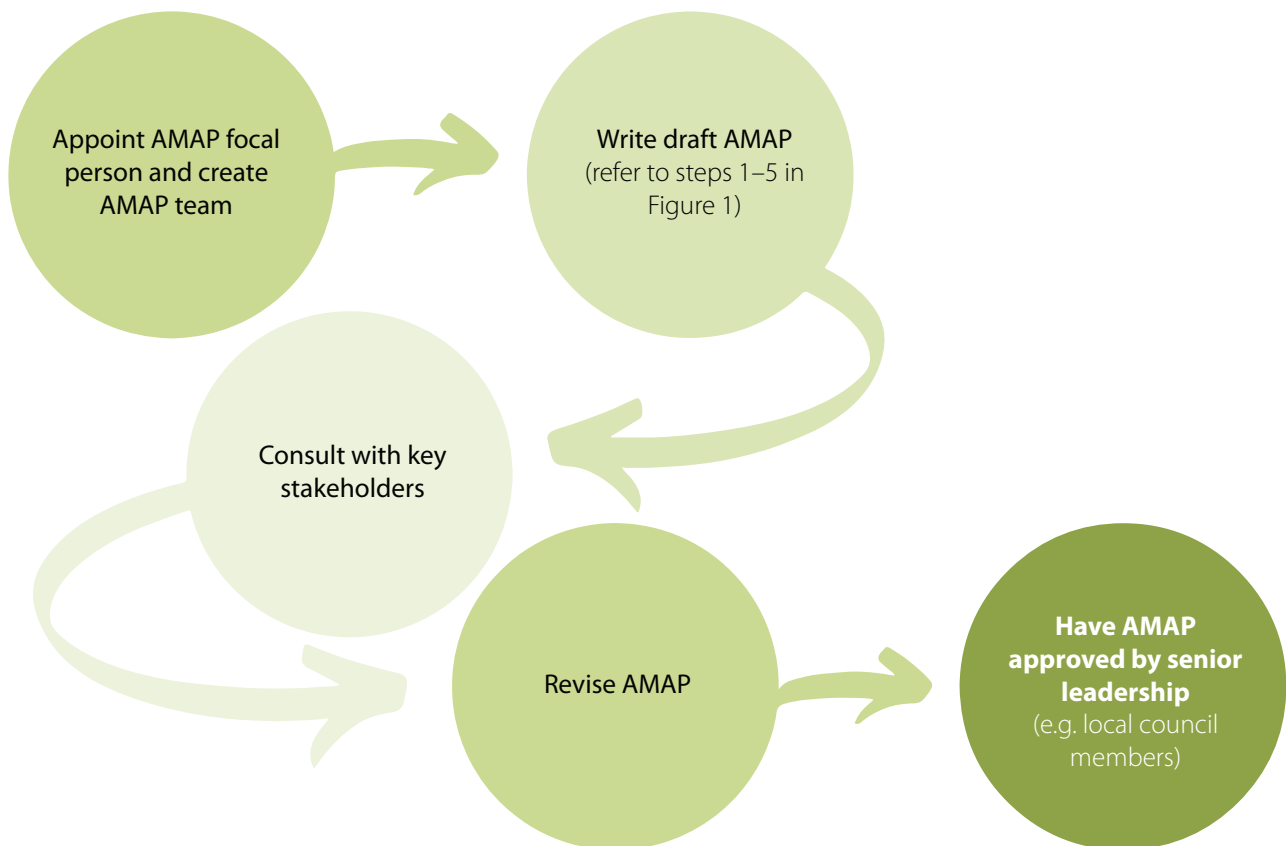
development, procurement, etc.

The team should set aside two to three full days to write the draft AMAP. This can be done in one session or spread out over a week or two to allow for proper consultation with key stakeholders. The draft AMAP should be reviewed with your active stakeholders and then revised as needed. Once this is done, you can complete your first AMAP, get it approved and take action to improve asset management in your organization.

To get started on the path to better asset management, your organization may choose to write an AMAP for just some rather than all assets. The AMAP process (see Figure 2 for an overview) can be repeated as many times as necessary, until you have AMAPs for all the priority actions and assets identified in your Diagnostic Tool assessment.

Figure 2

Full asset management action plan (AMAP) process



Exercise 1

a. What are the five steps to writing an AMAP?

b. How can an AMAP help your organization improve its asset management practices? Give a specific example.

4.1.3 Getting started

An AMAP template (Annex A) is available to help you write your AMAP. It follows the five AMAP steps.



AMAP writing tips

- Write in simple language, avoiding use of acronyms.
- Be consistent in use of terms.
- Be specific. Your AMAP must explain your plan so multiple stakeholder groups can understand it.
- Use the template provided. Where a section does not apply, do not amend the template by removing the section. Put in a statement to the effect “This section does not apply.”
- Ask questions and seek advice.

The template includes text and tables (in black text) that can be left in the document by those responsible for writing the AMAP. There is also guidance text (in *red italics*) to indicate

what information you should add. All red italic text should be deleted prior to finalizing your AMAP.

The next sections of this chapter follow the AMAP template and take you through the steps of writing your AMAP.

4.2 Asset management action plan introduction

The introduction is the first section of your AMAP. Its aim is to explain the purpose of your AMAP and any assumptions you made in preparing it, as well as any constraints you have identified.

This section can be written last, after you have identified your priority asset and developed your action plan.

The introduction begins with a short section on the purpose of the AMAP. The wording is common for all AMAPs.

Next, you will identify your priority asset (see Section 4.4.1 below) and provide a brief explanation of (1) why this asset has been selected, and (2) why it is critical to your local government and community.

Here is an example from an AMAP written by Dharan Sub-metropolitan City in Nepal:

“Water provision assets have been selected because the city of Dharan is currently facing acute water supply problems which have an adverse effect on health of the citizens and the economy of the city.”

4.2.1 Assumptions and constraints

Next, you will identify any assumptions and constraints that have an impact on your ability to implement your AMAP.

Figure 3

Examples of AMAP assumptions and constraints

Assumptions	
<ul style="list-style-type: none"> • We assume that our current level of own source funding will continue or increase modestly. • We assume that our current level of asset management resources will not decrease. 	
Constraints	
Internal	<ul style="list-style-type: none"> • We are limited in our ability to hire additional staff and must implement our AMAP within our existing capabilities.
External	<ul style="list-style-type: none"> • We must work with national agencies for assets that are used by our citizens but managed by others.

It is important to understand how your assumptions and constraints relate to the action plan. Should any of the major assumptions or constraints change, the plan should be revisited, and revised if necessary, to ensure that it is still relevant and achievable.

So, what are assumptions and constraints?

Assumptions are things that are accepted as true or inevitable, without proof that they exist or will occur. Constraints are things that limit your ability to undertake certain actions. They can be internal or external.

Internal constraints are those imposed by your own organization, such as staffing. External constraints are those imposed by other organizations, such as external funding agencies, national agencies such as the Ministry of Finance, or utilities such as electricity or water provision.

Figure 3 gives some examples of assumptions, internal constraints and external constraints.

4.3 Step 1: Establish a national or local asset management framework or policy

Chapter 2, Section 2.2 discussed the importance of having an asset management framework or policy that provides direction. Establishing your framework or policy is the first step in the AMAP process.

Begin by asking two questions.

1. Do we have an asset management framework or policy?

- ✓ If so, does it meet the requirements set out below?

Your framework and policy need to be in line with your municipal needs and capacity — that is, with your overall vision for the management of municipal assets, including objectives,

targets and links to the broader city vision and capital investment plan.

As discussed in Chapter 2, your asset management policy should be:

- In accordance with legal requirements of the government and other regulatory bodies.
- In accordance with the requirements of stakeholders and customers (new and existing).
- Agreed upon among key stakeholders.
- Adopted by the local council or equivalent decision-making body for a specified long-term period.
- Periodically reviewed by appointed representatives of both local government and stakeholders.
- × If the current framework or policy does not meet all of these requirements, it should be updated. It will lay the groundwork for many aspects of the asset management strategy and direction.

You can use the AMAP process as an initial step to develop your asset management framework or policy. Chapter 8 provides guidance to help national governments create an enabling environment to support local governments in developing an asset management framework.

2. Do we have an asset management strategy or plan?

- ✓ If so, does it meet the requirements set out below?

As you also learned in Chapter 2, the asset management strategy is an important document, providing practical direction on what needs to be done to comply with the asset management policy. It is often a part of the strategic asset management plan and should:

- Set out the local government's asset management vision, goals and objectives (following the policy or framework).
- Be aligned with local government strategic development goals.

- Document the current state of the assets
- Define the required levels of service
- Identify protocols to be used for:
 - ☒ Asset data collection and hierarchy
 - ☒ Condition and performance assessment
 - ☒ Criticality and risk assessment
 - ☒ Response to service interruptions
 - ☒ Response to customer complaints
- Define the roles and responsibilities of decision makers
- Adopt the assessment of asset condition and performance as a precondition for making all asset management decisions (this is a medium- to long-term objective)
- Establish risk-based decision-making processes for prioritization of maintenance and capital investment actions and interventions
- Use life cycle costing to evaluate competing investment needs.
- × If the current strategy or plan does not meet all of these requirements, it should be updated. You can use the AMAP process to develop your strategy or plan.

Answering 'no' to one or both questions does not prevent you from embarking on your AMAP process. The template requires you to include several objectives and main principles that will guide your AMAP analysis, priorities and actions. These will form the basis of your asset management framework, policy and strategy when you are ready to establish them.

Your organization's asset management objectives are the high-level goals or outcomes you wish to achieve, and your asset management principles provide a 'code of conduct' that you will follow to achieve your objectives. Several examples are given in Chapter 2, Figure 5.

Figure 4 shows additional examples of objectives and principles that local governments have used in creating their AMAPs.

Figure 4

Examples of asset management objectives and principles

- | | | |
|---------------------|---|---|
| Sustainability | { | <ul style="list-style-type: none">• We will encourage water harvesting and conservation schemes to counter erratic rainfall.• We will manage our natural assets to conserve resources and give attention to long-term solutions rather than short-term affordability or convenience.• Proper valuation of our environmental assets, such as lakes, rivers and groundwater will allow land and other assets to retain value. |
| Integrated approach | { | <ul style="list-style-type: none">• We will use a portfolio management approach to ensure we maximize benefits to our citizens while minimizing costs.• We will include financial asset management needs in our annual budget and medium-term fiscal expenditure plans. |
| Customer-focused | { | <ul style="list-style-type: none">• We commit to fair and equitable access and use of our assets regardless of race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status.• We will involve and inform the public on important decisions related to the acquisition, repair or sale of our assets. |
| Compliance | { | <ul style="list-style-type: none">• We will strive to meet or exceed all national regulations, benchmarks and requirements related to the management of our assets. |

Exercise 2

a. What is the purpose of asset management objectives and principles?

b. Identify at least four asset management objectives for your organization.

c. Identify at least two principles for each objective.

d. What assumptions can you make that will have an impact on your AMAP? What constraints do you face? Complete the following table.

Assumptions

Constraints

4.4 Step 2: Priorities, stakeholders and goals

The second step in developing your AMAP involves several activities (see Figure 5).

This is the most important step in the AMAP process. Unless you can identify your most important assets, you cannot focus your efforts to improve your asset management. Unless you identify the key stakeholders in these assets, you cannot determine if they have what they need or if they are using the best methods or tools. And unless you clearly

Figure 5

Priorities, stakeholders and goals



define your goals, you cannot identify the gaps that prevent you from achieving them.

4.4.1 Identifying priority assets

Recall from Chapter 1 that critical assets are those that have a high service and/or financial value. **Priority assets** are the critical assets that are most important to delivering the local government's objectives (see Figure 6). These assets need close attention, as neglecting them carries a significant risk to the local government and community. A local government may need to have contingency plans in place if the service a priority asset delivers is compromised.

You may have already identified your critical assets as part of the Diagnostic Tool assessment. If so, you can refer to your self-assessment. Consider our example from Chapter 3. Supertown's critical assets were its solid waste collection vehicles, its own-source revenue collection devices and the software used to track revenue collection.

If you have not identified your critical assets,

you can do so as part of this step. Now is also the time to think about the impact of climate change, public health events and other types of hazards and risks on your priority asset.

How do we choose one or two priority assets from our critical assets?

The process for identifying priority assets should:

- Align with your local government asset management framework or policy and asset management strategy or plan.
- Align with your local government strategic development goals.
- Reflect customer or stakeholder priorities, including required levels of service.
- Reflect the importance of the asset within the wider system or systems to ensure continued delivery of services and avoid cascade failure.
- Reflect the risks associated with each asset. (A lower priority asset usually faces lesser risks.)

You have to prioritize your assets objectively,

Figure 6

Examples of priority assets by category



Energy and utilities—energy production (such as hydroelectric dams), electrical transmission and distribution



Food—abattoirs, markets



Transportation—road networks (including interstate/regional systems), bus stations, transportation



Government—local government offices, courthouses, post offices



Health—hospitals and clinics, garbage and solid waste collection



Water—treatment plants, distribution networks and points (such as wells), sanitary sewage collection and treatment, dams



Safety—street lighting, police and fire departments

Figure 7

Determining priority assets



without emotion or bias. Prioritization should consider, at a minimum, the vital function supported by the asset and the impact of loss of service.

How can you quantify this?

A simple scoring system can be developed to help you prioritize. Figure 7 categorize levels of impact by color. In this method, you first identify the vital function the asset supports and determine what would be the impact if this service were disrupted. The impact could be loss of life, compromised public safety and/or security, loss of revenue, community unrest, etc. Next, you group the assets according to the severity of the impact if the service is disrupted.

Another good practice is to assign standard

criteria to all assets, and then score them against those criteria on a numerical scale. This is the **multi-criteria analysis** method, which was introduced in Chapter 2, Section 2.4.4, and the same sample scoring can be seen in Figure 8.

Once all the scores are added up, the highest-scoring assets are considered the most important and would normally be given the highest priority.

Once you have identified your priority assets, list them in Table 1 of your AMAP along with the rationale for selecting them, i.e. the vital functions supported and the impact of service disruption.

Worksheet 1 gives an example of AMAP Table

Figure 8

Sample scoring for multi-criteria analysis

Criteria	Sample scoring	
	1	5
Importance of asset to local government	Not important	Very important
Impact on community if asset is out of service	Very low	Very high
Condition of asset	Very poor	New
Replacement value of asset	< \$50,000 USD	> \$10 million USD

Determining your priority asset (AMAP Table 1)

Asset	Vital functions supported	Impact of service disruption
Solid waste collection	Health and safety, social well-being, economic	<ul style="list-style-type: none"> • Epidemic outbreaks • Loss of life and property • Loss of revenue • Loss of aesthetic value • Impact on other interrelated assets like drains, footpaths • Flooding • Impact on unclaimed cattle • Water and air pollution • Reduction in community quality of life

1 for Bheemdatt Municipality in Nepal.

4.4.2 Identifying stakeholders

Stakeholders are people or organizations who have an influence on the way you conduct your asset management activities. There are many stakeholders involved in asset management. It is important to understand their needs and expectations. They can be internal or external, and include users and outside agencies.

There are stakeholders who actively manage the asset (at the operational and strategic levels) as well as those who have an influence on, or interest in, how the asset is managed. It is important to understand the difference

between the two and the specific roles they play, so that you can maximize their support and minimize any resistance.

Some stakeholders may be internal to your organization, others external (see Figure 9).

Internal stakeholders are personnel in core roles who actively manage the asset, as well as personnel who have an influence on or interest in how the asset is managed.

External stakeholders are individuals or organizations outside of your local government who have an influence on or interest in how the asset is managed.

It is also important to understand each stakeholder’s influence and interest in the asset, so

Figure 9

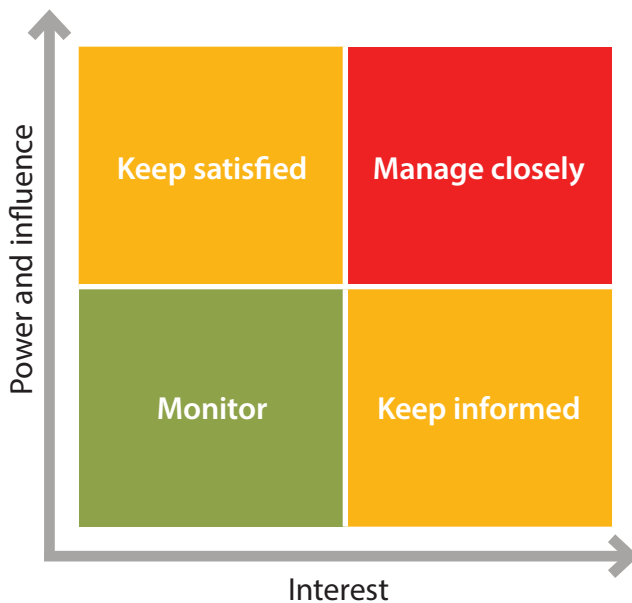
Stakeholder examples

Internal stakeholders	External stakeholders
<ul style="list-style-type: none"> • Accounting Officer • Finance Chief • Municipal Engineer • Procurement Officer • Community Development Planner • Community Officer • Operators and others who maintain priority assets 	<ul style="list-style-type: none"> • End users (customers) • Utilities/service providers • Ministry of Local Government • Multilateral or bilateral • development partners • Funding organizations

that you can develop a strategy for managing each category of stakeholder. Figure 10 shows how stakeholders should be managed based on their influence (or power) and their interest in the subject or asset. Stakeholders who fall into the 'Monitor' area have low interest and influence, whereas stakeholders who fall into the 'Manage closely' area have high interest and influence.

Figure 10

Stakeholder management strategies



Adaptation by Mind Tools Content Team, originally from A.L. Mendelow, p. 20.¹

For example, with regard to solid waste collection:

- The end users (customers) of the local government garbage collection service have low influence or power over how the service is performed but have high interest in the service delivered because failure of service affects their daily lives. They should be 'kept informed' of service changes or schedule changes to prevent them from becoming dissatisfied.
- The drivers of the solid waste collection

vehicles have high power and high interest in the service because they are essential components of the service. In order to maintain high service standards, the drivers should be 'managed closely.'

- The staff or contractor who maintains the trucks also has high power and high interest in the asset so they should also be 'managed closely.'

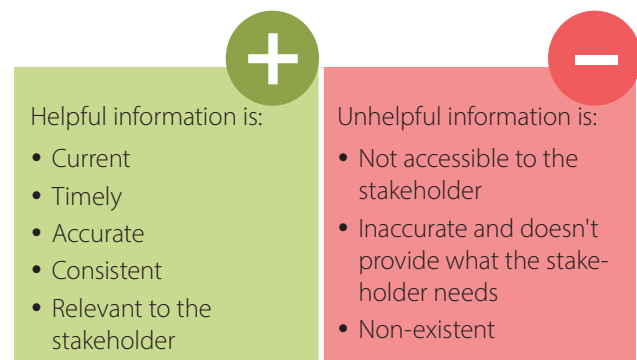
Your stakeholders and their level of influence or interest are put into Tables 2a and Table 2b of your AMAP template (see Worksheets 2 and 3). If you have stakeholders who are not currently involved but should be, these should also be included.

Once you have determined who your stakeholders are, you need to know what information they need to manage the asset, and if they have access to this information. You may need to further consult your stakeholders to complete this table.

It is important to be honest about whether or not you have the information your stakeholders need (see Figure 11 for an overview of what kind of information is helpful or unhelpful). This information must be accessible to the stakeholders. For example, if the information is contained in ledgers, are the ledgers catalogued by date and type of information or are they in a big room with no means of identifying what information is in

Figure 11

Stakeholder information



what ledger?

Worksheets 2 and 3 list the stakeholders identified by Gulu Municipality in Northern Uganda. Roads are Gulu’s priority asset.

Some stakeholders might not have been identified in this first draft—for example, equipment operators who maintain the roads. They can be added once the AMAP is reviewed and the team has had an opportunity to discuss this with the stakeholders.

4.4.3 Setting performance goals

Once you have a process for identifying priority assets, you can start setting performance goals for them using Table 2c of the AMAP template. The AMAP should contain performance goals only for priority assets (or priority asset groups), as it would be too large if all assets were included.

You can refer back to Chapter 2, Section 2.6.2,



Tips for goals and measures

Performance goals and measures need to be ‘SMART’:

- Specific
- Measurable
- Achievable
- Relevant
- Time-bound

to review how to set and measure performance goals.

As you learned, there may already be national performance goals that can be used for some assets. For example, the Nepalese National Planning Commission’s *Needs Assessment, Costing and Financing Strategy for Sustainable Development Goals* sets out goals for water and sanitation in Nepal (see Figure 12).²

Worksheet 2

Internal stakeholders example (AMAP Table 2a)

Stakeholders and roles	Influence e.g. ‘H’ for high, ‘L’ for low	Interest	Information needed by stakeholder to manage the priority asset	Do you have the information? Who has it?
Internal stakeholders who <u>are</u> involved:				
Accounting Officer	H	H	Asset inventory data	Yes, the Municipal Engineer
Municipal Engineer	H	H	Asset inventory data, asset condition data, level of service, costs of repairs, replacement value, and remaining service life.	Yes, the Municipal Engineer
Members of Technical Planning Committee	H	H	Asset inventory data, asset condition data, level of service, costs of repairs, replacement value, and remaining service life.	Yes, the Municipal Engineer
Members of Standing Committees	H	H	Asset inventory data, asset condition data, level of service, costs of repairs, replacement value, and remaining service life.	Yes, the Municipal Engineer
Internal stakeholders who <u>should be</u> involved:				

External stakeholders example (AMAP Table 2b)

Stakeholders and roles	Influence e.g. 'H' for high, 'L' for low	Interest	Information needed by stakeholder to manage the priority asset	Do you have the information? Who has it?
External stakeholders who <u>are</u> involved:				
Municipal Development Forum	H	L	Budgets, road names and location	Yes, the Municipal Engineer
External stakeholders who <u>should be</u> involved:				
Ministry of Works and Transport	L	H	Documentation, reports	Yes, the Municipal Engineer
Uganda National Roads Authority	H	H	Documentation, reports	Yes, the Municipal Engineer
Community	L	H	Quality of the end-product and functionality (service life)	Yes, the Municipal Engineer
Media	L	H	Quality, quantity and accountability	Yes, the Municipal Engineer
Banks	L	H	Budgets and workplans in case of corporate social responsibilities	Yes, the Municipal Engineer
Development partners	H	L	Workplans in case of additional funding on strategic development	Yes, the Municipal Engineer
Non-governmental organisations	H	L	Research based information on budgets and workplans	Yes, the Municipal Engineer

Where goals or targets do not exist, you can follow the guidance in Chapter 2 to determine performance goals for your priority asset. Remember, performance measures need to be 'SMART'—that is, specific, measurable, achievable, relevant and time-bound.

Consider this performance target for a solid

waste management truck fleet: *Garbage trucks will be functional 100% of the time.* Is it 'SMART'?

- It is specific and measurable because we state "100% of the time".
- It is relevant because the truck availability is

Figure 12

Nepal Sustainable Development Goal 6 targets

Table 3.9: Targets and indicators of SDG 6 (water and sanitation)

Targets and Indicators	2015	2019	2022	2025	2030
Households with Access to Piped Water Supply (%)	49.5	60.3	68.4	76.5	90
Basic Water Supply Coverage (%)	87	90.2	92.6	95	99
Population using Safe Drinking Water (%)	15	35	50	65	90
Open Defecation Free Area Declared (%)	41	56.5	71.9	83.5	99
Sanitation Coverage (%)	82	86.5	89.9	93.3	99
Proportion of Untreated Industrial Waste water(%)	99	75.3	57.5	39.7	10

Sources: SDG Status and Roadmap Report 2017

an important factor in service performance.

- It is time-bound, as it specifies “100% of the time”.
- But do the trucks need to be available 24 hours a day? This performance measure is not *achievable* if the local government only has one truck, because allowances need to be made for maintenance time and breakdowns. A more achievable goal would be: *Garbage trucks will be available for safe use on 95% of workdays (Monday to Friday, 6am until 8pm) in any calendar year.* This allows for maintenance at night or on weekends and for occasional breakdowns during workdays.

It is important to discuss performance goals with stakeholders. In our garbage truck example, some of the key stakeholders are drivers, maintenance managers or maintenance contractors, spare parts suppliers, and even vehicle buyers. You may even want to discuss the matter with human resources to see if it is appropriate to propose that maintenance staff and drivers receive a bonus if vehicle availability targets are achieved.

Worksheet 4 provides an example of AMAP Table 2c from Tanga City, Tanzania.

Now that you have identified your priority assets and performance goals, the last action in Step 2 is to go back and identify those stakeholders who are actively involved in managing your priority asset(s). Stakeholders who actively manage an asset make decisions that directly affect the asset and the service it delivers. You can do this by reviewing AMAP Tables 2a and 2b and indicating

Figure 13

Selecting active stakeholders example



only those stakeholders who provide information that is needed to make decisions about your asset. Figure 13 gives an example of selecting ‘active’ stakeholders by indicating them in red.

The Community Development Planner would not provide information in this situation, but the Community Officer may. Why? This individual might be the person who reports on whether the waste is collected or not.

Why would you include the Accounting Officer and not the Finance Chief? The Finance Chief is concerned with the overall budget, but the Accounting Officer may be responsible for operational costs and payments.

Now that you have identified your priority asset, your stakeholders and your

Worksheet 4

Tanga City performance goals (AMAP Table 2c)

Priority asset	Performance goal	Level of service and attribute	Performance targets
Solid waste collection equipment	To provide solid waste management on a daily basis	To collect solid waste generated and transport it to dumping site	<ul style="list-style-type: none"> • 90% of solid waste produced collected and transported to dumping site every day • 90% of fleet serving in a week

Exercise 3

- a. Answer the following questions using the guidance from this chapter, using the example of a community borehole.

What vital functions does the community borehole support?

What criteria would you use to measure loss of service?

Does it matter where the well is located? Why or why not?

- b. Use the tables in the AMAP template provided in Annex A to answer the following:

Identify one asset for your local government (Table 1).

Identify the key stakeholders who manage the priority asset you have identified, and the information they need to manage the asset (Tables 2a and 2b).

Set at least one performance goal for the asset and two performance measures (Table 2c). Be sure to consider the following if applicable: national government direction, United Nations Sustainable Development Goals.

performance goals, you are ready to move on to the next step: reviewing current asset management methods and technologies.

4.5 Step 3: Review current methods and technologies

In Step 2, you identified your stakeholders, the information they needed to help make decisions, and whether or not they had that information. In order to identify opportunities for improvement, it is important to understand what methods and tools are used by the active stakeholders to manage the priority asset, and whether or not they are effective. See Figure 14 for some examples.

Methods (or processes) define how you do things so that you do them the same way, consistently. *Tools* are used by your organization to manage asset information. They can take the form of ledgers, spreadsheets or software.

Start by listing the active stakeholders from Tables 2a and 2b of the AMAP template.

Next, research the methods and tools used by your active stakeholders to determine whether they contribute to, or perhaps detract from, achieving goals you have set for your priority

Figure 14

Asset management methods and tools

Methods and processes	Tools
<ul style="list-style-type: none"> • Asset condition assessment • Maintenance management or work order management • Identification, recording and monitoring of service levels • Portfolio review • Financial management • Capital planning • Asset disposal • Lease management 	<ul style="list-style-type: none"> • Asset recordkeeping system or ledger • Asset database software • Asset condition assessment software • Maintenance management or work order management software • Accounting ledgers • Financial management software • Lease ledger or software

asset. If you are unsure of what methods and tools are used, the guidance from the Diagnostic Tool can help you identify methods and tools used by your internal stakeholders, as many of them will have been interviewed during the on-site assessment. You may need to consult with active stakeholders who are not part of the AMAP team.

It is important to do a thorough assessment of the methods used. Make sure to ask questions about the methods so you understand what they are. If there are none, you must state that. It is a good idea to refer to Tables 2a and 2b from your AMAP.

Worksheet 5 provides an example of three very different stakeholders from Bhola Municipality in Bangladesh. The municipality’s priority asset is its bus terminal, and both paper-based and electronic methods are used to manage it.

The information you gather regarding your stakeholders — what information they need (and whether they have it), and what methods and the tools active stakeholders use in managing your priority assets — will help you identify where your current processes fall short of the requirements set out in your performance goals. These are your potential areas for improvement.

Asset management methods (AMAP Table 3)

Active stakeholders	What methods and tools do your stakeholders currently use to manage the priority asset?
Finance Officer	Accounting ledgers, financial management software, lease ledger
Municipal Engineer	Inventory software, condition assessment software
Traffic Control Manager	Bus/truck control ledger, vehicle ledger, log sheet

Exercise 4

a. Complete AMAP Table 3 for the priority asset and stakeholders you identified in Exercise 3.

Active stakeholders	What methods and tools do your stakeholders currently use to manage the priority asset?

b. Do the methods and tools you identified help you achieve the performance goal you have set for your priority asset? If so, how? If not, why not?

4.6 Step 4: Identifying areas for improvement

In previous sections you:

- Outlined your principles as part of your asset management framework
- Identified your priority asset(s)
- Identified key internal and external stakeholders

- Set performance goals for your priority asset(s)
- Listed current tools and methods used by stakeholders to manage your priority asset(s)

You are now ready to identify gaps in your asset management practices, the stakeholders affected and specific actions required to remove the gaps.

4.6.1 Gap analysis



Gap analysis tips

- Clear gap description that is not too complex
- Clear restatement of performance goal(s)
- Clear understanding of stakeholders affected
- Clear 'actively managing' stakeholder identification
- Brief 'actions required' statements
- Ask 'So what?'

A **gap analysis** is an assessment of your current asset management practices, tools and technologies against your stated goals and objectives to identify gaps and areas for improvement.

Through Steps 2–3, you identified your goals and areas for improvement. These areas for improvement are gaps that need to be assessed and addressed.

Insert them into Table 4 in the AMAP template. Worksheet 6 uses the example of Supertown to show how to complete Table 4.

In addition, if you have used the Diagnostic Tool or have had another assessment, such as one from your national government or other organization, you may have already identified gaps to address. These should also be entered into Table 4.

Supertown initially identified its solid waste collection vehicles as one of its priority assets, but after reviewing the United Nations Sustainable Development Goals and working on its AMAP, it decided that community boreholes are a priority for action.

It specified its performance goals and pinpointed two gaps related to water supply and water quality. The AMAP team identified the stakeholders affected by the asset and those actively managing the community boreholes.

Supertown also had a Diagnostic Tool assessment. One of the problems identified by

the assessment was lack of data with which to make decisions and poor quality of existing data. Because good data is important for knowing if performance goals are being met, the Supertown team includes this as a gap.

4.6.2 Identifying actions

Now that we have identified our gaps, we need to determine the most practical and suitable actions for all relevant stakeholders to address the identified gaps. This can be done as a brainstorming exercise among the AMAP team and key stakeholders.

As you look at each gap, ask “So what?” This forces you to think about what you need to do and how you will do it.

Figure 15 shows how to do this for Supertown’s first gap: *Current supply only reaches 80% of community.*

Figure 15

The “So what?” exercise—water provision example



Supertown’s gap analysis and required actions (AMAP Table 4)

Priority asset	Performance goal	Identified gap	Gap description	Stakeholders affected	Stakeholders actively managing	Actions required
Community borehole	Basic water supply to 92% of community by 2021	Water supply	Current supply only reaches 80% of community	All community members using well, schools, neighbouring communities, health centres	<ul style="list-style-type: none"> Senior Engineer Inventory Manager Maintenance Manager Plumbing technicians 	<ul style="list-style-type: none"> Identify areas underserved Develop plan to drill new boreholes Increase number of boreholes
	50% of community has safe drinking water by 2021	Water quality	Current water quality fails on a regular basis due to lack of treatment and poor well maintenance	All community members using well, schools, neighbouring communities, health centres	<ul style="list-style-type: none"> Senior Engineer Inventory Manager Maintenance Manager Plumbing technicians 	<ul style="list-style-type: none"> Monthly treatment of wells with disinfecting chemicals Develop maintenance plan and processes for boreholes
		Data collection and quality	Don't have accurate or timely data to measure goals	All community members using well, schools, neighbouring communities, health centres	<ul style="list-style-type: none"> Senior Engineer Inventory Manager Maintenance Manager Plumbing technicians 	<ul style="list-style-type: none"> Identify data needed and develop process to collect it Develop data validation process

Tanga City gap analysis (AMAP Table 4)

Priority asset	Performance goal	Identified gap	Gap description	Stakeholders affected	Stakeholders actively managing	Actions required
Solid waste equipment	To provide solid waste management on a daily basis	Increased garbage in the streets	The current solid waste equipment is unable to collect all garbage produced in the city	The community	<ul style="list-style-type: none"> City Environmental and Sanitation Officer City Director City Treasurer Mechanical Engineer City Mayor 	<ul style="list-style-type: none"> Train the community on reducing the production of garbage, so that less garbage will be collected and transported to dumping site Introduce better maintenance plan for the available equipment Schedule routes that can best serve the collection and transport of the waste Increase operation hours Acquire software to manage solid waste asset equipment Adopt recycling technology to reduce the volume of garbage Acquire additional compactor trucks if needed

Exercise 5

- a. Refer back to Worksheet 7. Are there actions Supertown could take before they drill new boreholes? If so, what are they? If not, why not?

- b. Complete AMAP Table 4 for the priority asset and stakeholders you identified in Exercise 3. Identify at least two gaps and four actions for each gap.

Priority asset	Performance goal	Identified gap	Gap description	Stakeholders affected	Stakeholders actively managing	Actions required
						<ul style="list-style-type: none"> • • • •
						<ul style="list-style-type: none"> • • • •

If you have had an external diagnostic assessment such as a UN/DESA-UNCDF visit, or have implemented the Diagnostic Tool, look at recommended areas of intervention from your assessment. The guidance from the Diagnostic Tool can be used to identify significant gaps and suggested approaches to closing them. Relevant recommendations from the Diagnostic Tool analysis should play a prominent part in the actions you identify for your AMAP. You should also consider input from other assessments, such as a local government performance assessment, if relevant.

Supertown's assessment recommended the following:

Develop data validation roles, responsibilities and process, which will require identifying one person to be in charge of:

- Ensuring that data is entered correctly by reviewing a sample of the data monthly to check for errors.
- Creating a simple checklist of what must be entered and in what format, and how to ensure the data is correct. This checklist will include the correct local government departments, asset categories, types and subtypes to be used in the asset management system.
- Training others on how to enter data and use the checklist.

The team includes these recommendations in their actions and amends the final column of Table 4 (revisit red text Worksheet 6).

Notice that one of the actions is to “increase number of boreholes.” There may be other actions Supertown could take to minimize the number of new boreholes that need to be drilled. This is an important consideration whenever your actions include the need for new assets.

In a previous example, you saw Tanga City's performance goal for its priority asset: solid waste collection. Now, consider how they applied the “So what?” exercise to determine if

they really needed new assets.

One response could have been:

Identified gap: *The current solid waste equipment is unable to collect all garbage produced in the City.*

So what?: *We don't have enough equipment.*

Action: *Buy more equipment!*

This was not Tanga City's response, though.

Instead, their response to the first “So what?” was, “We need to know why we can't collect all the garbage.” There was no mention of equipment yet.

Leading from the first “So what?”, their response to the second “So what?” was to identify possible reasons why they could not collect all the garbage. These reasons became the basis for their proposed actions. They listed ‘Buy more equipment!’ as an action, but only at the end (see Worksheet 7).

This example shows how the “So what?” exercise can frame your government or organization's thinking about what the problems are and the actions to address them.

4.7 Finalizing your action plan

You may have identified many gaps and actions, but it would not be practical to include them all in the final AMAP because limited resources would likely result in failure to close all the gaps. You should choose the best actions for all relevant stakeholders who can address the identified gaps, and link your proposed actions to improve the management of the asset to the current and medium-term municipal budget.

The next step will help you prioritize those actions. Only those that are achievable in the short- to medium-term (less than three years) and those that will have the greatest impact should be included in your AMAP. This becomes your Action Plan.

4.7.1 Actions and resources



Action plan tips

- Select priority actions:
 - Quick wins
 - Biggest impact
 - Practical actions
- Summarise resources needed
- Set realistic completion dates
- Get Council approval
- Follow up regularly

The second-to-last step to complete your AMAP is to identify the actions and resources needed to address your gaps. This is done using Table 5a. In this table you list your actions from Table 4, nominate an ‘owner’ for each action and identify the resources required to implement the actions.

This is a particularly important step, as it brings into focus all the resources required to implement the change. This helps you determine whether the actions can be realistically implemented with the available resources, or if additional money, systems or personnel would be required.

If sufficient resources are not available to implement an action, you can put together

a business case to seek additional resources. If the business case shows that the benefits outweigh the costs, you may be able to obtain additional funding from the central government, donors or NGOs.

Worksheet 8 offers an example from Tulsipur Submetropolitan City, Nepal.

This municipality chose solid waste collection equipment as its priority asset. It has a collection capacity gap and, like Tanga City, also recognized that the first action was not to purchase new equipment. Tulsipur felt that this gap could be due to a lack of knowledge, as the public were not properly separating degradable and non-degradable waste. One of the required actions identified was an information campaign to educate the citizens about waste separation. This is a simple action that can be done with the city’s own resources. Their AMAP also included a second action: to monitor the impact of the training, to ensure that citizens were applying what they had learned, and to reinforce the idea of waste separation.

4.7.2 Prioritized action plan

Once you have identified all the actions you need to take, it is time to prioritize the actions you are including in your AMAP and set target dates for completion.

Worksheet 8

Tulsipur Submetropolitan City actions and resources required (AMAP Table 5a)

Actions required	Owner	Resources required			Funding and source
		People	Training/mentoring	Tools	
Regular information through radio, local television	Administrative and Information Officer	Available: current staff	New: Training about waste segregation and knowledge about degradable and non-degradable waste	New: Information script	Own-source revenue
Monitor waste separation door to door		New: Supervisor	New: Data collection training	New: Tool to collect data	Own-source revenue

There are many criteria for prioritization, but you can take a simple approach. First, review the actions that result in the greatest impact for the least resources. These are the 'low-hanging fruit' actions or 'quick wins' discussed in Chapter 3, Section 3.5. The results achieved from implementing these actions and getting results will help to motivate your asset management team—which will help when it comes to implementing more challenging actions.

Good criteria for selecting the next priority actions include:

- Practicality
- Urgency
- Resource availability

These are not listed in order of importance. You may choose to deal with the most urgent actions despite not having the resources to implement them immediately available. You may choose to select the next 'easiest' actions to implement based on practicality and resource availability.

Once you have prioritized your actions, it is time to complete your plan and Table 5b: *Our AMAP priorities*. You should include a brief description of the criteria used to prioritize the actions and relate them back to your goals and your asset management framework principles, referencing policy or regulatory requirements if appropriate.

Ensure your top priority actions are based on merit and logical reasoning. Additional details needed to support your actions and priorities can be included in an annex if necessary.

Our highest priority actions are based on those that we can accomplish quickly and with our own resources.

They are practical actions that will have an immediate impact. They help us understand the full extent of our problem, and demonstrate progress to our stakeholders.

Worksheet 9 continues the example of Supertown.

The first priority is to identify areas underserved. Why? Without this action you cannot undertake the others. Therefore, it is the most urgent action. It also uses the least resources, as it can be done in-house.

Next, consider the related actions for this priority—the steps that need to be taken to complete it.

In this example, you need to define what is meant by 'basic water supply' (if you have not already done so, and there is no stated national level of service). Does 'basic water supply' mean access to a borehole? If so, is

Worksheet 9

Supertown AMAP priorities (AMAP Table 5b)

Priority rank	Priority action	Related actions	Summary of resources needed	Target date for completion	Funding and sources
1	Identify areas underserved	<ul style="list-style-type: none"> • Define level of service for 'basic water supply' • Survey local citizens to determine who has basic water supply 	<ul style="list-style-type: none"> • Own staff and Council • Survey tool 	Three months from approval of AMAP	Own-source revenue
2	Develop plan to drill new boreholes				
3	Increase number of boreholes				

this based on population served per borehole or distance from the borehole? Once you define this, you can determine who has access, so you know which areas are underserved.

Repeat this exercise for your remaining three priorities until you have completed your plan.

Your AMAP is almost done! All that is left is to determine how you will follow up your actions and review your progress.

Exercise 6

- a. Select the actions you listed for one gap in Exercise 5 to complete a version of Table 5a (below) of the AMAP template.

Actions required	Owner	Resources required			Funding and source
		People	Training/mentoring	Tools	

- b. Prioritize these actions in a version of Table 5b below.

Priority rank	Priority action	Related actions	Summary of resources needed	Target date for completion	Funding and source

4.8 Follow-up and review

How you propose to follow up and review your AMAP needs to be clearly articulated in this last section.



Your AMAP is a living document. Responsibility for review and update lies with the asset management focal point and the key stakeholders. You should follow up on progress with all action owners at least every six months.

You will also need to update your AMAP when significant changes occur, such as:

- Any significant assumption or constraint changes
- Significant stakeholder change
- Legislative or regulatory change

If required, reassess your priorities and make changes to the AMAP to ensure that it reflects current local government policy. This may result in a re-draft of your AMAP and distribution to all affected stakeholders.



Communication of the AMAP to key stakeholders is vital. This may be done by presentation (where it is easier to add more information to demonstrate a point) or simply by email or paper copy of the AMAP. You cannot guarantee that stakeholders will read the AMAP, so it is recommended that you conduct a 'launch' or presentation along with distributing paper copies of the AMAP.

Communicate successes to all stakeholders using emails, newsletters or meetings. Keeping stakeholders up to date and motivated will help to ensure the success of the improvement programme.

Endnotes

- 1 Mind Tools Content Team, "Stakeholder Analysis", MindTools, Available at https://www.mindtools.com/pages/article/newPPM_07.htm; A.L. Mendelow, "Environmental Scanning--The Impact of the Stakeholder Concept", ICIS 1981 Proceedings (1981), p. 20.
- 2 National Planning Commission, *Nepal Needs Assessment, Costing and Financing Strategy for Sustainable Development Goals* (Singhadurbar, Kathmandu, Government of Nepal, 2018), p. 31.

“

Guaranteeing equal access to public goods and the provision of public services, particularly at the local level, are critical to ensure the well-being of everyone in our communities.

We will need to secure sound asset management and adequate investments to leave no one and no place behind.

— Mohamed Boudra,
Mayor of Al Hoceima, Morocco,
President of United Cities and
Local Governments (UCLG)



An aerial, high-angle photograph of a densely packed urban landscape, likely a city in South America. The scene is dominated by a multitude of high-rise apartment buildings and commercial structures, creating a complex, layered skyline. The buildings vary in color, with prominent shades of white, blue, yellow, and grey. A winding road or highway is visible in the middle ground, cutting through the dense cluster of buildings. The sky is overcast with soft, grey clouds, and the overall atmosphere is one of intense urban density. In the foreground, the edge of a building's roof and some construction elements are visible, suggesting the photo was taken from an elevated vantage point.

Part 3
In focus

Chapter 5

Capturing and utilizing the right data and information

Key takeaways

- ▶ A systematic, methodical approach to data collection will result in a more effective and robust asset management information system that delivers reliable information necessary for sound decision-making and, ultimately, for improved service performance.
- ▶ Having adequate data on the location, condition, performance and finances of assets allows governments to anticipate the resources that need to be set aside for repair, renewal and replacement over the long term, particularly for critical assets.
- ▶ Ensuring the accuracy, quality and quantity of asset information is a collective effort. However, the costs of collecting, validating and maintaining data should not exceed the value of information.

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The terms in **bold** can be found in the Glossary.

5.1 Introduction

Deteriorating assets pose challenges for all communities. Local governments and public enterprises might notice and repair visible problems, such as a broken electrical pole, but miss more hidden and often more serious problems, such as structural deficiencies in buildings that can result in their collapse.

Maintaining up-to-date information on public infrastructure assets can help catch such hidden problems before they cause serious service disruptions. Furthermore, limited budgets and increased demands for better quality of service add to the urgency of harnessing timely and reliable data. This will ensure that the assets that deliver public services are well maintained.

Structured and reliable information will enable your local government to make the right asset management decisions in support of ever-growing service demands. Setting up such an information system requires that you collect the right data and get it to the right people at the right time—so that the right work can be done to meet your community's needs.

A robust information system is also necessary to support an efficient and appropriate allocation of funds to top priorities. The lack of reliable information about assets, such as about their performance and value, often make it difficult for governments to justify the expenditure of limited resources for maintenance, renewal and replacement of assets. Without good data you will not be able to anticipate what needs repair and with what level of urgency. And once your community is hit with a problem, the resources may not be readily available to deal with it.

If your resources are limited, you need not set up anything elaborate. No matter how elementary your information system is, being able to leverage data in even a minimally effective way can significantly improve service delivery and mitigate risk.

The first few chapters of this handbook introduced asset management as an effective system for improving service performance, reducing costs and streamlining compliance with central government regulations. In this chapter you will learn that an effective asset management system needs to be supported by an effective **asset management information system**.¹

As Figure 1 highlights, the asset management information system—or asset information in general—supports all other parts of the asset management system and facilitates better coordination between them. The system would collapse without asset information driving its inner processes. For example, detailed and structured information about transport infrastructure, health services or social infrastructure is the foundation of effective capital investment programs. This information allows planners to prioritize the necessary repair, renewal or replacement of assets before critical failures occur.

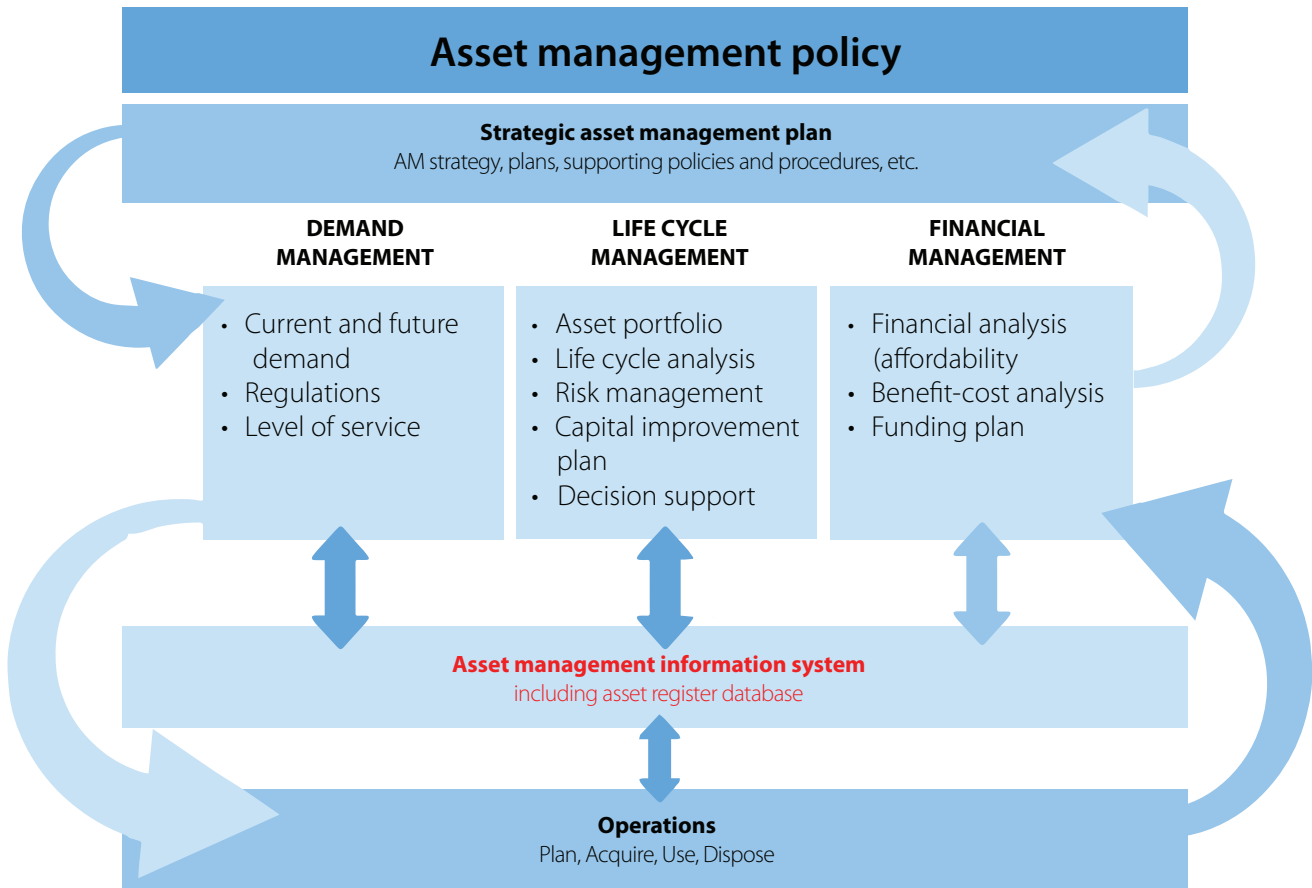
The development of a full-fledged asset management information system will be a resource-intensive process. But a lot can be done with limited financial and human resources, if parties involved show genuine long-term commitment. Even small initial steps can yield enormous payoffs.

When developing an asset information system, you must select and adopt information processes suitable to the requirements of your own local or central government. There is an extensive range of asset management information systems available. At the beginning, your asset information management system may simply be based on a register of assets that helps you identify assets that are deteriorating. At a more advanced level, it will be more comprehensive and include decision support tools that show you when to renew, replace or acquire new assets.

The development and implementation of an effective asset management information system will support:

Figure 1

Asset information within asset management



- Effective collection, processing and presentation of data
- Better understanding of asset characteristics, condition and performance
- Improved maintenance of assets through comprehensive and accurate maintenance records
- Enhanced identification, information and reporting of possible asset defects, failures or operational incidents.

Such a system will ensure that the right information goes to the right people for efficient decision-making in capital expenditure planning. It will also improve compliance with regulatory or government requirements.

This chapter provides guidance on the development and implementation of a basic asset management information system, covering

all the key steps and employing tools that are simple, accessible and not dependent on advanced technology or software. You will find that any local government can undertake data collection and organization in support of achieving efficient and effective service delivery. Simply reflecting on the quality of data and data systems will help your local authority understand how to better optimize the use of assets.

5.2 The benefits of good asset data

Gathering and utilizing the right asset information can lead to significant cost savings and improve the efficiency and performance of the whole asset management system. For instance,

Data vs. information

Before we can even gain knowledge in the form of information, we need data. The definitions of 'data' and 'information' are often conflated.



The length of a road is 1.5km. This is **data**.



The length of all roads in our municipality is 25km, of which 2 km are critical. This is **information**.

Data are simply facts presented in a raw format, unorganized and unprocessed. For asset managers to be able to make informed decisions, these facts need to be processed and structured into information.

Information results from the interpretation, organization and contextualization of data.

the accumulated time that management and staff may spend searching for information, then compiling and processing it for bookkeeping or reporting purposes, has significant but often hidden operational and capital costs. Repeating these information activities in each department or public utility office can result in extremely high costs across all of government.

Consider a real-life example of the benefits of adopting an asset information system. A mid-term evaluation of a water utilities management project in South-Eastern Europe found that in the first year of implementing the system, 46 of 70 participating water utilities reported that their performance levels (in terms of data management, planning, operation and maintenance) had improved by an average of 30 per cent.²

A unified system or approach for collecting data provides a coherent framework within which to consolidate information and ultimately make decisions about the assets in your portfolio. Senior leadership relies on data that is compiled and packaged into briefs and reports in order to make decisions, which will impact the wider community. A lack of reliable asset information therefore results in poor decision-making that fails to properly address service demands, among other considerations.

It can further expose your community to risks from crises, such as climate change and disease outbreaks.

To reap the benefits of data collection, you do not need just any information but *targeted* and *effective* information that enables you to prioritize assets for maintenance, renewal or replacement. This is what a good asset management information system seeks to provide. It is hard to derive effective information from incomplete or inaccurate data. Without accurate data, you will not know the right questions to ask. For example, how can you tell if a particular bridge is a critical asset if you are not monitoring its performance and therefore do not know how many and how often people rely on the bridge being in good condition? A good asset management information system will help you ask the right questions, fill in missing gaps and deliver effective information to enable decision-making.

5.2.1 Data for prioritizing critical assets

Given scarce public resources and the costs of effective asset management, it is important to identify which infrastructure systems and their underlying assets are most critical to your government. Recall the 'six whats' from Chapter 1.

Much of asset management is about knowing what in your asset portfolio to fix first. To know the answers, we need to collect and maintain basic data about our assets.

Asset information enables us to focus our limited resources on those projects that will bring the most benefit to the community, optimizing our infrastructure investments and possibly attracting more. From here, we can make more informed decisions about which assets are in poor condition, pose a significant risk to service delivery and require immediate attention, and which assets are in good shape, with low to medium risk and need little attention.

Does this sound familiar? Chapter 2 explained that the best approach to asset management is based on proper risk management. Your assets will not only face internal risks (e.g. failure, depreciation over time, etc.). They will also

face external risks from climate hazards, public health crises and other unanticipated shocks.

Operating and maintaining assets in a landscape of multiple, unpredictable and unavoidable risks will be less daunting if your government takes steps to better understand the assets in its portfolio. Chapter 2 explained that risk is the product of the likelihood that an incident occurs and the expected consequences of it occurring. Collecting and analyzing data through a risk management lens will help you prioritize your assets based on risk. For example, when you measure an asset's condition, you can come to a better conclusion of how likely it is to fail, which factors into your calculations of risk and whether this asset is critical. Refer to Figure 16 in Chapter 2 for risk-based questions to guide your data collection process, which we will introduce in section 5.3.

Exercise 1

1. How would you explain the concept and purpose of an information system for asset management to a member of your local community who is not familiar with asset management or asset management information?

2. Identify three benefits of a good asset management information system.

3. Identify (human or financial) resource constraints within your local government that could impede the development of an asset management information system. How might you overcome such challenges?

3. Select one group of assets (e.g. waste collection, streetlights or road signs). What type of information would you need in order to develop an asset management plan for that group?

5.3 Building the foundation of an efficient asset information system

Information derived from data informs decision-making. For your asset management information system to work effectively, you need to collect the correct and relevant data that will allow you to generate reliable information about the past and present state of your assets. Such information will guide decision-making on how to manage assets in the present and future to meet the required levels of services (LOS).

The development of a simple **asset register database** is a good place to begin capturing some of the most basic data you need for informed asset management decision-making

processes. Such data could include:

- Asset identification information, e.g. location or unique ID number
- Past and current asset condition
- Related maintenance activities, including rehabilitation costs, upgrades or replacements
- Current asset performance level
- Other data that allow for the adequate evaluation of different courses of action.

The primary purpose of an asset register database is to generate timely, relevant and accurate information on all the assets you own and manage, including their structure and condition. A local authority with such information should be able to make strategic and sound decisions.

There are three layers to asset information management: collecting data, deriving information from the data and using the

information to make decisions (see Figure 2). It is a multi-directional process, and there is always room for improvement at each layer. For instance, the outcomes of one set of decisions can inform future data collection, when a new reality requires updated information. For a database to be useful, it must stay fresh.

To build an asset database that provides a solid foundation for an efficient asset management information system, you must plan, design and implement a process that includes the following general steps (see Figure 3):

1. Assemble an asset management information team

Figure 2

Data, information and decisions



DATA

For any fixed asset that your local government owns, you should have the following:

- Physical data
- Location
- Condition data
- Performance data
- Financial data



INFORMATION

From the data, you can derive real-time information about:

(Each asset)

- Where is it located?
- What is it worth?
- What is its condition?
- What is its remaining service life?
- What is its deferred maintenance?
- What is its probability of failure?

(All assets)

- What should we fix first?
- What are our most critical assets?
- Which assets require improved maintenance?
- What are our expenditure needs for the repair, renewal or replacement of future assets?

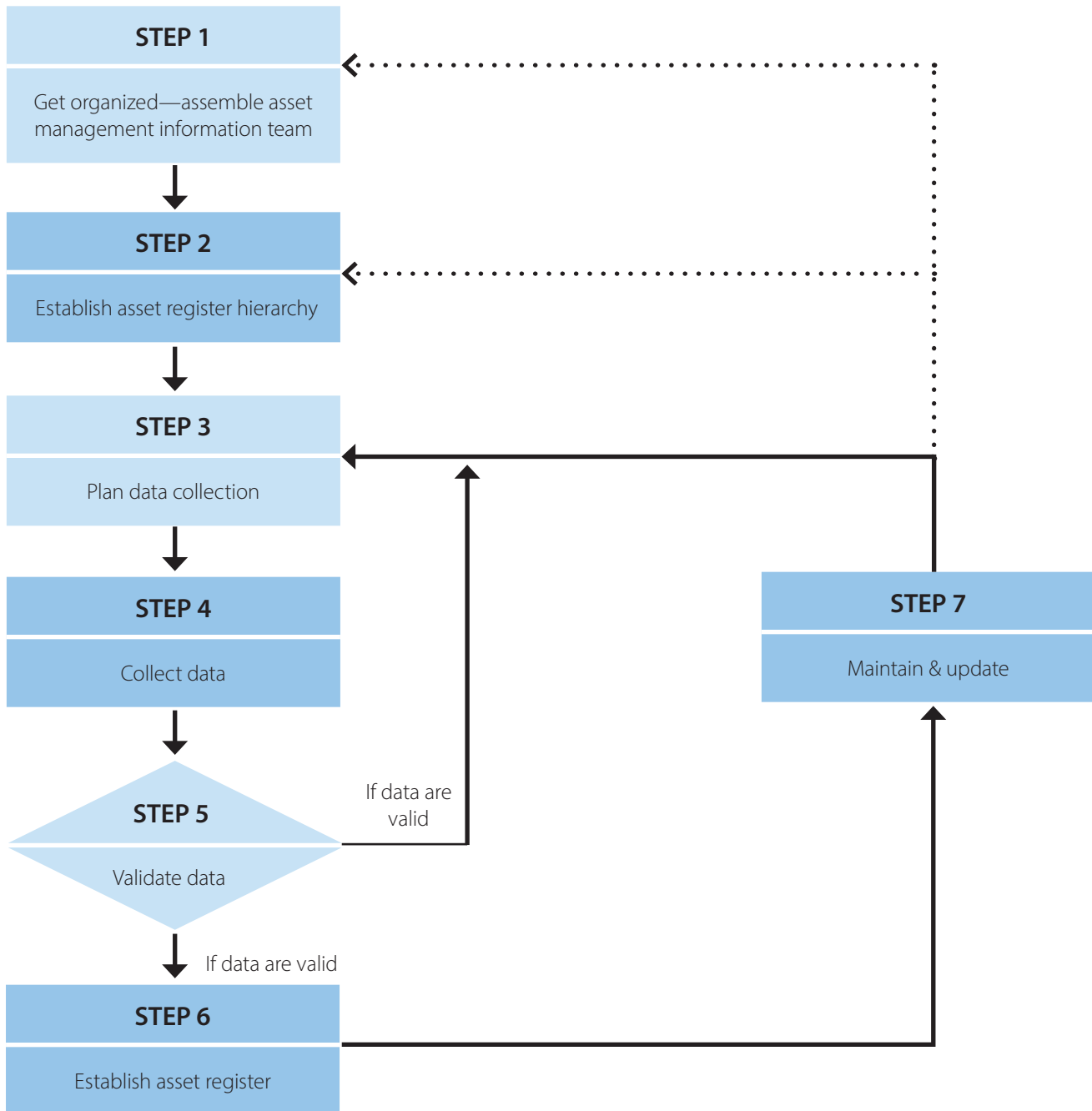


DECISIONS

- Meet strategic objectives and customer demands
- Meet local management needs
- Better control of operation and maintenance activities, in line with government regulations

Figure 3

Asset register database process



2. Design your asset registry hierarchy
3. Plan your data collection
4. Collect the data
5. Validate the data

6. Establish your asset register
7. Maintain and update your asset register database

Let us now go through each step in more detail.

5.3.1 Assemble an asset management information team

STEP 1

Get organized — assemble asset management information team

The first step in building your asset management information system is to assemble a functional **asset management information team** comprising local government officials and, potentially, outside experts and stakeholders, each with a clear list of duties and responsibilities. This team is tasked with defining your data requirements, helping implement those requirements and then providing training to others on the asset register database.

Not all government officials have enough technical knowledge in data management, so the team must engage other resources necessary for adequate data collection, such as colleagues with relevant expertise and technical equipment.

A general organizational chart of the asset management information team is presented

in Figure 4. It represents a subset of local government and is based on the broader organizational chart presented in Chapter 2 with the role of an *asset management champion*. The chart here includes an *information management champion*, also positioned between senior public officials (e.g. mayor, council members, committee chairs) and departmental staff. There is no need to create a separate group. Instead, you can build on this basic organization in two ways:

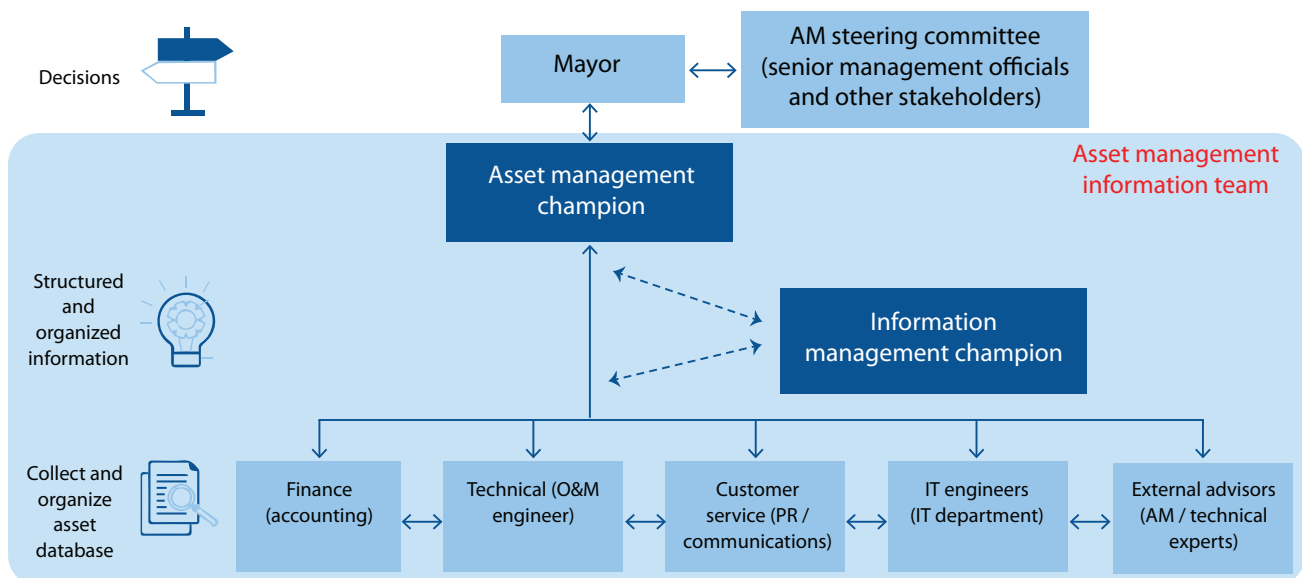
1. Expand the role of existing members to include additional responsibilities related to data management.
2. Expand the chart by adding new team members whose involvement is necessary to establishing an asset register database, for example, a senior information technology (IT) manager or operations and maintenance (O&M) engineer.

You should also consider the following points when forming the team:³

- Given limited resources, we must ensure that we do not engage relevant staff beyond what is minimally required for an effective team.

Figure 4

Asset management information team organizational chart



- Look at the development of the asset management information system as a new and improved process of managing asset data on a regular basis, not just another a project.
- Each team member must recognize his or her role in the organizational transformation necessary to adopt the principles, practices and everyday tasks underpinning a sound asset management information system.

5.3.1.1 *The champion*

The *information management champion* oversees the day-to-day aspects of implementing an asset management information system and is responsible for motivating the team's collective efforts.

If your government has the capacity, it should designate someone from the technical ranks to fill this role. Since the work is performed mostly at a technical level, this individual should ideally have an engineering or operational background as well as familiarity with general accounting and financial concepts.

If your government does not have the resources to carve out a separate *information system champion* role, the work should be divided up among existing team members, with the asset management champion undertaking the largest portion, especially those duties that require more leadership, teamwork or communication with other branches. In this scenario, the asset management champion doubles as an information system champion and oversees the asset management information team in addition to other asset management activities.

The champion must have direct access to political and administrative leadership, because the asset management information team's initial task will be to mobilize resources and secure buy-in from senior officials in the local government. The head of the local government should give political support to the champion and help ensure that the team is able to fulfill its responsibilities and achieve its

objectives.

The champion leads the asset management information team in:

- Designing, documenting, reviewing and improving the asset management information system.
- Clearly communicating asset management documentation, protocols and processes to the team.
- Ensuring that all team members have a full understanding of their individual roles and accountability within the asset management information system.
- Monitoring implementation of plans according to established and agreed-upon methodologies, tools and techniques by all team members.
- Monitoring and advising on the team's performance.

It is important to remember that championing an asset management information system with a designated team is an ongoing process. Once the system is in place, the role changes to one of monitoring and ensuring the system continues to meet the needs of the organization.

5.3.1.2 *Team members*

Earlier, we touched upon two ways of building your asset management information team. The question of how best to incorporate the relevant roles and responsibilities into the existing organizational structure depends on the size of your local government.

In any case, the champion should ensure that asset management information team members are competent and well-trained, with substantial relevant experience. Team members will generally be drawn from technical, operational, and service departments.

The asset management information team will help define the specific data required for decision making for each of the departments. Team members will need to settle on a

structure for the asset management information system; the work policies, procedures and protocols that govern it; and the expected outcomes of their assignments.

Individual team members will have clearly assigned tasks and workstreams, but they should all demonstrate a commitment to supporting an effective asset management information system with clear objectives and requirements..

The successful development and implementation of the asset management information system requires the sustained commitment of all team members as well as key decision-makers in the broader asset management organizational chart.

5.3.2 Establish the asset register hierarchy

STEP 2

Establish asset register hierarchy

When designing your asset register database, it is important to include all assets and related services in your community. Establishing an **asset register hierarchy** will help ensure your asset register database follows a clear and logical breakdown of assets.

How you intend to use your asset information should inform how you design your asset register hierarchy. The basic decisions you will

Exercise 2

Review the duties and responsibilities of an information system champion and answer the following questions:

1. What is the purpose of an asset management information team?

2. Under what circumstances would you form an asset management information team, and which roles from your local government would you engage to be involved in it?

3. Who could be the information system champion in your local government? What characteristics lead you to select them? List some of the champion's priority actions.

need to make include the number of levels in your data hierarchy and the type of data to be collected at each level.

Take a moment to reflect on some of the assets and how you conceptualize them. Are you picturing individual assets like docks and sea walls, or asset systems such as coastal services? How does your local government define and structure assets and their components? The answers to these questions will provide a foundation on which to aggregate and organize the data in your database. No matter what the breakdown, your database should use a consistent methodology for all assets.

Since data collection can be a rather expensive and time-consuming process, you should carefully consider the scope and detail of data needed in your asset register database. Not every asset system has to be represented down to an atomic level, nor is it practical to do so. The extent of representation necessary will depend on how you intend to use the data.

5.3.2.1 Information roll-up and information roll-down

Before we demonstrate the concept of an asset register hierarchy and its classification

Figure 5

Information roll-up and roll-down for asset management

Rolling up information by using your database to navigate from micro- to macro-level data

Category 1 Supertown	Category 2 sanitation system	Category 3 sanitation services	Category 4 sewage collection	Category 5 sewer mains	Category 6 sewer main B
<ul style="list-style-type: none"> • Historical data on population • Current population • Total area 	<ul style="list-style-type: none"> • System demands and parameters • Criticality • Aggregated risks 	<ul style="list-style-type: none"> • Levels of service and their attributes (per function) • Service demands, including for new functions • Customer satisfaction • # users • Responsible department(s), i.e. who owns/operates 	<ul style="list-style-type: none"> • Geographical distribution of facilities (location) • Area covered • Quality of service function • Feasibility • Capacity of equipment to adequately deliver on service function • # users 	<ul style="list-style-type: none"> • Geographical distribution of equipment (location) • Overall: <ul style="list-style-type: none"> - Condition - Performance - Maintenance - Risk 	<ul style="list-style-type: none"> • Location • Condition • Performance • Maintenance • Risk • Criticality

Rolling down information by using your database to navigate from macro- to micro-level data

properties, it is important to understand the concept of information roll-up and roll-down.

Imagine that sewer main *B* needs repair or replacement. Your government will not be alerted each time a sewer main is faulty, but it will know when the overall functioning of the sanitation system is disrupted. This is the idea of **information roll-up**. An asset register database tracking your sanitation system can provide information at the macro level, aggregating information about the system's subcomponents—it's 'child' assets—including sewer main *B*.

When you access the database to check on the performance of sewage collection functions and the wider sanitation system—the 'parent' and 'grandparent' assets, respectively—you can then drill down to access micro-level information. By navigating and querying the database, you can pinpoint the exact issue requiring attention. This is the idea of **information roll-down**, or navigating from macro-level data to data on the system's subcomponents.

A hierarchical asset register database allows you to abstract from or dig into the details of asset systems or service areas depending on who is using the information and for what purpose. As shown in Figure 5, information roll-up and roll-down is just a formal way of describing how you access and move through the database. The more organized it is, the more efficient the process.

5.3.2.2 Hierarchical structure

Once you have a general idea of what information you would like to capture, you can begin to list the (1) the services provided through your asset systems and (2) the assets required for the provision of those services. This will help you categorize asset systems in terms of functions, facilities, facility components and asset types.

From this list, you can map out where each component would fall in a hierarchical structure, following a logical 'parent-child' order of

significant asset components, as represented in Figure 6. This approach mirrors the popular work breakdown structure (WBS) management tool (see Figure 7) as well as hierarchical models widely used in accounting and even in our everyday lives—for instance, in how files are stored in folders and sub-folders on our computers.

When it comes to public infrastructure assets, breaking down asset systems into components, as illustrated here, allows you to document improvements and replacements more accurately for each asset type. Every government's asset portfolio varies in its complexity and capacity to collect data to a certain granularity, so the breakdown laid out here can serve as a starting point for you to come up with the most straightforward and effective way to organize your assets. It is important to take the time to get this right as it can be difficult to change this later.

Many systems are also interconnected, so you will also want to consider the most appropriate way to group or separate interconnected asset systems. For example, over time, water, sanitation and hygiene have become jointly referred to as 'WASH' and become a sector of its own, with further links to public education and medical services. It might make more sense, however, to track each of these as individual systems within the database.

Figure 8 gives an example of what part of an asset register hierarchy might look like using

Lines of dependencies

A hierarchical structure effectively establishes **lines of dependencies** within and between asset systems. The basic idea is that assets are represented as nodes and their linkages as lines. Your database may even visualize this core logic, especially if you are using some IT software to map your asset portfolio. Since assets exist in both horizontal and vertical relationships, there is an inherent hierarchy that your database should reflect.⁴

Figure 6

'Parent-child' asset hierarchy WBS management tool

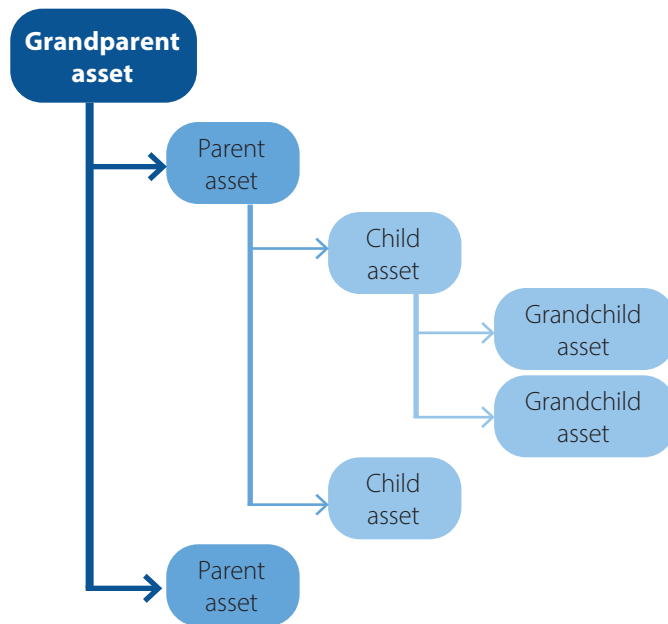
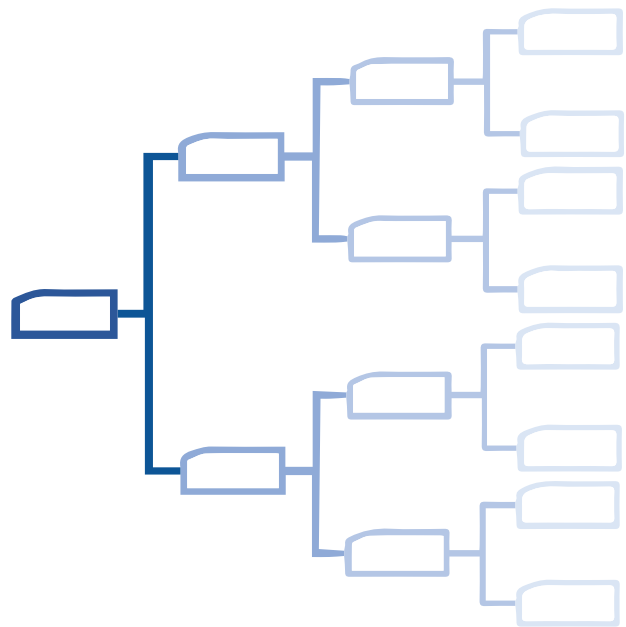


Figure 7



the example of a sanitation system from earlier. You will be able to put your own visual asset mapping skills to the test in an exercise at the end of this section.

The hierarchy will vary in breadth and depth depending on the size of your local government's asset portfolio. Some assets will have fewer branches due to their size or simplicity (and vice versa). Mapping out your asset systems this way will help you distinguish between different levels and identify which components fall under which level.

Once you have organized your assets and systems into a hierarchical structure, you have a skeleton for your asset register database. Let us now make it more functional.

5.3.2.3 Identification

Every asset captured in the database should be labelled (or tagged) with a unique identification number or name.

When you seek specific information about an asset, such as its location, condition, finances and maintenance schedule, the ID helps you

to record, access and continually update these 'primary data sources' of the asset over time. Since data are often pulled from different departments, the unique ID also helps to bring together data on an asset in one place. Any updates to the asset's primary data are recorded and linked through this ID.

When assigning ID numbers, take a unified approach across all departments in your organization. In a sense, an asset's unique ID works to assign the asset a 'position' in the asset register database relative to its related assets—its 'children,' 'parents,' 'grandparents' and so on. The components of your ID should reflect levels and components of your asset register hierarchy, making the numbers and characters easy to interpret.

Figure 9 illustrates one system involving a combination of numbers and letters for asset identification. Let us take a hospital's ventilators as an example:

- The ID, "DV7.1.1.5," refers to a specific type of ventilator, Dräger ventilators (Category 5).
- Dräger ventilators fall under the more

general category of ventilators, referred to as "VT", in which there are other types (Category 4).

- All ventilators are part of equipment, or "EQ" (Category 3).
- The hospital that owns this equipment and serves food is referred to as "HOS7.1", with other hospitals also having the "HOS" label (Category 2).
- All hospitals are categorized as public health care assets, or "HC" (Category 1).

In the example, health care has been designated as the 7th among all asset systems, hence,

the "7" in the ID and all the IDs of its children. Adjust the identification schema for your healthcare system depending on the relationship between the underlying assets and what makes the most sense.

As with every aspect of your database design, your needs and goals should inform your choice of a classification method or format. In general, review all your information and reporting needs before designing or modifying your database to ensure that it is efficient to use and effective in delivering what you need. Your system should contain no more and no less data than you need.

Figure 8

Asset register hierarchy for partial sanitation system

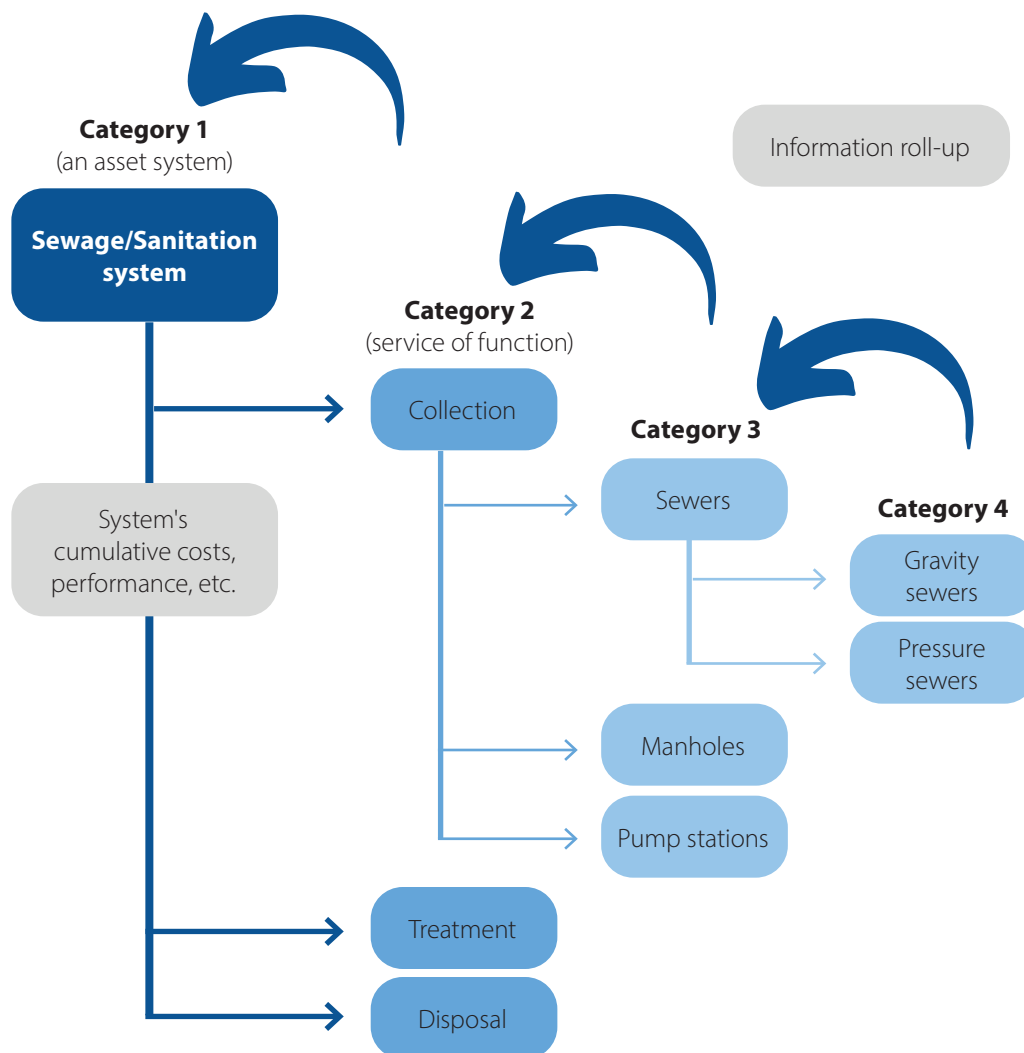
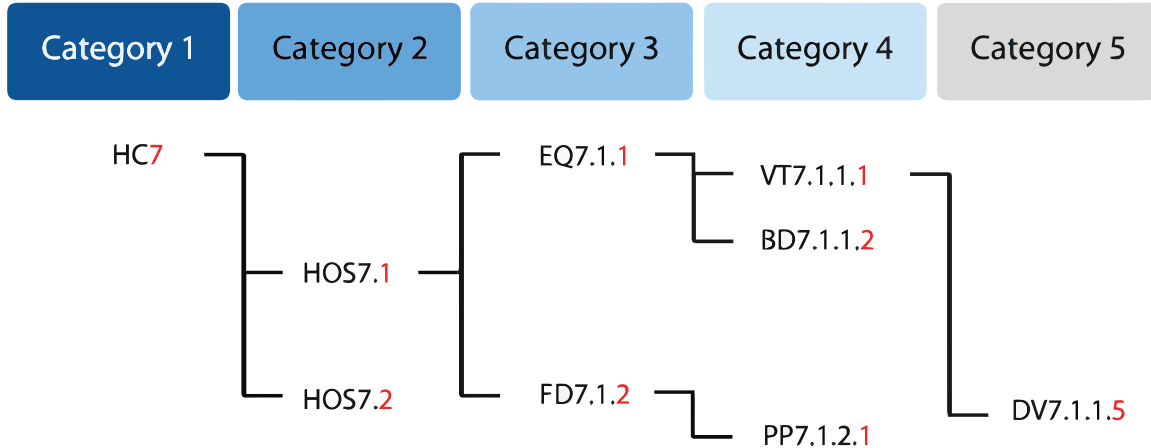


Figure 9

Asset register hierarchy ID system for healthcare

Key: HC = health care; HOS = hospital; EQ = equipment; FD = food; VT = ventilators; BD = beds; PP = people; DV = Dräger Ventilator.



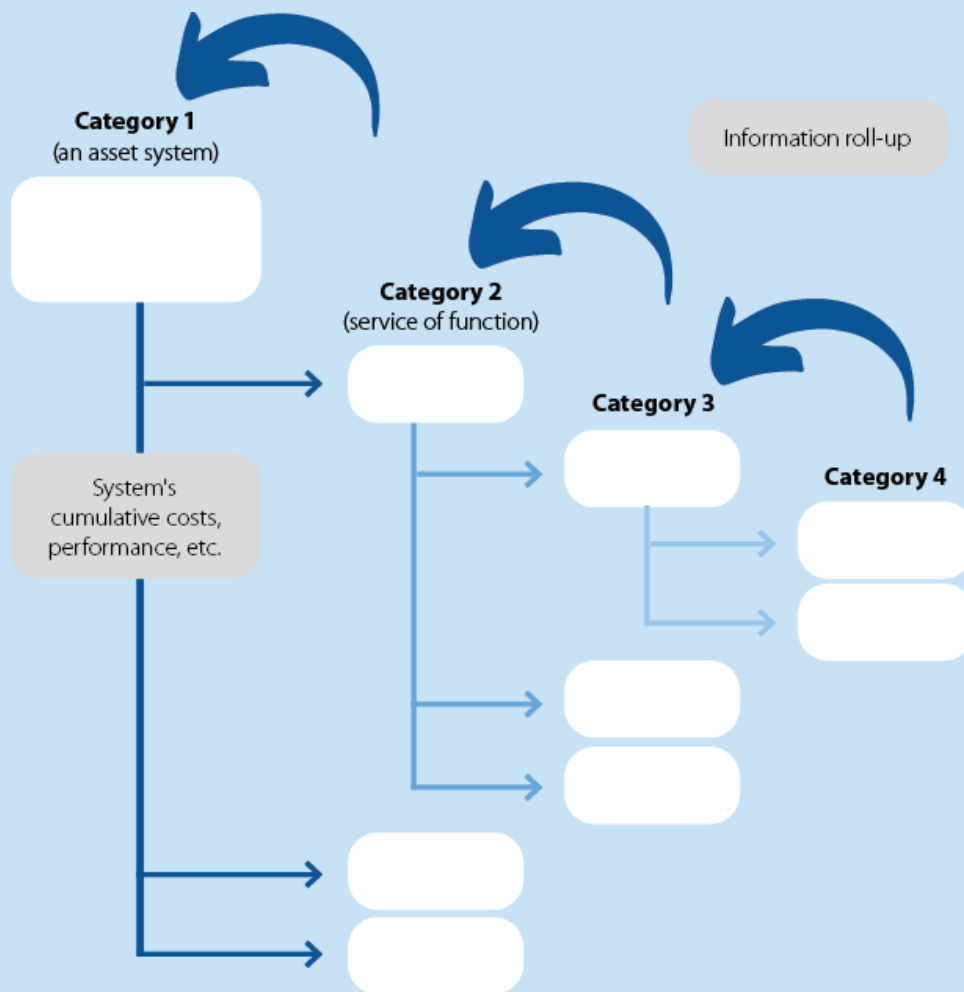
Exercise 3

1. Select a high priority asset system and list the services and asset categories included in it. Some examples to choose from include transportation services, solid waste management, health care or education.

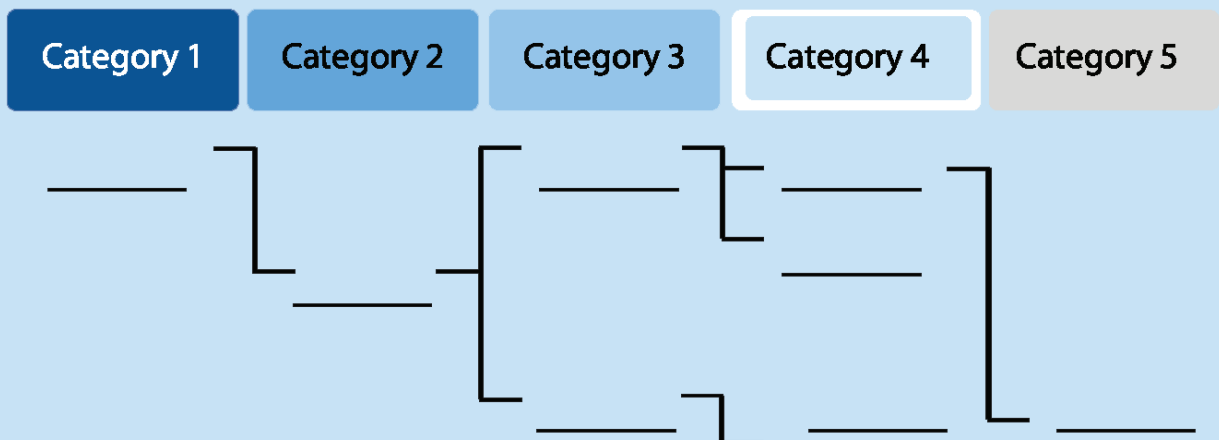
Asset system: Transportation services

Asset category	Asset sub-categories
Rail services	<ul style="list-style-type: none"> • Signalling controlling systems [signalling center, ...] • Stations [...]

- From the list you created, sketch out a potential asset hierarchy for that system. Add and remove branches as needed.



- Implement an identification system so that each asset has a unique ID that is apparent and intuitive.



4. From your chosen asset system, pick one asset category. Divide this category further into asset types and indicate the data you need for the effective operation and maintenance of each type. Try to distinguish different types based on properties of the asset; for example, the category of sanitary sewers is made up of pressure, vacuum and gravity types. Be careful not to get too granular, as that can make data collection too costly and difficult to manage.



5. From the level of the asset system, explain how the roll-up principle might work for one service or function that this system offers. To jog your memory on information roll-up, think back to our example with the faulty sewer main.



You have now set up the basic structure of your asset register database. Because its design is based on its intended use, your specific information and reporting needs have been built in. While needs will change over time, at least you can be confident that the structure you have set up reasonably meets your current priorities and circumstances.

The benefits of a systematic approach to asset data management are that it:

- Creates consistent definitions
- Maps asset relationships in the database
- Establishes a 'line of dependencies' between services, categories, assets and accountabilities (for instance, so you know that asset **A** needs this before asset **B** can do that)
- Increases data reliability and accuracy
- Facilitates analysis, planning and decision-making at all levels of our organization.

5.3.3 Plan data collection

STEP 3

Plan data collection

Once you have set up or improved upon the structure of your asset register database, you need a plan for collecting data to fill that database and support a variety of asset management needs. The asset register hierarchy you defined in the last step can give a sense of how much data to collect for each asset system. Complex infrastructure likely requires more data since there are more sub-categories (branches), and vice-versa. Even so, it is important to always prioritize your assets as it will not be possible to collect data on all the assets in your portfolio at one time.

Chapters 2 and 4 of this handbook explained how to identify critical assets according to risk and a range of other considerations, such as whether an asset aligns more with an overall strategy than another asset. Before collecting any data, you should carefully review your critical assets—or determine them if you have not already—so that you can prioritize resources on the infrastructure services that most impact your community and face higher risks of failure or disruption.

Say a railway system is critical for the daily passage of people and goods within and beyond your city's limits. You should therefore prioritize collecting and maintaining reliable data about this asset (system) in your data collection plan. To keep the data accurate and useful, you need to make sure regular performance checks, among other activities, are in place to keep it operating.

Now, let us go over the different types of data to collect, including location, condition, performance, maintenance and financial data. We will also discuss some sources where you can find and collect different data.

5.3.3.1 Location data

You need to know where an asset is in order to conduct on-site visits for data collection, operation, inspection, maintenance and other activities. Location also provides a sense of an asset's spatial relation to other assets, which can influence how you structure your database (i.e. based on geography) after you defined the basic hierarchy in Section 5.3.2.

During the on-site visit, the data you collect on an asset's location should be descriptive and can include the following:

- Location within the local government (e.g. ward or town)
- Street address
- Area or zone of service (e.g. zoning for water-supply networks)
- Start and end distances for linear assets (e.g. start node number to end node number for water supply or sewerage pipeline)
- Map coordinates
- Longitude and latitude for GIS coordinates

5.3.3.2 Asset condition data

You should periodically evaluate the physical condition and functionality of your assets as a minimum after gathering location data. Other information can be added at a later stage. Asset condition data can be quantitative or qualitative, detailed or generic. For instance, you might simply assign 'good' or 'bad' labels. Existing practices and standards can inform these choices on data type and specificity.

Knowing the **expected service life** (ESL) of your assets is key to tracking and responding to their condition. The ESL is different from the design service life discussed in Chapter 1. The design service life is based on ideal use whereas the ESL is based on realistic use.

Assets that are closer to the end of their ESL will generally be in poorer condition than newer assets, such that older assets may require more immediate attention or regular

check-ups. Lifespan estimates differ from one asset category to the next because they depend on performance criteria or level of service (LOS) indicators specific to that asset. ESL may also vary among asset types—for instance, one type of landfill site might have a longer ESL than another.

Monitoring progress towards the ESL involves recording milestones throughout the asset's life, such as when it was built, when it was first put to use and when it was inspected. As certain milestones are reached (5 years, 10 years, etc.), you can take the appropriate action, whether it's a simple quality control check, repair, renewal or disposal. This time-based information is critical to assessing the condition of an asset, especially when its failure could gravely impact service delivery and even create a hazard for people in your community.

ESLs should be realistic in view of the standards of design and construction, the utilization of the asset, the operating environment, the maintenance regime, legal prescriptions and potential obsolescence. The expertise of the engineers who design the asset should be front and center when determining its ESL. Some examples of ESLs of various asset categories are shown in Figure 10:

Chapter 2 presented a basic tool for assessing asset conditions. Here, we present a more elaborate data collection process that can be applied to more complex and multifaceted assets, such as bridges, wastewater plants or bioreactors. In this example, the lower the score, the better the condition. Figure 11 outlines how the scoring works.

The condition assessment is done individually for each asset category and, if necessary, each asset type. It is essential that you know and correct for different factors that affect the accuracy, reliability and consistency of our data. The method by which we collect our data is one such factor.

You may initially assess the condition of most publicly owned assets based on staff

knowledge and experience. For some older assets, you might benefit from historical data on past failures. However, you should always try to visually assess condition through on-site visits or specific tests, especially for assets with a high risk of failure or whose performance must meet minimum levels of service demanded by the community.

The asset condition data you gather during on-site visits requires analysis, because different personnel may assess the condition of assets differently even if they were trained in one standard method. If you are not entirely confident with an on-site condition assessment or are juggling competing assessments, you can use a 'value judgment tool' to assign conditional scores. This works like a panel of judges, as follows:

1. Assemble a team of the most knowledgeable personnel for the asset(s) in question, such as the relevant maintenance engineer, design engineer or operation manager.
2. Poll each member for a detailed opinion on the competing condition scores and how he or she would score the asset.
3. Examine relevant work order data and asset failure patterns.
4. Use photos and process schematics.
5. Facilitate group consensus through discussion.
6. Agree on adjustments to the assessed asset condition.

5.3.3.3 Asset performance data

Knowing the condition of an asset is not useful unless you can tie it to performance. An asset performance assessment will tell you whether the asset effectively supports your community's needs.

Let's say you discover that a section of a footpath has developed numerous cracks and become overgrown with weeds. You need to

Figure 10

Sample expected service lives (ESLs) of assets

Asset system	Asset category	Expected service life (in years)
Civil – water supply, wastewater, stormwater	Sewers	100
	Civil (dams, boreholes)	75–100
	Pressure Pipework	60
	Storm-water pipelines	50
	Pumps	40
	Valves	30
	Telemetry	20
	Water meters	15
Electrical	Electrical HV transformers	50
	HV cables	50
	MV cables and lines	50
	LV network (overhead)	45
	Electrical plant	15
Transport - roads	Bridges and culverts	100
	Foot paths	50
	Gravel roads and parking areas	25
	Streetlights	20
	Erosion protection structures	15
	Asphalt paving	8
	Road signs	7
Solid waste	Landfill site	20
	Solid waste disposal vehicles	10
	Waste bins	10
Hospital equipment and furniture	Intensive care unit (ICU) furniture	15
	Hospital beds	10–15
	X-ray unit	5–10
	Ventilator, respirator	8
	Defibrillator	5
	CT scanner	5
	PET scanner	5
Other	Building assets (e.g. hospitals)	60
	Parks	50
	Swimming pools	20
	Landscaping	10

understand how this poor condition affects the performance of the path. Through a performance assessment, you might conclude that this part of the path is no longer passable by pedestrians and requires the city's park and recreation services to put in a work order to fix it.

Essentially, performance links condition to action. When asset managers are aware of the deteriorating condition of an asset and how it is affecting or will affect performance, they are able to take proactive steps to deal with it. Sustaining service delivery should be the

Figure 11

On-site condition assessment rating guidelines

Score	Description of condition	Remainder of ESL
1 Like new	Asset is like new, fully operable, with maintenance procedures and training completed, and performs consistently at or above current standards. No further action required.	95–100 per cent ESL
2 Excellent	Asset is in excellent condition, fully operable, well maintained, and performs consistently at current standards. No wear shown and no further action required.	90–95 per cent ESL
3 Very good	Asset is in very good condition and well maintained but may be showing some signs of wear. Delivering full efficiency and no performance deterioration. Maintenance is planned and preventive in nature. At worst, only minor repair might be needed in the near term.	83–90 per cent ESL
4 Good	Asset is sound and regularly maintained but showing minor signs of wear. Delivering good efficiency with minor performance deterioration. Minimal repair is needed in the near term.	75–83 per cent ESL
5 Moderate	Asset is sound and well maintained but may be showing some signs of wear. Delivering almost full efficiency but with some performance deterioration. Yearly regular maintenance is planned and preventive in nature. Minimal repair is needed.	65–75 per cent ESL
6 Fair	Asset is functionally sound, showing normal signs of wear relative to use and age. May have minor failures or diminished efficiency and some performance deterioration. Likely showing modest increased maintenance and/or operations costs. Repair is needed.	50–65 per cent ESL
7 Poor	Asset functions but requires a sustained high level of maintenance to remain operational. Shows deterioration. Corrective maintenance is common. Near-term scheduled rehabilitation or replacement needed	35–50 per cent ESL
8 Very poor	Near to end of physical life. Substantial on-going maintenance with short maintenance intervals required to keep the asset operational. Frequent need for replacement of spare parts or asset components. Renewal or replacement is required.	25–35 per cent ESL
9 Failing	Effective service life nearly exceeded and/or high maintenance costs incurred. High risk of breakdown or imminent failure with serious impact on performance. Urgent replacement needed.	10–25 per cent ESL
10 At the end of service life	Effective service life exceeded and/or extreme maintenance and operational costs incurred. Very often is out of service. No service life expectancy; not repairable. Disposal needed.	0–10 per cent ESL

top priority.

Collecting data on asset performance can be a complex and sensitive process since it addresses the *impact* of an asset, which cannot always be objectively determined. Consider developing assessment guidelines during the planning stage of your data collection process to ensure there are clearly outlined indicators you can follow to assess performance and identify where interventions are needed.

Performance indicator ratings must include data on the physical condition of assets, operating performance, reliability and maintenance. The performance rating table in Figure 12 outlines potential indicators and how to use them to score an asset's performance:

5.3.3.4 Maintenance data

You may need to collect data on the maintenance of assets throughout their life cycle. Knowing the details of check-ups and repairs will help you explain changes in the condition of an asset over time and anticipate future maintenance needs. The performance of assets that are more difficult to assess, such as underground assets like water supply or wastewater pipes, will especially benefit from maintenance schedules supported by complete, accurate and up-to-date information.

The office that directly handles maintenance (e.g. work orders) will be the main source for such data, but you may also turn to finance and other offices for more comprehensive information. Maintenance data should include:

- Total asset maintenance costs
- Name of person or company responsible for maintenance of each asset type
- Description of inspection and/or testing schedules
- Description of identified defects
- Work status (pending, outstanding or completed).

If your government also has a maintenance

management system, that data should be integrated into your asset management information system.

5.3.3.5 Financial data

Every asset management activity has financial implications. Planning an asset on paper comes with financial outlays, as does constructing, operating and maintaining it through its full life cycle. Even building your asset register database involves paying for staff, technology, equipment, travel and much more. In addition, as we learned in Part 1 of this handbook, assets are also important sources of revenues, whether through the collection of user fees, taxes or the leasing out or sale of public land. Consequently, any type of financial activity tied to asset management benefits from data that allows for proper financial valuation of assets.

Recall the second 'what' of the 'six whats' of asset management: what is it worth? In Chapter 2 we learned about three major valuation approaches: (1) Depreciated book value; (2) Replacement Cost and (3) Market Value. Which method to use depends on the asset and the data available. To allow your financial team to access the data it needs when valuating assets, you should update the financial value of all of your assets in your asset register on an annual basis. A simple way to do so is to plan how much money is written off each year and project the book value of the asset. Recall from Chapter 2 that the book value is calculated according to the government's accounting policies and refers to the original cost of the asset minus depreciation.

For financial reporting purposes, there are five common methods to calculate depreciation, each with varying complexity and accuracy.

You will notice a common pattern regardless of the depreciation method used: The book value at the end of an accounting period (typically after one year) is equal to the book value at the beginning of the accounting period

Figure 12

Performance rating assessment—indicators and score

<p>Physical condition: The physical condition of an asset results from age, utilization and maintenance. You can assess the physical condition by comparing your desk assessments with on-site assessments.</p>	Desk assessment	On -site assessment (including adjustments)	Description
	1	1 to 2	Exceeds actual requirements
	2	3 to 4	Meets actual requirements, shows signs of improvement
	3	5 to 6	Evidently concerning; cost/benefit issues
	4	7 to 8	Inefficient, becoming inefficient, outdated
	5	9 to 10	Deteriorates—incapable of maintaining required service level
<p>Operating performance indicators: Measuring the asset's actual capacity to perform its immediate or future operating requirements.</p>	Operating rating		Description
	1		Exceeds actual requirements
	2		Meets actual requirements, shows signs of improvement
	3		Evidently concerning; cost/benefit issues
	4		Inefficient, becoming inefficient, outdated
	5		Deteriorates—incapable of maintaining required service level
<p>Reliability: Measuring the capacity to perform under given circumstances for a definite period of time.</p>	Failure frequency	Reliability rating	Description
	Never	1	As specified by manufacturer
	Every 2 years	2	Random breakdown
	Every 1 year	3	Occasional breakdown
	Every 3 months	4	Periodic breakdown
	Every month	5	Continuous breakdown
<p>Maintenance: Measuring the frequency and type of maintenance interventions.</p>	Maintenance rating		Description
	1		Only operational maintenance, normal monitoring
	2		Minor corrective maintenance required, short monitoring intervals
	3		Predictive and corrective monitoring become dominant, frequency of work orders increases

(cont'd)

	4	Work orders considerably above average, minor repairs persist
	5	Corrective maintenance is frequent, failure pattern persists
<p>Overall performance: Measured as the average score of the above indicators.</p> <p>E.g. If your scores for physical condition, operating, maintenance and reliability are 2, 3, 3 and 3 respectively, the overall performance of your asset would be $(2+3+3+3)/4 = 3$.</p>	Performance rating	Description
	1	Exceeds or meets all performance expectations
	2	Minor performance deficiencies
	3	Considerable performance deficiencies
	4	Major performance deficiencies
	5	Does not meet any performance expectations

minus the annual depreciation expense. Only in the straight-line method is the cost of depreciation fixed over the course of an asset's service life.

So which method do you use? Most local governments begin with the straight-line depreciation method given its simplicity. As a rule of thumb, sum of units of production is most appropriate for vehicles, pumps and equipment. Sum of years will work well for most other asset types.

Let's now look at one more example using all five methods, to compare the calculated depreciation costs and rates, as well as the effort required in each method.

Say your local government acquired a vehicle in 2018 worth €18,000. The total depreciation period, or service life, of the vehicle is 10 years. Assume that the residual value at the end of the period is zero. Figure 13 displays the calculations of each method for the first two years of depreciation, followed by Figure 14 with the depreciation and book values for the first five years.

The two graphs in Figure 15 present the asset book values and depreciation expenses over the first five-year period.

Whatever method you use, the depreciation

costs are typically high and can amount to around 30 per cent of total asset costs. Where technically and socially feasible, the service fees or permit fees linked to the asset would cover such depreciation costs.

When calculating asset depreciation, it is important to have reliable data on the condition of assets. Let us look at an example.

Imagine a local hospital installed three new respirators in 2016. Each respirator was procured and installed for \$10,000 USD. The estimated service life for each respirator is eight years. Therefore, the remaining service life as of 2020 is four years. As the COVID-19 pandemic struck, the respirators were used almost full time during the months of March, April and May.

With a new wave of the outbreak expected at the end of September, your town has performed an on-site condition assessment of these respirators in the interim. The survey team assessed their condition and rated all three respirators a 6 (or Fair), with the following description: "All three respirators are functioning well and showing normal signs of wear relative to use and age. The respirators may have minor failures or diminished efficiency and some performance deterioration. Minor repair is needed for all three respirators."

1

Straight-line method (SL):

This method is the simplest and most common way to calculate depreciation, often requiring just one calculation, from which you can also determine the depreciation rate.

$$\text{Depreciation expense} = \frac{\text{Asset cost} - \text{Residual value}}{\text{Expected service life of the asset}}$$

Where:

- Asset cost = Procurement price or historical cost
- Residual value = Value of the asset remaining after its expected service life (ESL)
- Expected service life = # years for which an asset is expected to be in service (see Figure 10 for ESLs of selected assets).

Once you have the depreciation expense, you can calculate the depreciation rate:

$$\text{Depreciation rate} = \frac{\text{Annual depreciation expense}}{\text{Asset cost} - \text{Residual value}}$$

The depreciation expense is deducted from the asset's book value at the start of each accounting period.

Example:

A local hospital in your town purchases a new ventilator for \$20,000 with a service life of 30 years and a residual value of \$2,000.

The asset would depreciate annually by = \$600.

The depreciation rate would be $600 / (20000 - 2000) = 3.33\%$.

2

Diminishing balance method (DB):

This method often provides a more accurate accounting of an asset's value than the SL method. However, it is more complex since it requires several rounds of calculations.

$$\text{Depreciation expense} = \text{SL depreciation rate} \times \text{Book value at the beginning of the accounting period}$$

Where:

- Book value = Asset cost – Accumulated depreciation
- Accumulated depreciation = Total amount of asset cost allocated to depreciation expense (or to manufacturing overhead) since asset was put into service.

Example:

Let us continue with the ventilator example.

We know that the SL depreciation rate is 3.33% and that the original asset costs were \$20,000. The DB method requires separate calculations for each year:

Year 1: No previously accumulated depreciation, so depreciation after one year is $3.33\% \times (20000 - 0) = \667 .

Year 2: The book value of the ventilator at the start of the accounting period is $20000 - 667 = \$19,333$.
 Depreciation after two years is therefore $3.33\% \times 19333 = \$644$.
 Accumulated depreciation is $667 + 644 = \$1,311$.

Year 3: The book value is $20000 - 1311 = \$18,689$
 DB depreciation after three years is $3.33\% \times 18689 = \$622$.
 Accumulated depreciation is $1311 + 622 = \$1,933$.

Repeat for Years 4 and 5.

3 Double-declining balance method (DDB):

As the name suggests, this is an accelerated depreciation method where a large part of the depreciation cost is incurred at the beginning of the asset's life.

Depreciation expense = $2 \times \text{SL depreciation rate} \times \text{Book value at the beginning of the accounting period}$

So far, each method expands on the previous with additional calculations, but increased complexity does come with the benefit of increased accuracy.

Example:

Following from the ventilator example: after one year, the DDB depreciation is $2 \times 3.33\% \times (20000 - 0) = \$1,333$.

After two years, the DDB depreciation is $2 \times 3.33\% \times (20000 - 1333) = \$1,244$.

The accumulated depreciation after Year 2 is $1333 + 1244 = \$2,577$.

4 Sum of years' digits method (SYD):

This method is also an accelerated depreciation method that captures costs of maintenance and repair costs that will increase with the age of the asset. The SYD method is useful for assets that may quickly become obsolete.

Depreciation expense = $\text{Asset cost} \times \frac{\text{\# years of estimated life remaining at the beginning of the year}}{\text{SYD digits}}$

Where SYD digits = $\frac{n(n+1)}{2}$ and n = service life

Example:

Your local government purchases a new garbage truck for \$100,000 with a service life of 10 years. The sum of years' digits is $(10 \times 11) / 2 = 55$.

After one year, the depreciation expense is $100,000 \times 10 / 55 = \$18,182$. The SYD depreciation rate is ~18.2%.

After two years, the depreciation expense is $100,000 \times 9 / 55 = \$16,364$. The SYD depreciation rate is ~16.4%.

5

Sum of the units of production method

Unlike the SYD method, this method is useful when an asset's value is more closely related to the number of units it produces than the number of years it is in use. Greater deductions are taken for depreciation in years when the asset is heavily used.

Depreciation expense = Units of production rate \times # units produced

Where units of production rate = $\frac{\text{Asset cost} - \text{Residual value}}{\text{Estimated total units to be produced over estimated service life}}$

Example:

Your local government invests into a new wind turbine that costs \$4 million with a capacity of 3 MW. The turbine can produce up to 6 million kWh in a year. Over its lifespan of 25 years, it is estimated to produce a total 140 million kWh in energy. Assume the windfarm's salvageable parts have a residual value of \$100,000 based on future steel and copper prices.

The units of production (depreciation) rate is $(4 \text{ million} - 100,000)/140 \text{ million kWh} = \$27,857$ per million kWh.

In the first year, the farm produces 5 million kWh. The depreciation expense is $\$27,857 \times 5 = \$139,286$.

In the second year, the turbines are more efficient and produce 5.9 million kWh. The depreciation expense is $\$27,857 \times 5.9 = \$164,357$.

As respirators are considered very valuable assets, especially at this time, a team of experts was assembled to make a 'value judgement' on the given rating. Based on those results as well as the respirators' performance analyses, maintenance records, operational history, pictures and operating environment, the assessment rating was reduced by 10 per cent compared to the on-site assessment, to 7 (Poor), with a brief description: "All three respirators are functioning but require a sustained high level of maintenance to remain operational. Respirators show signs of deterioration and corrective maintenance is common. They need major repairs, scheduled rehabilitation or replacement in the near term."

5.3.3.6 Where to collect

You now have a good sense of *what* data to collect and to what degree of specificity or

precision, based on the definition of your asset register hierarchy and resource capacity.

So where will you get the data to populate your database?

First, pinpoint the data sources you expect to be the most useful. You can comb through existing records in each department or public utility office. For certain data, you may have to branch out to regional or higher levels, depending on where the central authority for an asset system lies. For example, rail services in a small town may be provided through a network that covers an entire province's railways. The asset management information team in that town may be able to source maintenance data from city hall records, but then reach out to a provincial government office for blueprints of the railway's design for other information purposes.

You might select data sources based on the criticality of certain assets. For example, if the

weather patterns in your area make storm-water drainage a priority public service, you might first turn to engineering designs of culverts and catch basins from the relevant management office.

You might also select data sources based on missing data. Which of your assets face the

Figure 13

Vehicle depreciation example—first two years' calculations

Straight line

Depreciation expense = (asset cost - residual value) / service life of asset

- Each year: $(€18,000 - €0)/10 = €1,800$

Diminishing balance

Depreciation expense = SL depreciation rate x book value at the beginning of the accounting period

- Straight-line depreciation rate = $€1,800/€18,00 = 10\%$
- Year 1: $10\% \times (€18,000 - €0) = €1,800$
- Year 2: $10\% \times (€18,000 - €1,800) = €1,620$

Double-declining balance

Depreciation expense = 2 x SL depreciation rate x book value at the beginning of the accounting period

- Year 1: $2 \times 10\% \times (€18,000 - €0) = €3,600$
- Year 2: $2 \times 10\% \times (€18,000 - €3,600) = €2,880$

Sum of years' digits

Depreciation expense = Asset cost x (number of years of estimated life remaining at the beginning of the year / SYD digits)

- SYD = $(10(10+1))/2 = 55$
- Year 1: $€18,000 \times 10/55 = €3,273$
- Year 2: $€18,000 \times 9/55 = €2,945$

largest information gaps that affect performance and service delivery?

Start with an initial list. As you proceed, you may need to tap additional data sources. Figure 16 provides some potential sources of primary data on assets.

Few local governments have access to all

Sum of units of production

Depreciation expense = Units of production rate x units that are produced
Assume that 250,000km is the maximum distance.

- Units of production rate: $(€18,000 - €0)/(250,000) = 0.072$
- Year 1: $0.072 \times 9,000 = €648$
- Year 2: $0.072 \times 16,000 = €1,152$

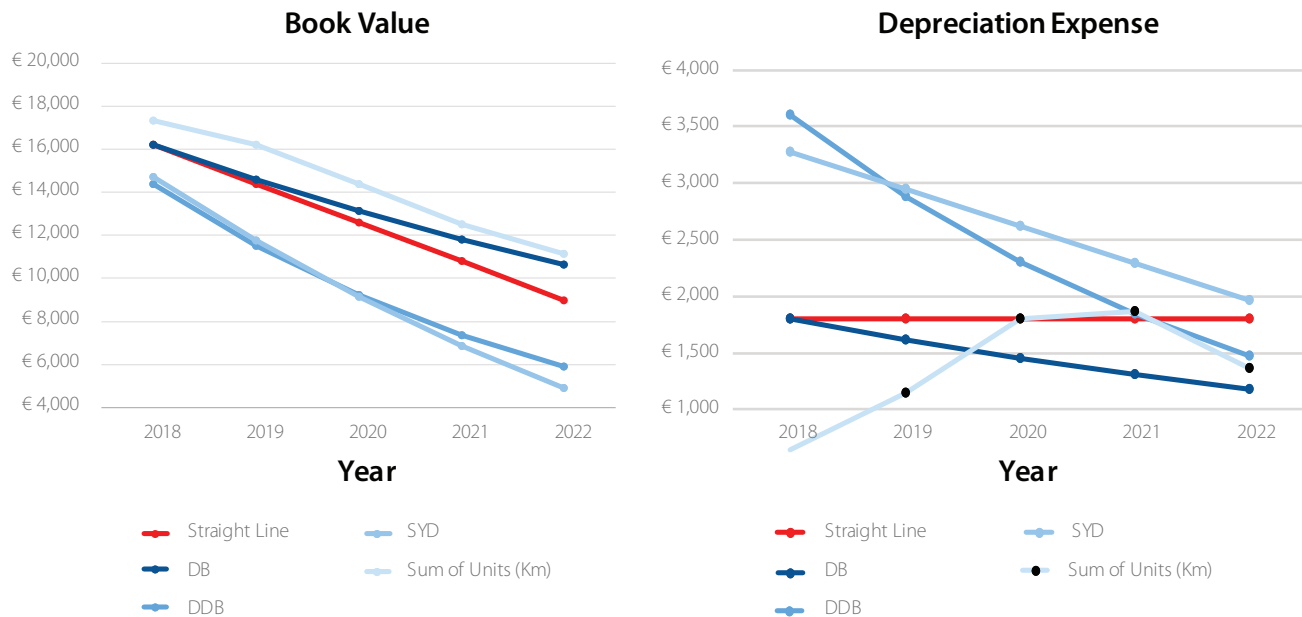
Figure 14

Vehicle depreciation example—first five years' depreciation and book values

Year	2018	2019	2020	2021	2022
Straight line					
Opening book value	€18,000	€16,200	€14,400	€12,600	€10,800
Depreciation	€1,800	€1,800	€1,800	€1,800	€1,800
Ending book value	€16,200	€14,400	€12,600	€10,800	€9,000
Diminishing balance					
Opening book value	€18,000	€16,200	€14,580	€13,122	€11,810
Depreciation = 10%	€1,800	€1,620	€1,458	€1,312	€1,181
Ending book value	€16,200	€14,580	€13,122	€11,810	€10,629
Double-declining balance					
Opening book value	€18,000	€14,400	€11,520	€9,216	€7,373
Depreciation = 20%	€3,600	€2,880	€2,304	€1,843	€1,475
Ending book value	€14,400	€11,520	€9,216	€7,373	€5,898
Sum of years' digits					
Opening book value	€18,000	€14,727	€11,782	€9,164	€6,873
Depreciation	€3,273	€2,945	€2,618	€2,291	€1,964
Ending book value	€14,727	€11,782	€9,164	€6,873	€4,909
Sum of units of production					
<i>Km driven each year:</i>	9,000	16,000	25,000	26,000	19,000
Opening book value	€18,000	€17,352	€16,200	€14,400	€12,528
Depreciation	€648	€1,152	€1,800	€1,872	€1,368
Ending book value	€17,352	€16,200	€14,400	€12,528	€11,160

Figure 15

Book value and depreciation expense (example)



relevant data at the level of accuracy or quality required for a fully functioning asset management information system. Reasons for the lack of reliable data include:

- Insufficient and infrequent data updates
- Inaccurate or incomplete records
- Data on the same asset referenced inconsistently across different department
- Inconsistent data terminology or descriptions leading to duplicative records

Additional obstacles to an effective information system include

- Software failures or other technical interfaces
- Poorly executed data migration when new software applications (i.e. accounting software; technical CAD/GIS software) are implemented

- Operational or technological changes that require new and different types of data
- Any database will suffer from some of these problems to some extent, but the data collection concepts and methods in this handbook will help your local government go a long way towards adopting an asset management information system and putting it to good use.

An asset identification system will help reduce the inconsistencies that often arise when data on one asset type comes from different sources. Maintaining an organized hierarchy will help team members and stakeholders through the use of standard terminology. This decreases misunderstandings and duplication of data and enables more open and productive discussions about the value of an information system.

Exercise 4

1. What is the most appropriate depreciation method for the respirators? Please explain.

2. Calculate the most appropriate depreciation method based on the final assessment results.

3. What additional information do you need in order to decide whether the respirators should be repaired or replaced?

5.3.4 Collect data

STEP 4

Collect data

On-site surveys provide the most accurate method of filling data gaps. While software tools and spreadsheets can help assess the validity, completeness or consistency of your data, technology alone cannot confirm the accuracy of data on the ground. Therefore, on-site visits remain critical for gathering and verifying data for asset management.

Come to your on-site visits equipped with a plan, based on what data are most critical to collect. To facilitate your data collection on the ground, it is good practice to use worksheet

templates based on the predetermined structure of your asset register database.

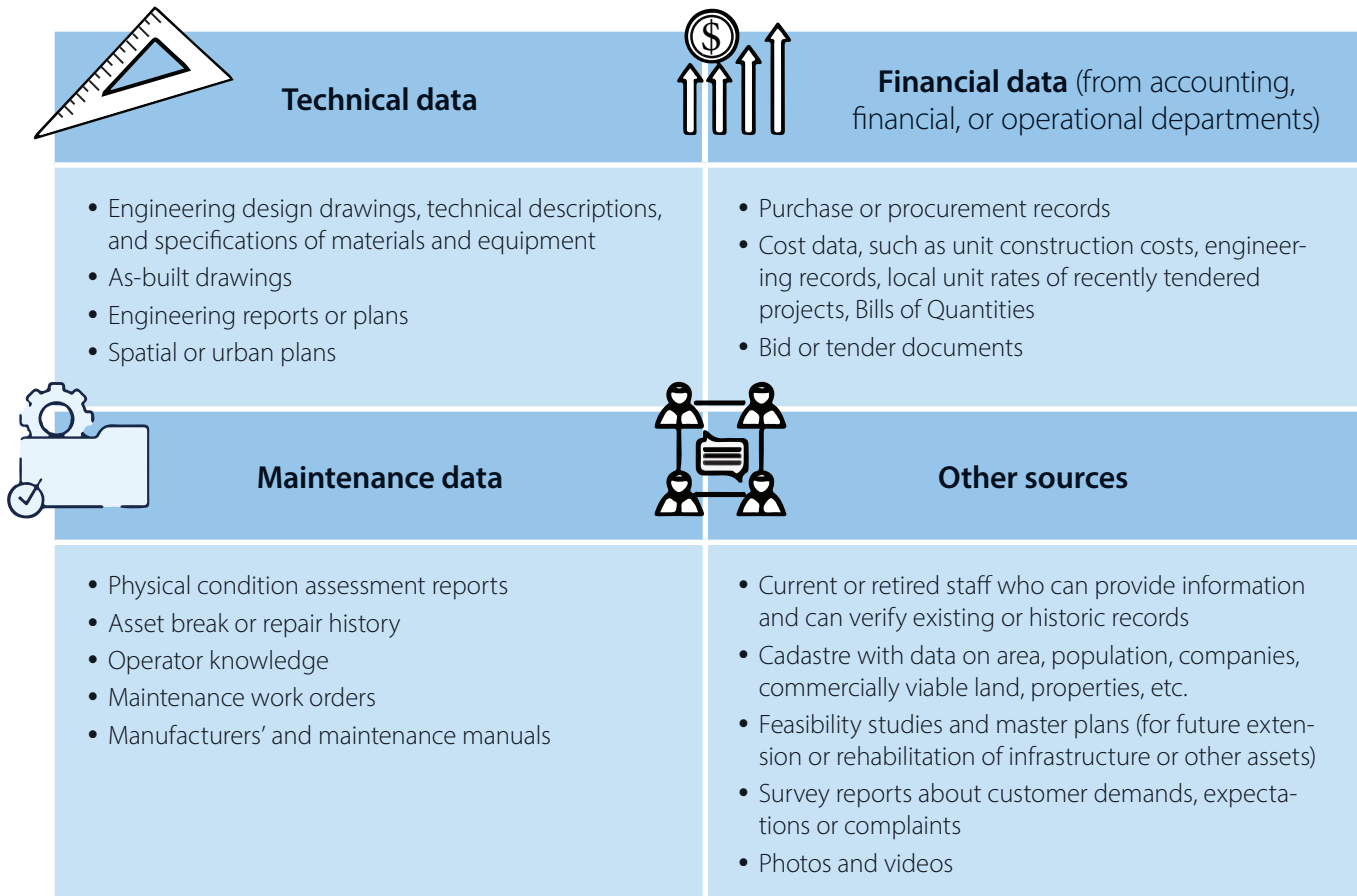
In most cases, you will want to start collecting data at the highest level in the asset register hierarchy and work your way down. When starting out, it is more important to measure the performance of an entire system than that of any individual component (for instance, to see how the sanitation system is working before looking at individual sewers). Data on asset types can be collected during subsequent data collection runs.

Alternatively, you can start with the hierarchy level(s) with the highest value to your asset management system. Again, you can focus on the most critical assets, or the most critical information gaps affecting the performance of your assets.

On-site surveys are especially important when

Figure 16

Potential data sources



your existing data records are of poor quality or non-existent. Indeed, in addition to gathering new data during your on-site visit, you might seize the opportunity to verify other existing data. Although this will probably increase the time required on site to complete your survey, it may ultimately save you travel time and related expenses, especially if your sites are geographically spread out and multiple trips are costly.

Usually, you need to visit a range of sites (and sometimes one site multiple times) to gather comprehensive data on critical assets. Members of the asset management information team should be well equipped to do on-site data collection. The job may also be outsourced to trained surveyors outside your team.

Asset information should ideally be stored in a **Geographic Information System (GIS)**, which makes it easy to access information and allows for export of spreadsheets as needed. At the beginning, though, you may consider using less expensive tools such as spreadsheets or basic CAD (Computer Aided Designs) software that can be easily tailored to your information system needs.

While on-site data collection is an accurate method of filling gaps in existing datasets or registers, it typically comes with significant costs (e.g. people, travel). Your plans for on-site data collection should therefore focus on critical assets where high-quality data is of top priority.

We have covered the 'where,' 'what' and 'how' of a data collection plan. It will also need a

‘when’—a timeline for collecting data. This may be organized into phases.

Your plan also needs to identify ‘who’ will collect the data. Your surveyors should be selected based on their background, expertise and reputation, so each is well placed to gather the requisite data. Someone who already has experience liaising with the finance department, for instance, might be suited to the task of collecting data there.

You should develop clear descriptions of the data survey activities, including surveyors’ responsibilities, milestones and the estimated duration of data collection. Surveyors should also be provided with guidelines on condition and performance assessment methodologies, and clear minimum standards for the quality of the data collected. They will also need general guidelines on analyzing and validating the data collected (who, how and when), and on data reporting and communication procedures. You may need to organize training on the use of equipment.

Remember, efficiency is key. Try to minimize data collection costs, especially for on-site surveys, by collecting data only when needed. Your data collection activities and methods must meet—but should not exceed—the levels of accuracy, precision and resolution required for well-informed and data-driven asset management. There is always room to improve on the asset register database later, as needed.

You now have a solid plan in place to frame your data collection activities. Before you begin, let’s go over some key data characteristics and criteria. The entire process might seem laborious, but there are many ways you can go wrong that may result in wasted resources or, worse, an information system that is less user-friendly and effective than the previous one. A commitment to understanding the desired outcomes of your database beforehand and the efforts you put in to achieving them cannot be stressed enough.

Data collection methodologies for on-site surveys

- **Manual:** The collected data are documented either with pen and paper or with handheld computer devices equipped with GPS.
- Data collectors may work as a team and may use additional equipment such as a measuring device for distance (tape measure or laser).
- **Automated:** Cutting-edge data collection equipment has a high degree of automation and precision, enabling very fast and complete data collection. However, procuring such automated equipment is costly and might not be feasible for small municipalities.
- Equipment for capturing, storing and processing collected data includes distance measuring devices, digital video cameras, gyroscopes, laser sensors, computer hardware and GPS antennas.
- **Semi-automated:** Involves comparable equipment as the automated method but with a somewhat lesser degree of automation. Manual surveying is used to supplement data collection.

5.3.5 Validate your data

STEP 5

Validate data

Now that the data have been collected, they must undergo a proper, expert-led review. Data validation should be done by a team of experts with asset management experience and familiarity with your fixed assets. The purpose of the data validating step is to ensure that your data:

- Are consistent across the entire database
- Comply with the relevant quality standards
- Are representative of the underlying assets

The data validation experts might grade your database according to the scale in Figure 17.

Based on the results of the review, your asset

Exercise 5

1. Which asset systems will your data collection plan prioritize? You could base your decisions on the systems that are most critical and/or on where you have the largest information gaps. Recall Section 5.3 where we looked at two methods for evaluating criticality.

2. What tools and software are you currently using to store and report data, and what are their shortcomings? What new, upgraded software could your government invest the resources for (now or in the future) to improve upon the current methods?

3. For the priority assets in your plan, what local or national guidelines or standards exist around (i) their condition and performance requirements, (ii) the quality of data collected for those assets and (iii) the procedures for reporting on those assets?

management information team can make any necessary adjustments and continue improving on the data collection activities. In this section, we will look at key criteria for data validation.

The data you collect for your asset register

database and information purposes should have certain attributes and characteristics to ensure overall **data integrity**, in other words, data has not been altered or destroyed and is complete and sound for the purposes required of it. Data integrity entails accuracy as

Figure 17

Data collection accuracy

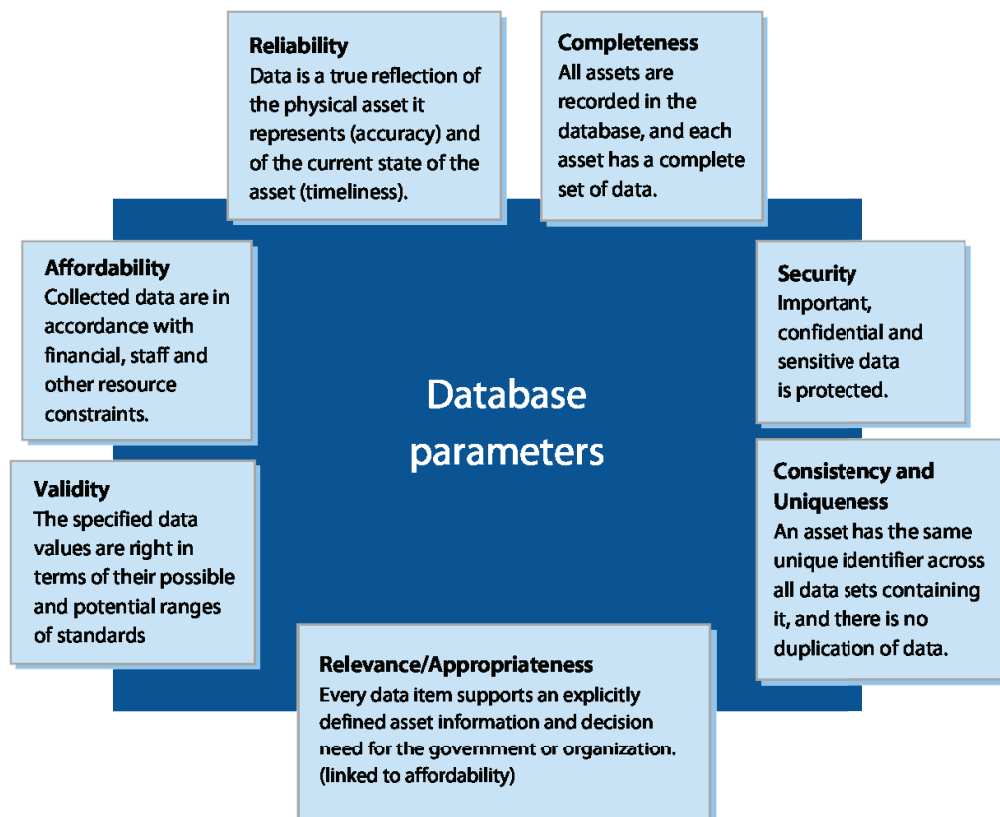
Grade	Description	Accuracy
1	Accurate	± 1%
2	Minor inaccuracies	± 5%
3	50 percent estimated	± 20%
4	Significant data estimated	± 30%
5	All data estimated	± 40%

well as security, meaning important, confidential and sensitive data are protected (i.e. access restrictions, frequent back-ups).

Figure 18 shows the parameters that should be used to assess your data collection. These important criteria will guide you in deciding whether the data you have collected meets organizational needs and standards, and what data you may need to collect in the future. If you carefully considered the ‘where, what, how, when and who’ of your data collection plan, as outlined in the preceding sections, you may already meet most of the criteria.

Figure 18

Database parameters



Adapted from The Institute of Asset Management, p. 60.⁵

As with all other asset management activities, the costs of data collection should always be weighed against the value added of the data collected (or to be collected). Asset information embedded in a well-structured database and used for its intended purposes can lead to large savings for your organization. However, there is always a point at which information exceeds the level of detail or scope necessary to still make informed decisions and ensure high performance. When validating the data in your database and planning for future data collection, be sure not to overlook the *relevance, appropriateness* and *affordability* parameters; otherwise, you could be diverting resources from other beneficial activities.

Checking the parameters in Figure 18 will also help you assess whether your asset register database captures all the right information. Conducting such an exercise before, during and after data collection activities will highlight gaps and areas for improvement and keep your asset management information team on the right track. It can include the following questions:

- What information do we have?
- What information do we need and why do we need it?
- What quality of data is sufficient for the asset management information system?
- Are we collecting and managing our data in the right place or point in our organizational process?
- What tools exist for assessing existing data quality?
- Is data accessible to its intended users?
- Do we need additional checks for quality assurance or compliance with legislation for financial reporting, asset inventorying, etc.?

As always, you need to weigh the accuracy, quantity and quality of data you plan to collect against the costs. Always keep in mind the value added associated with the data in question.

5.3.6 Create your asset register database

STEP 6

Maintain & update

So far, you have:

1. Organized an asset management information team, headed by a champion.
2. Designed an asset register hierarchy with a classification and identification scheme.
3. Planned your data collection activities.
4. Ventured out to collect the data, taking special care to calculate asset depreciation.
5. Validated the data collected.

You now have everything you need to establish your asset register database. This database will allow you to:

- Establish asset life cycle and asset costs database relations
- Develop risk assessment and risk management indicators
- Prepare analyses and reports for intervention alternatives for operation, maintenance, renovation, replacement, and disposal

The functionality and degree of complexity of your database need to suit the nature, size and complexity of the assets it describes. It will likely be limited by the capacity of your local government. For smaller municipalities, a simple spreadsheet or database software with data tables, queries and reports could be adequate. Local governments with extensive portfolios and the resources to manage more complex systems might prefer more sophisticated (and more expensive) software systems.

You can always start with a minimally functional database and scale up over time. Also remember, building the foundation of an

information system—a dedicated team of individuals and a compilation of reliable data sources—is often times the most difficult part. Once you get started, you will see efficiency gains that will likely motivate you to keep using and improving the system.

5.3.7 Review, maintain and update data

STEP 7

Maintain & update

An explanation of how to establish an asset register database would not be complete without stressing the importance of keeping it updated over time. Assets require ongoing maintenance to perform well; the same goes for your asset register database. The database should remain functional far beyond the first few months after you create it.

An updated and ever-expanding asset register database enables you to more effectively carry out collection, recordkeeping, processing and analysis of asset data—all the aspects of a proper asset management information system. A few basic principles for maintenance and upgrades include:

- Consistent, efficient and frequent data collection
- Reliability of data
- Systematization and recordkeeping of key asset information
- Control, verification and safety of asset data

Your asset management information team must periodically assess whether the information you are receiving is adequate to meet local government officials' requirements for effective decision-making. The assessment should also check whether the results of their decisions are delivering the expected outcomes.

Asking these questions on a regular basis

can help you improve many elements of your asset register database. The answers might, for instance, change your specifications for which data to be collected. You might also revise information processing requirements and business processes and competencies upwards as your information system becomes more sophisticated.

When you establish a sound asset information system, the feedback cycle shown in Figure 19 is set in motion.

5.4 Beyond the basic database

A well-functioning asset register database is a key element in your asset management framework. It is the basic structure underpinning your growing asset management information system. Once you have established your database, you can begin to consider other ways to use your current data, gather new data, and expand your asset management information system. In the final section of this chapter, we will address two such aspects: key performance indicators (KPIs) and information technology (IT) tools.

5.4.1 Key performance indicators

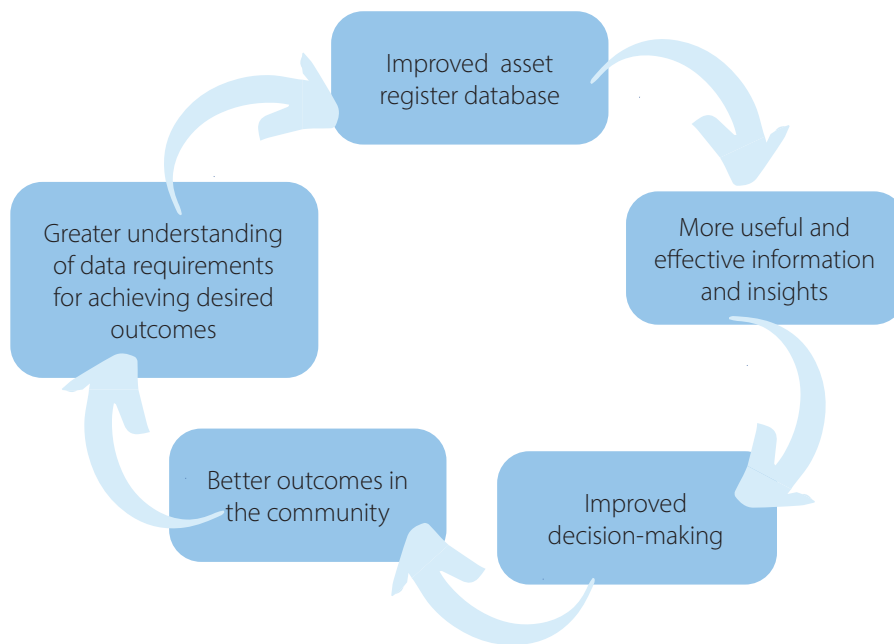
To monitor and evaluate the performance and sustainability of your assets, you can use **key performance indicators** (KPIs). You can use these indicators to set targets against which to compare outcomes on a regular basis. The results present valuable information in quantitative terms, which is particularly effective for senior decision-makers who often do not have the time to read through a lengthy report.

There are several KPIs you can use for asset management:⁶

1. The asset consumption ratio highlights the condition of your local assets and the extent of capital investments required in the future to preserve their service life.

Figure 19

Asset information feedback cycle



Specifically, it indicates the current value of depreciable local assets relative to their ‘as new’ value in current costs.

Before calculating this ratio, you will need to understand what current replacement costs (CRC) and depreciated replacement costs (DRC) are. CRC is an estimate of the current cost of replacing the asset. It should include all financial outlays associated with the planning, design, construction, operations and maintenance of the replacement asset. If the asset was acquired a long time ago, you can estimate using a modern equivalent of similar capacity.

Since assets also depreciate in value (as discussed in Section 5.3), each asset has a depreciated replacement cost, which is a portion of its CRC adjusted down based on what is left of its service life. A lower DRC indicates a shorter remaining service life in proportion to its ESL. For the purpose of showing the relationship between variables:

$$\text{Depreciated Replacement Cost [DRC]} = (\text{Remaining Service Life} / \text{Estimated Service Life [ESL]}) \times \text{Current Replacement Costs [CRC]}$$

$$\text{1 Asset consumption ratio} = \frac{\text{Sum of depreciated replacement costs (DRC) of assets}}{\text{Sum of current replacement costs (CRC) of depreciable assets}}$$

A ratio less than or equal to 50 per cent indicates a rapid deterioration of the assets in question. If the ratio is greater than 75 per cent, your local government is likely overinvesting in that asset system or category.

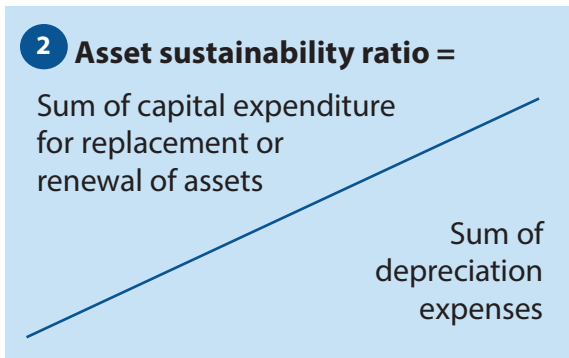
As an example, let’s calculate the asset consumption ratio for your local health care system.

Say the DRC of publicly owned buildings (hospitals, urgent care centers, etc.) totals \$57 million, and the DRC of publicly owned equipment (stretchers, crash carts, etc.) totals \$123 million. The sum of all depreciated replacement costs is then \$57 million + \$123 million = \$180 million.

The CRCs of those buildings and equipment are \$75 million and \$165 million, giving a total CRC of \$240 million.

The asset consumption ratio is therefore \$180 million / \$240 million = **75 per cent**. The ratio indicates that we are *close to over-investing* in the asset system of health-care services.

2. The sustainability ratio measures the extent to which assets are being replaced as they reach the end of their useful service lives.



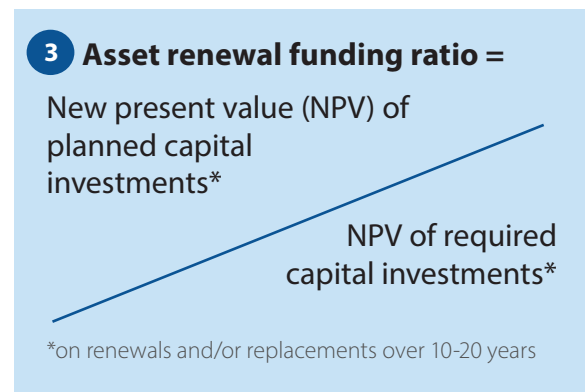
An acceptable ratio is between 90 and 110 per cent. If the ratio is greater than 110 per cent, your local government may be over-investing in the renewal or replacement of the assets or asset system in question.

Let's continue with the example of your local healthcare system.

The sum of expenditures for renewal and/or replacement of the healthcare system (buildings and equipment) in your municipality is \$4 million + \$3 million = \$7 million. The sum of depreciation expenses is \$5 million + \$4 million = \$9 million.

The asset sustainability ratio is therefore \$7 million / \$9 million = **78 per cent**. The ratio indicates that your municipality (or government) is *under investing* in the renewal and replacement of assets in your health-care system.

3. The asset renewal funding ratio: This ratio indicates whether your local government has the financial capacity to fund projected asset renewals or replacements as required in the future.



The ratio should be between 95 and 105 per cent.

From our example, the NPV of the long-term financial plan of investments for renewal and/or replacement of the health-care system (buildings and equipment) in your local government is \$16.8 million. The NPV of projected investments for health care services in your local government asset management plan is \$17 million.

The asset renewal funding ratio is therefore \$16.8 million / \$17 million = **99 per cent**. The ratio indicates that your local government *has* the financial capacity to fund health care asset renewal or replacement as required.

5.4.2 Information technology tools for asset management

Adopting IT software can have a significant impact on the quality of your data and

information. The visual application and organizational integration of information that come with software support often dramatically reduces operational and maintenance costs in the long run. However, IT software and equipment generally come at a high cost, both in the form of upfront expenses and upgrades over time.

You should, therefore, carefully evaluate how beneficial IT software can be for managing your organization's assets, against the costs of purchasing and implementing it. Questions to ask include:

- Do you need it now?
- What are the track records of proposed software and equipment, and might they introduce an unacceptable risk?
- Do you need vast volumes of data and information, and can you handle it?
- Will other software and IT equipment become available in the next year or two that could offer a more effective and cost-effective solution?⁷

What is often more important than *which* software product you select is *how* you use it and whether it is effective for your system's purposes. You will need to factor into your asset management activities the time it will take to properly install software and train people on how to use it. Inadequately used software,

even if it is up to date, can lead to worse results than doing nothing. Wrongly implemented processing or system integration can degrade the quality of your data, without you even knowing.

Before making decisions about introducing IT software into your asset management system, especially a developing one, you should first undertake a thorough review of the market for asset management software, particularly adapted to local governments of your size and structure. Review the advantages and disadvantages of general-purpose versus custom-made software and make a list of your top choices. Then, assess each item on the list for functionality and affordability against current and future needs of your government's asset management information system. Just as you would consider the life cycle costs of managing your assets, your review should also consider such costs for maintaining asset management software and any associated equipment. These may include costs for licensing, periodic maintenance checks and upgrades.

By properly integrating new tools and practices into existing modes of operation, you ensure that asset management activities, such as developing your new asset register database, are cost-effective and serve the true needs of your government or organization.

We developed our asset management program from the ground-up, and approached it from an asset ownership, asset inventory, and data collection process that was not driven by specialized software. We built the data sets ourselves and use fairly standard tools like Excel, Access databases, or our corporate GIS database to store the data. This has worked well for us, because we haven't been tied to any particular vendor or software system. It has allowed us to focus on the inventory, raw condition data and the financial information. We are at a state now where we are looking for software, as we want to start making higher-level analytical decisions, using software that will look at the inventory and condition data and make more comprehensive assessments of long-term capital priorities.

Canadian Water Network, Canadian Water and Wastewater Association and Public Sector Digest, p. 368 ⁸

Appendix: Data collection template

Name of the Data Surveyor: _____
Date: [Click or tap to enter a date](#) Time start: _____ end: _____

Asset Category: _____
Asset type: _____

Category ID Number: _____

Asset Type ID Number: _____

Location:
Town/village: _____
Address1: _____
Address 2: _____
Latitude: _____ Longitude: _____

General Data:
Date of Acquisition/Installation/Construction: [Click or tap to enter a date](#)
Acquisition/Installation/Construction Cost: _____ Number of: _____
Size / Dimensions: _____ Capacity: _____
Name of Supplier / Works Contractor: _____
Contact Details: _____
Other Data/Descriptions:

Condition grade - desk assessment:

1. Excellent
2. Good
3. Fair
4. Poor
5. Failing

Need for on-site assessment -> [Click to select](#)

On-site Condition Assessment Grade:

1. As new
2. Excellent
3. Very Good
4. Good
5. Moderate
6. Fair
7. Poor
8. Very Poor
9. Failing
10. At the end of service life

Condition adjustments – by the expert condition assessment: [Click to select](#)

Endnotes

- 1 The Institute of Asset Management, *Subjects 22, 23 and 25: Asset Information, Strategy, Standards and Data Management* (IAM, October 2015).
- 2 GIZ, *Mid Term Report on Integrated Asset Management for Water Utilities in South-Eastern Europe* (2017).
- 3 GIZ, *Municipal Asset Management Toolkit, Guidelines for Local Decision Makers* (Sarajevo, Standing Conference of Towns and Municipalities (SCTM) and Network of Association of Local Authorities of South-East Europe (NALAS), November 2014), pp. 14-15.
- 4 P. Pederson et al., *Critical Infrastructure Interdependency Modeling: A Survey of U.S. and International Research* (Idaho National Laboratory, August 2006), p. 3.
- 5 The Institute of Asset Management, *Asset Management— an anatomy* (IAM, December 2015), p. 60.
- 6 Department of Local Governments and Communities, *Integrated Planning and Reporting Asset Management Guidelines* (Government of Western Australia, September 2016), pp. 20-26.
- 7 The Institute of Asset Management, *Subjects 22, 23 and 25: Asset Information, Strategy, Standards and Data Management* (IAM, October 2015).
- 8 Canadian Water Network, Canadian Water and Wastewater Association and Public Sector Digest, *Leveraging Asset Management Data for Improved Water Infrastructure Planning—A National Report* (Canadian Water Network, 2018), p. 36.

Chapter 6

Improving climate resilience

Key takeaways

- ▶ Climate change threatens local services and the assets they rely on, jeopardizing the quality of life of residents. Local governments are closest to the lives of residents, so they play an essential role in adapting to climate change.
- ▶ Climate risk assessments provide information needed to make climate resilience a part of government operations through asset management practices. Publicly available climate information is often sufficient to conduct a high-level climate risk assessment.
- ▶ The economic value of climate resilience is enormous. By reducing service and asset vulnerability to climate impacts, local and national governments can reduce the costs of disaster events, while acquiring greater value from infrastructure investments.

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The terms in **bold** can be found in the Glossary.

Climate change is felt all around the world—in the form of increasingly frequent, severe or erratic storms, floods, droughts or wildfires and the accompanying loss of life, infrastructure, services, crops and commodities. As the level of government closest to the lives of residents, local governments play an essential role in adapting to climate change. Likewise, local assets are essential in ensuring local resilience.

By some estimates, more than \$6 trillion USD needs to be invested globally in infrastructure every year to sustain growth and meet the basic needs generated by rapid population growth and urbanization.¹ A large percentage of this infrastructure will be owned by local governments. If local governments fail to consider climate change impacts with respect to existing and future assets, we risk not obtaining the full value from these investments due to the early failure of assets.

In this chapter, we will examine climate change concerns, learn how to access and interpret climate data, and outline the process of developing a climate-resilient asset management action plan.

6.1 Benefits and challenges of climate-resilient asset management

Climate-resilient asset management seeks to improve the reliability of service delivery, increase asset life and protect financial outlays. The essential feature of climate-resilient infrastructure is that it is planned, designed, located, built and operated in a way that anticipates and responds to changing climate conditions.

Climate-resilient assets can accommodate or quickly recover from disruptions caused by severe climate events or chronic climate stresses, reducing the likelihood of a damaging or irreversible impact. Building climate resilience is an ongoing process throughout the life

of the asset that works to reduce, but may not fully eliminate, the risk of climate-related disruptions.² It can involve a series of soft interventions, such as changing maintenance schedules, and structural measures, such as raising the height of bridges to account for sea-level rise.

Asset owners—that is, your government—should adopt an ‘adaptive’ philosophy during the design and planning stages to allow for future changes without involving large capital outlays. For example, the foundation and columns of a bridge can be designed to take on future loads should the bridge deck need to be raised at some future date.

Ensuring that assets are climate-resilient offers a range of possible benefits, including:

- *More reliable services:* Climate-resilient assets experience fewer, less severe disruptions when they have their operational threshold exceeded during natural events.
- *Increased asset life:* Building and operating assets to tolerate a changing climate will extend their life cycle.
- *Reduced cost:* Designing assets to endure climate conditions that may arise later on in their life cycle can avoid the need for costly retrofits and reduce the risk that the assets will become prematurely obsolete.
- *Co-benefits:* Some climate-resilient assets, particularly natural infrastructure, can provide the services the community needs along with co-benefits such as urban cooling, biodiversity conservation, recreational opportunities and climate change mitigation.

While there are clear reasons to ensure that the assets communities rely on are prepared to perform under certain climate conditions, there are also several barriers to consider:

- *Lag time between costs and benefits:* Given the long lifespan of most types of local assets, the bulk of the benefits of increased climate resilience will occur beyond the timelines, election terms or budget cycles

that decision-makers typically consider. Meanwhile, the costs are incurred in the short term.

- *Uncertainty*: No one can say for certain what climate change will mean for your community. Estimates are based on numerous factors that can affect how much and in what ways the climate changes. Therefore, climate-resilient assets must be prepared for a range of possible future scenarios, which can be difficult to plan for. At the same time, the costs of preparation should always be weighed against the expected benefits, as over-preparation takes resources away from other needs.
- *Lack of awareness and information*: Awareness of the risks of climate change rests largely on climate data such as detailed local climate projections. These may not be available readily or in a usable format to inform design decisions. Low awareness of the potential benefits of climate-resilient infrastructure may mean that its value is not taken into account in decision-making.^{3 4}
- *Lack of local capacity*: Additional capacity may be needed to support decision-making that takes into account the complexity and uncertainty of climate change. This expertise entails additional costs and may not be available in your region.
- *Policy misalignments*: Existing regulatory decisions and policy frameworks may not support decision-making that takes climate change into account. For example, your local government's procurement policies may require selecting the lowest-cost bid for a project, eliminating the selection of a climate-resilient option in which long-term cost savings offset a large upfront cost.
- *Fear of change*: People accustomed to performing tasks in a certain way are hesitant to change. Overcoming this hesitancy requires a dedicated effort.

Working with communities to develop climate change adaptation plans enables asset owners to address many of the issues that create the

above barriers. Adaptive planning allows several scenarios or pathways to be created and discussed. The outputs from such scenarios can be used to prepare or modify long-term asset management plans and infrastructure resilience strategies.

6.2 Understanding climate change

Climate change refers to changes in the global climate that result from increasing average global temperatures over multiple decades (see Figure 1).

Earth's climate is now changing faster than at any point in human history, almost entirely due to human activity.⁵ By burning fossil fuels such as coal, oil and natural gas to produce energy, as well as reducing global forest cover, we have increased the level of carbon dioxide in the atmosphere by more than 40 per cent since the late nineteenth century. The concentrations of other potent greenhouse gases (GHGs) like methane (CH⁴) and nitrous oxide (N²O) have also risen due to industrial, waste and agricultural activities.

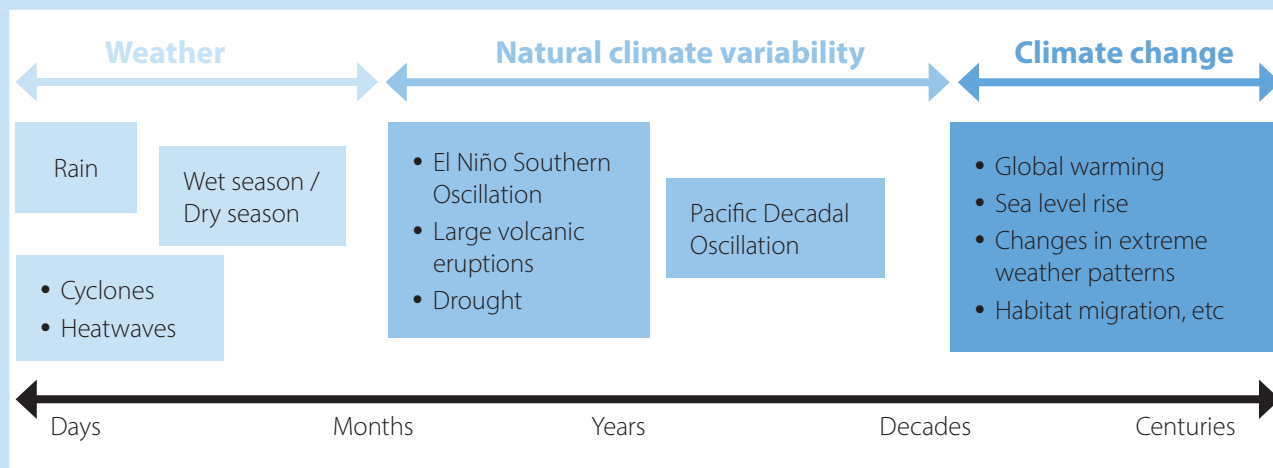
More GHGs in the atmosphere enhance the greenhouse effect. This means that while the same amount of energy from the sun can enter the climate system, less heat can escape into space. As a result, the heat content in the climate system is increasing, raising average global temperatures. Enhancing the greenhouse effect has overwhelmed the natural mechanisms that have ensured stable climate conditions since the last ice age 11,000 years ago.⁶

We refer to these three-decade averages of weather observations as 'Climate Normals'. Seeing how patterns change from these Climate Normals is how we detect climate change.⁷ Shifting precipitation patterns, a greater frequency or intensity of droughts or heat waves, sea level rise and other extreme weather events are examples of

At what point does changing weather become climate change?

Figure 1

Climate change and weather timescales



Adapted from Diffenbaugh and Field, pp. 486-492⁸

Weather is what a particular area experiences each day in the atmosphere, whereas climate describes what the weather is like over a long period of time. Averages of precipitation, temperature, humidity, sunshine, wind and other indicators are used to measure climate, typically over periods of approximately 30 years.

climate change.

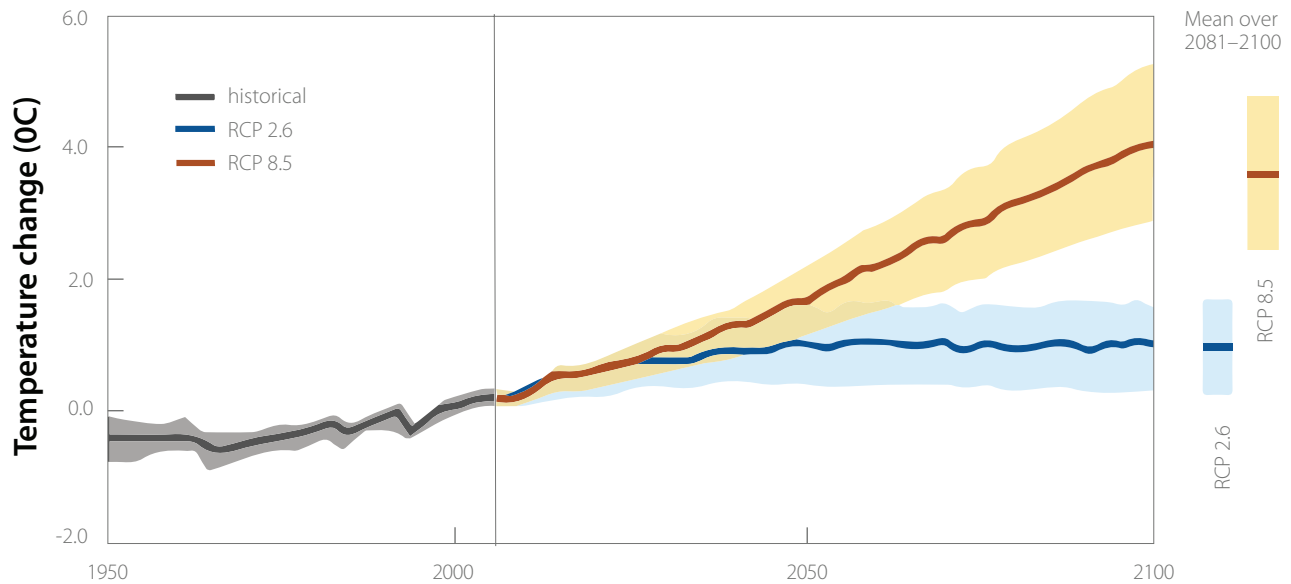
Understanding how the climate will change, and the extreme events it may produce, is a key step towards determining what we have to do to respond to it. **Climate projections** are assessments of the likelihood of future climate conditions, based on how high atmospheric greenhouse gas concentrations become.

Scientists use a set of four standard scenarios when modeling the future climate. These scenarios are called **Representative Concentration Pathways (RCPs)**. RCPs estimate the amount of excess energy retained in the climate system due to how much we have enhanced the greenhouse effect, and the resulting global temperature increases. Scientists primarily look at four RCPs:

1. *RCP 2.6*, which broadly aligns with the goals of the Paris Agreement to keep the increase in global temperature below 1.5°C compared to the late 1800s.
2. *RCP 4.5*, where GHG emissions continue to climb until mid-century, then decline to near-zero by the end of the century.
3. *RCP 6.0*, where GHG emissions peak around 2060 but only marginally decline by the end of the century, resulting in temperature increases below 3°C.
4. *RCP 8.5*, the worst-case scenario where emissions drastically increase throughout the twenty-first century, with warming reaching roughly 3°C–4°C.

Figure 2

RCP global surface warming



Adapted from Stocker, et al., pp. 21-26 ⁹

The difference in temperature or precipitation changes between the RCPs (see Figure 2) can mean substantial differences in impacts. For example, in some jurisdictions the difference between RCP 2.6 and RCP 8.5 can mean a doubling of the amount of rain that falls in extreme events. These changes can occur in a matter of only a few decades.

The difference in the level of effort required to adapt to these different scenarios can be significant, and scientists cannot say which scenario to prepare for.

In the absence of certainty, you need a good understanding of the range of possible impacts. Credible climate data can help your asset management team think through what climate change will mean for your community's levels of services, the risks associated with those services failing, and how much risk you are willing to tolerate. These considerations will help determine your response strategies.

While global climate change has already resulted in a wide range of impacts across every

continent, unique geographic factors will play a major role in determining what it looks like in your community. The steps you take today to build resilience will influence that outlook in the long run.

6.3 Climate and infrastructure

Around the world, temperatures and sea levels are rising. Rainfall patterns are becoming less reliable, while strong storms are releasing more rain in shorter periods. Each of these has potential negative consequences that we must be aware of.

Climate change creates hazards for communities around the world, and their impacts on infrastructure assets are serious and wide-ranging. Meanwhile, communities often overlook and underuse natural infrastructure, which provides some of the most cost-effective ways to manage the impacts of climate change and deliver public services.



6.3.1 Climate change hazards

Climate change is altering the climate hazard profiles of communities on every continent. Climate hazards are climatic events with the

potential to cause harm. Figure 3 includes common hazards that might impact your assets and service delivery. Not all hazards may be applicable to your community.

Figure 3

Climate change hazards

Climate hazards	Description
 <p>Coastal erosion</p>	<p>Climate change is expected to accelerate coastal erosion. Higher seas and stronger wave action speed up the wearing down or carrying away of rocks, soils and sands along coastlines.</p>
 <p>Sea level rise</p>	<p>Global sea levels are rising due to melting glaciers and ice sheets, and ocean water is expanding as it warms. Oceans have risen more than 20 centimeters since 1880, and the rate is accelerating. Globally, 230 million people live below 1 meter above sea level. Most projections of sea level rise estimate an increase of 50–120 centimeters by 2100, but sea levels may rise up to 200 centimeters.</p>
 <p>Storm surge</p>	<p>Storm surge is local coastal flood caused by low-pressure weather systems. Cyclones are one example of this. Storm surges create a serious threat of death by drowning and can cause extensive property loss and erosion damage to coastal habitats. They can also undermine the foundations of assets such as roads, railroads, bridges, buildings and pipelines.</p>
 <p>Flooding</p>	<p>Climate change can worsen both coastal and urban flooding. In addition to sea level rise and storm surge, climate change is increasing the amount of rain in heavy rainfall events, even in areas where total precipitation is declining.</p> <p>Heavy rainfall can cause three types of flooding:</p> <ol style="list-style-type: none"> Flash floods occur in small, steep watersheds and waterways such as mountain valleys and can be caused by brief, intense storms and dam or levee failure. Urban flooding is caused by heavy rains falling on a community's impermeable surfaces, such as roads, parking lots and buildings. The immediate runoff exceeds the system's drainage capacity. River flooding occurs when the capacity of a stream or river is exceeded, causing water to spill over the banks and flood low-lying areas.
 <p>Drought</p>	<p>Some parts of the world are expected to become more drought-prone due to climate change. Melting glaciers threaten the ability of many river systems to meet water demand, while precipitation patterns like seasonal rains may become less reliable. Warmer air temperatures cause more moisture to evaporate from water bodies and soil. When rainfall does come to drought-stricken areas, drier soils are less able to absorb the water. Lack of rainfall depletes groundwater resources, and as the ground sinks, infrastructure may collapse. Drought also affects the availability of energy, as water is needed for hydroelectric power—the world's most used renewable energy source—and to cool fossil fuel-powered electric generators.</p>



Extreme temperatures

Warm days are getting hotter and more frequent, while we are experiencing fewer cold days. By 2050, some parts of the world may be too hot for daytime outdoor work in summer months. Many asset types are affected by extreme heat, including roads, rails and airports. The concentration of dark surfaces like pavement and asphalt in urban areas exacerbates the impact of high temperatures by absorbing solar radiation, heating up then slowly releasing it at night.



Wildfires

Increasing temperatures from climate change are worsening wildfires. More frequent drought and higher evaporation cause fuel to burn, while strong winds spread the fires. Even excessively wet places like the Amazon rainforest are susceptible to wildfire. As the atmosphere becomes warmer, many areas are seeing an increase in the number of lightning strikes, which can ignite wildfires.



Severe weather

Warmer air temperatures are leading to more frequent and intense storms, dropping more rain in shorter periods of time. Adding to the flood risk, strong storms produce high winds that can damage trees, buildings, signs and utility lines. Severe storms can also produce dangerous hailstorms, which can quickly decimate an entire harvest, leave dents in vehicles and badly damage buildings.



Landslides

Some areas may become more prone to landslides as a result of climate change. Warmer temperatures and more intense rainstorms can cause landslides in mountainous environments. Drought or wildfire followed by heavy rains can destabilize slopes.

6.3.2 The impacts of climate change on infrastructure

The hazards climate change gives rise to can greatly impact the effectiveness and lifespan of assets, which can result in inconvenient, costly or even dangerous service failures.

Past examples of severe weather provide indications of how severe the impact of climate change events can be in the absence of resilience-building activities. For instance:

- In 2011, flooding in eastern China caused major damage to 28 rail connections, 21,961 roads and 49 airports as well as power disruptions to millions of users.
- In 2010, 17 consecutive hours of heavy rainfall caused severe flooding that left Panama City without access to drinking water and prompted the closure of Panama's Inter-Oceanic Canal for only the third time in its 96 years of operation.

- Intensified drought can critically imperil drinking water supplies, as in São Paulo in 2015 and Cape Town between 2015 and 2018.¹⁰

The economic implications can be substantial. For example, it is estimated that a major disaster in Indonesia could cost the economy up to 0.3 per cent of its GDP.¹¹

Refer to Appendix A for a more detailed look at how the climate hazards described above might affect specific asset groupings, such as buildings or waste management

6.3.3 Natural infrastructure

While communities around the world are looking for ways to manage the impacts of climate change, it is becoming increasingly apparent that local governments already own some of the most cost-effective resources available. Aspects of the natural environment can serve

as efficient resources to deliver services and bolster resilience.

Natural infrastructure refers to existing, restored, enhanced or simulated combinations of land, water and vegetation. Different types of natural infrastructure are noted in Figure 4. The ecosystem services provided by natural infrastructure lead to outcomes that would otherwise need to be replicated with engineered infrastructure.

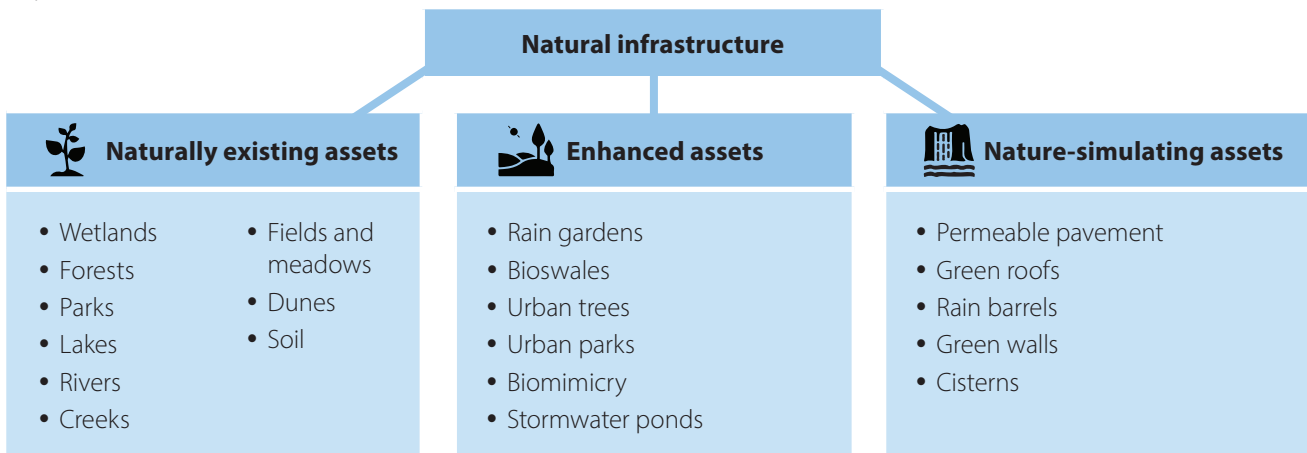
Water purification, coastal buffering, extreme heat mitigation, and mitigation of floods, erosion and landslides are all services that natural infrastructure can provide.¹³ For instance,

coastal ecosystems such as dunes and salt marshes provide a natural buffer to cope with severe storm events and can offer important spaces for recreational activities such as tourism and fishing. Wetlands provide stormwater management and flood mitigation services that would have to be replaced by an engineered alternative if the wetlands were lost.

Incorporating nature into infrastructure asset management has numerous benefits (see Figure 5). In addition to climate resilience, it also improves physical and psychological health and economic gains.¹⁴ For example, green spaces integrated into urban planning:¹⁵

Figure 4

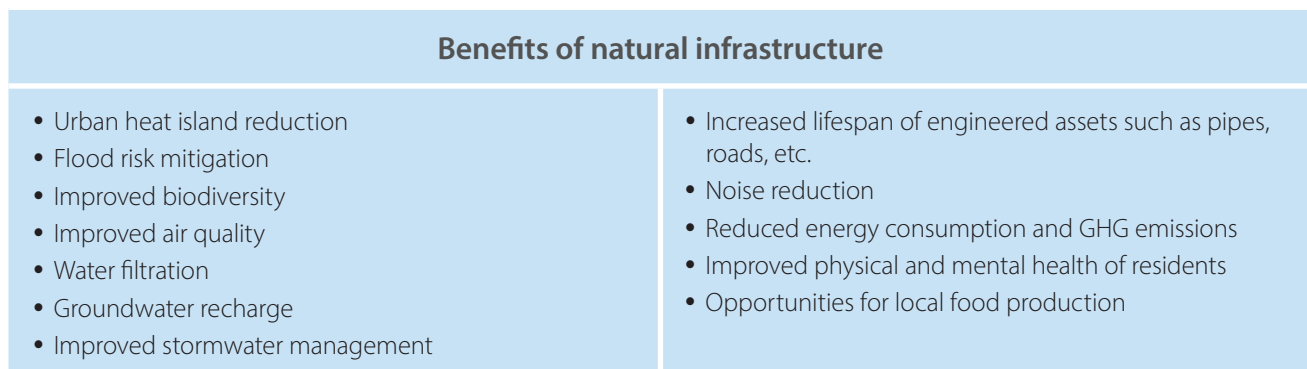
Types of natural infrastructure



Adapted from Municipal Natural Assets Initiative, pp. 1-3¹²

Figure 5

Benefits of natural infrastructure



Adapted from Lilauwala and Gubert, pp. 18-22.¹⁷

- Mitigate and moderate the effects of climate change, keeping spaces cool, which in turn saves energy and the costs of cooling systems in cities.
- Are associated with health benefits such as improved psychological outcomes.
- Help increase revenue by raising property and neighborhood values, with significant effects on local property taxes. Some municipalities have seen property values rise by 5 to 20 per cent.¹⁶

Recognizing the value of natural infrastructure and managing it effectively can allow municipalities to increase the quality and resilience of services at lower costs. While engineered assets must be replaced once their useful lifespan ends, natural infrastructure—if managed correctly—can provide services indefinitely, along with benefits not available from engineered assets. Natural infrastructure can even become more valuable and effective over time, with monitoring, maintenance and restoration.

Natural infrastructure and more traditional engineering approaches are not mutually exclusive. Combining the two in a strategic manner can yield significant benefits. In the Philippines, for example, Conservation International is both restoring mangroves and building breakwaters to protect the population from potentially devastating storm surges.¹⁸

Preserving natural ecosystems is much less expensive than restoring or replacing them, so infrastructure planners benefit by considering

natural infrastructure as early as possible in planning processes.¹⁹ In general, the most cost-effective way to prioritize use of natural infrastructure and conventional approaches to manage climate events is to:



Conserve what you have,
restore what you lose, and
build what you must.

Adapted from Moudrak et al., p. 420

Many countries have abundant natural resources, but the value of natural infrastructure is generally unaccounted for or undervalued in asset management practices. Many local governments are under-resourced when it comes to the expertise, fiscal capacity and political willpower needed to manage them sustainably. Meanwhile, with urbanization, growing energy and other demands are driving more resource extraction. By not accounting for the services that natural infrastructure provides, your community may be committing to higher levels of investment in assets to meet equivalent service targets.²¹

Governments need to act in ways that serve the environment and the communities that live in it for generations to come. Investing in natural infrastructure both preserves resources and sustainably meets ever-growing demands for them (see box).

Tapping into natural wealth brings more than cost savings

Investing in natural infrastructure can be a way to deliver services at a lower cost than engineered infrastructure solutions—and the benefits do not stop there.

For example, the City of New York saved an estimated \$6.5–8.5 billion USD on the cost of supplying

drinking water by electing to spend \$1.5 billion USD on protecting the source watershed instead of constructing a water treatment plant.²² Co-benefits included carbon sequestration provided by the forested watershed, maintaining biodiversity in the

watershed, and opportunities for recreational use, with positive impacts on human health and well-being and on the local economy.

In Vietnam, the Red Cross spent \$1.1 million USD on restoring mangrove habitats, saving millions of dollars per year in dyke maintenance costs, increasing the safety and climate resilience of local communities and their infrastructure, and providing local livelihoods for thousands of families through fisheries that thrive in the mangrove habitat.²³

Furthermore, the efficient sharing of revenues tied to natural assets has important societal benefits, particularly in regions prone to violent conflict. While there is no one-size-fits-all revenue-sharing system, a fair and efficient model will involve choosing

appropriate revenue streams and fiscal tools, smoothing expenditures, implementing the formula as law and staying accountable through independent oversight.²⁴

For example, the central government can collect locally generated revenues and then transfer them back to the area of extraction, as seen in Bolivia, Brazil, Nigeria, Ethiopia and the United States. Other governments, as in Ecuador, Mexico and Mongolia, have used indicators such as population and poverty levels to allocate revenue to each local government irrespective of where the natural resources are extracted.

A portion of this box was provided by Marco Kamiya from UN-Habitat for the purposes of this handbook. Adapted with the author's permission.

6.4 Focus on what is important

The potential implications of climate change on asset management will be wide-ranging and complex. Even in well-resourced cities, it is not possible to quickly adapt a community's asset portfolio to become completely climate resilient.

It will require gradual, systemic change to make your community climate-resilient. To ensure that your response to climate change risks makes the most of your available resources, you will need to prioritize the most critical services and assets and undertake a systematic climate risk assessment to identify the most serious risks posed by climate change.

The first step is to consider the services your local government provides, identify which ones residents most heavily depend on, and from there pinpoint the assets that are most critical to delivering those services. These critical assets will form an important basis of your climate risk assessment and response strategies.

When dealing with disruptions and emergencies, not all the services provided by your local

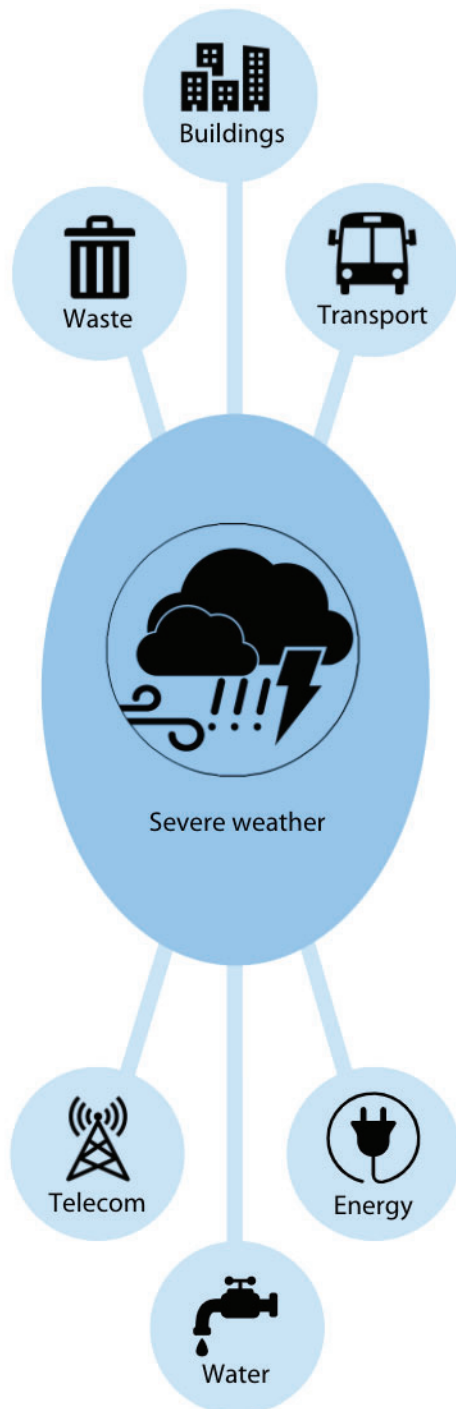
government are equally important. While the disruption of some may simply be a mild inconvenience, the disruption of others can result in a very high degree of harm to the health, safety, security or economic well-being of residents.

Similarly, when it comes to ensuring that essential services continue to be delivered, some assets are more important than others. The absence or malfunction of some individual components of an integrated asset system can pose particularly large risks to service delivery. At the same time, it is important to remember that assets rely on a system of interdependencies to operate. When identifying your critical assets, consider the resilience of individual assets in the context of the system as a whole. This approach is often referred to as a systems approach to infrastructure planning.

Chapters 2 and 4 discussed how to identify critical assets. The most effective way to identify critical assets is to think about the consequences of those assets not being available. Consider the following hypothetical scenarios. Could something similar happen in your community?

Figure 6:

Climate hazards affect government operations and assets



Scenario 1: Your community relies on a single landfill to deposit collected waste. It is located several kilometers outside the local government’s boundaries, in an area surrounded by forests. This year has been particularly hot and dry, and wildfires are burning in the vicinity of the landfill. It has become unsafe to unload garbage trucks at the landfill, and waste receptacles are beginning to overflow.

Scenario 2: Your coastal community relies on a large wastewater treatment plant to treat raw sewage. The plant is roughly 1.5 meters above sea level but already experiences occasional interruptions or damage when storms occur during high tide. Sea level in your region is expected to increase by at least 30 centimeters in the coming decades. This change significantly increases the risk of substantial damage to the plant and imperils your community’s ability to treat wastewater.

Scenario 3: Your community relies on computers for most of its administrative functions, including property tax payments, licensing and asset management. These are all housed at City Hall. The server room, which stores the data for the internal network, is located in the basement. The last storm dropped a month’s worth of rain in a single day, causing extensive flooding. The server room was completely inundated, destroying the data.

Typically, consequences are assessed against risk criteria such as public safety, service interruption, financial impact and environmental harm. As you begin, assess the consequences of failure based on the risk criteria *with the most serious potential impact* for that asset. For instance, if a fuel storage tank at the port were to fail, the highest risk may be environmental harm. On the other hand, if floodwaters submerge tram or light rail tracks, the main risk would be to service delivery.

Adapted from C40, p. 40 ²⁵

6.5 Climate risk assessments

Climate risk assessments are a way to identify potential hazards from climate-related projections and events. The results are used to develop strategies to avoid or manage risks.

What is a risk assessment?

Risk assessments are the overall process of risk identification, analysis and evaluation. The ISO 31000 Risk Management Standard provides internationally recognized guidelines on managing risks faced by organizations.²⁶ These guidelines can be adapted to particular risk categories. The standard suggests that any risk assessment should be conducted systematically, iteratively and collaboratively, drawing on the knowledge and views of stakeholders. These guidelines form the basis of the following climate risk assessment process. While the following is explicitly dedicated to assessing climate risks, the approach can be applied to other risks as well.

The climate risk assessment process involves a number of distinct steps, shown in Figure 7. The first three help you select the most serious climate risks for in-depth analysis:

1. **Hazard identification** uses climate projections and consideration of past disaster impacts to identify the specific climate hazards that are likely to affect your community.
2. **Climate impact statements** articulate how each hazard will translate into an impact on your community
3. A **vulnerability assessment** determines which climate impacts have the potential to cause a major disruption to the community.
4. Following this screening exercise, any

climate impact statements deemed serious are subjected to a more comprehensive **risk assessment**, where consequences are measured against five criteria to determine severity.

5. The resulting risk score is subject to a **strategic evaluation** that balances identified risks with community objectives to determine which risks warrant risk responses in the form of adaptation strategies.

Risk management requires trade-offs between risk minimization and cost. It becomes more expensive and increasingly challenging to prepare for events that present only modest consequences or are unlikely to occur. The costs of protection must be weighed against the consequences of damage or disruption. With local budgets stretched among many competing priorities, it is important to prioritize spending where it will provide the most significant benefit.

Climate change and severe weather impacts should be considered as part of a portfolio risk management approach balances the risks they impose with other risks facing your community, including health emergencies like COVID-19 and geophysical hazards such as earthquakes, tsunamis or volcanic eruptions. This is the most effective way to ensure that resources are being allocated in a way that most accurately reflects your community's priorities.

6.5.1 Hazard identification

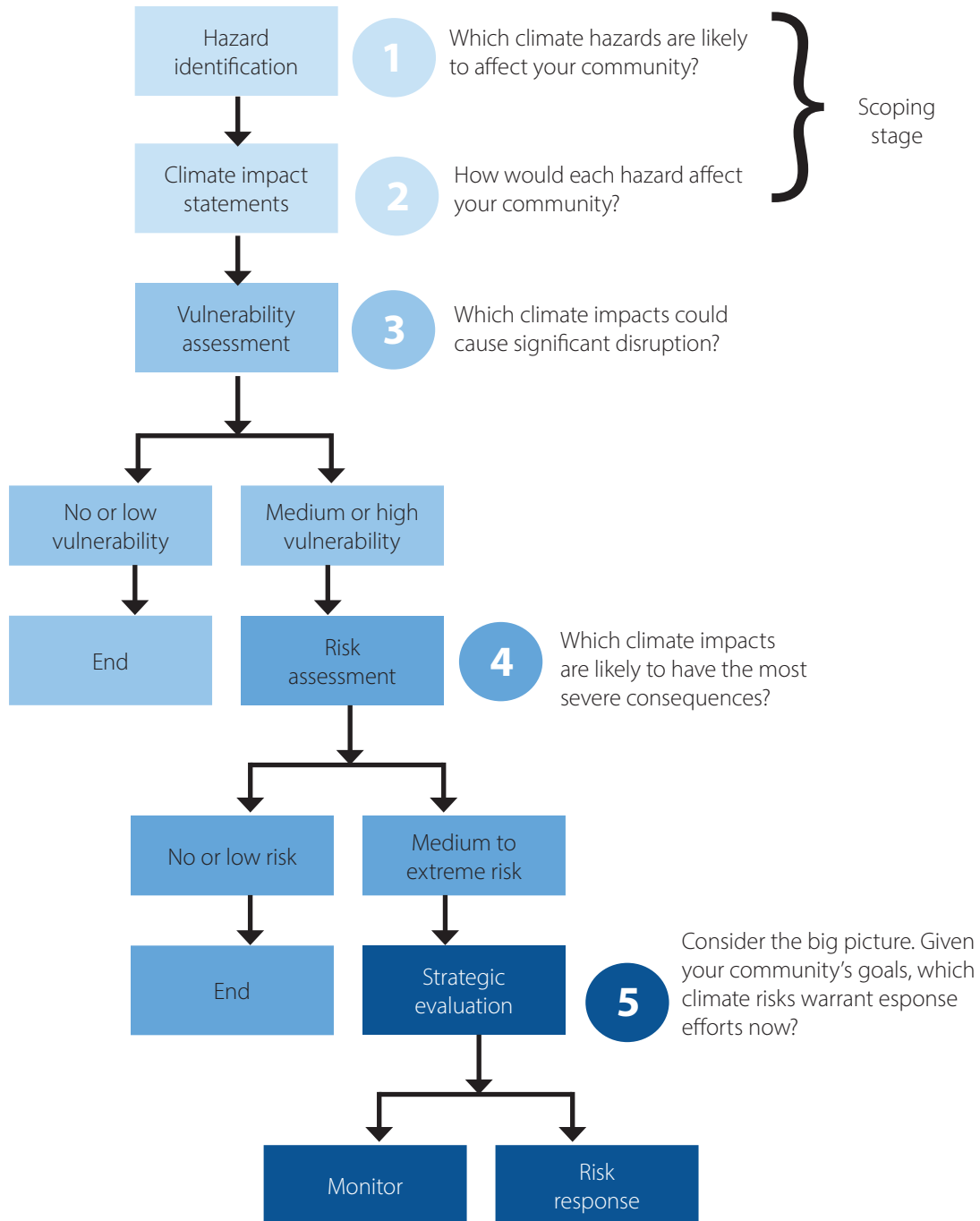
To determine what kinds of climate hazards you need to plan for, consider:

1. How past climate hazards have affected your community
2. How different climate scenarios are projected to affect your community

While the future promises to be different from the past, previous experiences can provide a good indication of which hazards you are most exposed to.

Figure 7

Climate risk assessment process



Adapted from British Standards Institution, pp. 8-14.²⁷

Climate projections will help you assess future hazards. Your regional or national government, or a local university, may have climate projections readily available for use, so it is always worth checking with them first. Otherwise, Figure 8 offers publicly available resources you can use to better plan for the future climate outlook of your local area. While it can be challenging and confusing to have this information spread across many platforms, it is especially difficult to interpret raw climate model data without the right training. Taking advantage of the work other organizations have done to translate the complex information into easy-to-understand platforms will make your job much easier.

6.5.2 Climate impact statements

Assessing climate risks requires considering both the likelihood of climate hazards and



their consequences. To identify the consequences of particular hazards, you will need to define the relationship between your community’s climate hazards and the services you provide. While some hazards like increasing annual temperatures are almost certain to occur, it is impossible to understand whether that hazard poses a serious risk to your community without the added context of how it will impact assets and services.

Climate impact statements articulate how

Figure 8

Sources of climate change projections

Organization	Climate data
USAID	Country climate projections and risk profiles
US National Oceanic and Atmospheric Administration (NOAA) Global Data Explorer	Ocean temperature, air temperature and annual precipitation change for each RCP
Carbon Brief	Global historical and future temperature rise for each RCP
Carbon Brief	Interactive map that assesses how extreme weather in your city may change
Climate Central	Interactive map overlay of sea level rise corresponding with global warming of 2°C and 4°C
The Crowther Lab	Pairs your city with another, warmer global city to approximate the climate you can expect
Intergovernmental Panel on Climate Change	Technical assessments of climate science, including chapters on climate projections
US National Aeronautics and Space Administration (NASA) Centre for Climate Simulation	Raw climate model data for advanced practitioners

Exercise 1

a. Think back over the past 10 years. Which climate hazards affected your community during major events?

Hazard type	Year	Consequences for your community

b. Refer to Figure 8 to select projection resources and assess climate indices for your community.

Question	Answer
What would your annual temperature look like in the 2050s under RCP 4.5?	
What would your annual temperature look like in the 2090s under RCP 8.5?	
Check out the Crowther Lab tool from the previous table. Which local government is provided as an indicator of what yours may look like by 2050?	
What other potential climate hazards (e.g. increased rainfall or coastal erosion) are likely to affect your community?	

certain climate hazards will affect public health, service delivery, local assets, community finances or the environment. To draft them (see Exercise 2a), consider the climate change hazards affecting different assets (as identified in Appendix A), as well as the services your local government provides. Examples of climate impact statements are provided in Exercise 2a.

Use the following screening questions to assess and refine your impact statements:

1. Will the climate hazard threaten public safety (e.g. causing loss of life, long-term health consequences)?
2. Will the climate hazard impact service delivery?
3. Will the climate hazard result in financial consequences?
4. Is the climate hazard likely to cause environmental harm?
5. Is the climate hazard likely to damage built assets?^{28 29}

A hazard does not have to meet each of these criteria to be included. Its impact on service delivery may take a number of different forms (as with the severe weather examples in Exercise 2a).

Once you have developed your impact statements, determine which service area(s) are

relevant to each consequence — either are exposed to or have a role in managing their impacts (see Exercise 2b). This will help identify vulnerabilities and attribute ownership of response strategies.

For a simple approach to this exercise, you can focus on critical assets, essential services and supporting asset systems. You can also include areas of your community that are known to be vulnerable to existing climate events. If you choose this approach, you can always repeat the process later to include additional services.

6.5.3 Vulnerability assessment


Next, you will determine how vulnerable your services are to each of the climate impacts. While climate hazards drive the need for climate risk management, vulnerability and capacity are major determinants of actual losses from a climate hazard event occurring.



Vulnerability is a function of the exposure and adaptive capacity of a particular service or asset to suffer harm from hazard events.

Exposure refers to the degree to which a given system may be directly or indirectly affected by changes to climatic conditions (e.g. average summer temperature) or a specific climate change impact (e.g. a heatwave). For instance, if an asset were not located in potentially dangerous settings, the exposure

Exercise 2

- a. Review each of the climate hazards identified as relevant to your community. Produce three impact statements, similar to the examples provided, that consider the implications for service delivery. For ease of tracking, place each statement in a separate row, numbering in the right-most column.

Climate hazard	Impact statement	Number
 Severe weather	<i>Riverine or overland flooding, resulting in disruption or damage to city-owned assets (e.g. buildings, roads, underground infrastructure)</i>	1

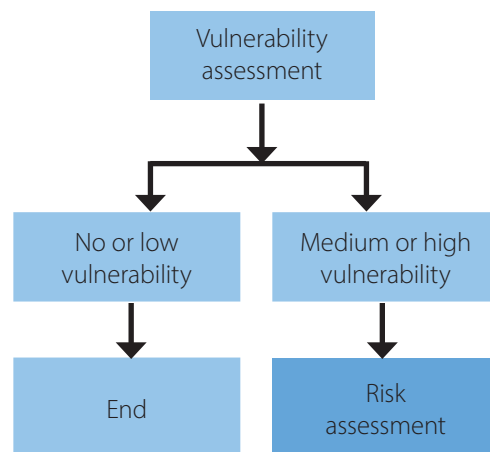
	Severe weather	<i>Riverine or overland flooding, resulting in increased public emergencies and evacuations</i>	2
	Extreme temperatures	<i>Increased frequency and duration of hot days, resulting in increased damage to roads, culverts, sidewalks, trails, parking lots and outdoor recreation facilities</i>	3

- b. List the impact statements you have developed with their corresponding climate hazard(s). Now, check off which service areas are relevant to the associated consequences in each statement. You will have a simple yet comprehensive table that allows you to visualize how the climate hazards in your community are spread across different local service areas.

Impact statement #	Transportation	Sewer	Drainage	Water	Marine infrastructure	Public buildings	Public housing	Street lighting	Hospitals/clinics	Emergency services	Waste	Natural infrastructure, land parks
1	X	X	X	X		X	X		X	X		X
3	X		X									X

associated with that climate hazard would be very low.

Exposure is a necessary, but not sufficient, determinant of the potential for harm. It is possible to be highly exposed but not highly vulnerable to a hazard. For instance, the owners of a building located in a floodplain could take precautions against flooding by keeping critical or valuable components such as electrical equipment out of at-risk areas. The degree to which something can be exposed but not vulnerable is determined by its adaptive capacity.³⁰



Adaptive capacity is a measure of a system's existing resilience to shocks or changes. It assesses how capable an asset, system or service is of accommodating stresses before adaptive interventions are required to maintain the service level you currently provide.

For example, if your drinking water is stably sourced from a large, fast-flowing river, its adaptive capacity to extreme heat-related hazards such as algae formation or decreased availability would be high. Conversely, if the drainage system of an area is overwhelmed by frequent storm events, its adaptive capacity to extreme weather intensification would be very low.

As factors of a vulnerability assessment, exposure and adaptive capacity have opposite influences.

- A high degree of exposure with low adaptive capacity would translate to high vulnerability.
- A high adaptive capacity score means that the system is capable of absorbing the effects of a high exposure to climate hazards, resulting in a lower net vulnerability.

The last exercise tied your climate hazards and impact statements to specific service areas, which have different vulnerability levels depending on the asset system as a whole. Determining which services are sufficiently vulnerable to proceed with a risk



Photo © Linda Newton

assessment is a collaborative process that involves evaluating their exposure and adaptive capacity.

Consider the following scoping questions when assessing vulnerability for each service area:

1. Do current climatic events cause disruptions in services? Are disruptions geographically dependent or clustered?
2. What existing pressures are exerting stress on the ability to deliver services?
3. Will service disruptions induce the need for additional services (e.g. cooling stations or areas, desalinization plans due to depleted drinking water supply)?
4. Are services flexible enough to accommodate changing resource, staffing or policy demands?
5. Are climate-related impacts factored into decision-making today? How?
6. Are there any risk management strategies in place to protect previously affected systems from future occurrence of that hazard?
7. To what extent can other assets fill gaps produced by the failure of one asset within the system? Are there situations where asset failures have no implications and point to redundancies?
8. How reliant is the service on the effective delivery of other service areas?

As you determine the exposure and adaptive capacity of service areas to projected climate impacts, placing them on a vulnerability matrix will help determine which impacts are of sufficient vulnerability to proceed through the risk assessment process. In general:

- Service areas with high exposure and low adaptive capacity are *highly* vulnerable.
- Service areas with low exposure and high adaptive capacity have *low* vulnerability.
- Service areas with high exposure and high

Figure 9

Determination of exposure and adaptive capacity

(a) Exposure analysis

If the climate impact were to occur, would it affect service delivery?				
1 – No impact on service delivery	2 – Sporadic or minimal decline in service delivery	3 – Service delivery is likely to noticeably decline	4 – Reductions in the capacity to deliver services	5 – Ability to deliver services is severely compromised

(b) Adaptive capacity analysis

Can the service area respond to the climate impact with minimal cost, resources and disruption?				
1 – Response will require very high costs (\$\$\$\$\$), new skills and significant staff interventions.	2 – Response will require high costs (\$\$\$\$), new skills and staff interventions.	3 – Response will require some costs (\$\$\$), staff interventions and possible new skills.	4 – Response will require slight costs (\$\$) and staff interventions. Existing skill base likely sufficient.	5 – Response will require little to no cost (\$) or staff intervention.

Adapted from ICLEI, pp. 16–19³¹

Exercise 3

Use the scales for exposure and adaptive capacity in Figure 9 to conduct a vulnerability assessment of each climate impact you identified and what it will mean for the related service areas, in terms of service delivery (exposure) as well as necessary costs, new skills and staff interventions (adaptive capacity).

Fill in the following table with the values for exposure and adaptive capacity for each impact statement.

Impact statement #	Exposure (1-5) and implications	Adaptive capacity (1-5) and implications

adaptive capacity are *moderately* vulnerable. It is important to note that vulnerability is not the same as risk, where a score is determined by multiplying the determining factors together. A higher exposure score is equivalent to higher vulnerability, while a higher adaptive capacity score is equivalent to lower vulnerability. Therefore, multiplying these scores together is not a useful measurement.

Instead, determine vulnerability based on the placement of each impact statement on the vulnerability matrix in Figure 10. With more than half of cells allocated to 'low vulnerability' ratings, the matrix sets a high threshold for impacts to be included in the risk assessment phase. If this distribution of low, moderate and

high vulnerability cells is too high a standard, you can adjust the number of cells for each category. How would you adjust the distribution of cells on the matrix? See Exercise 4.

6.5.4 Risk assessment

Climate impacts that rank as either moderate or high vulnerability for at least one service area can be carried forward to the risk assessment process. Through this process, you analyze the likelihood and consequences of the impacts.

Analysis techniques can be qualitative, quantitative or a combination of the two, depending on the circumstances and intended use.³² Quantitative analysis tends to provide more robust information to assess the capacity of an asset system to accommodate a greater load. However, accessing this information may require support from an external engineering firm and thus additional costs. A qualitative assessment based on the expertise available within your organization is often sufficient.

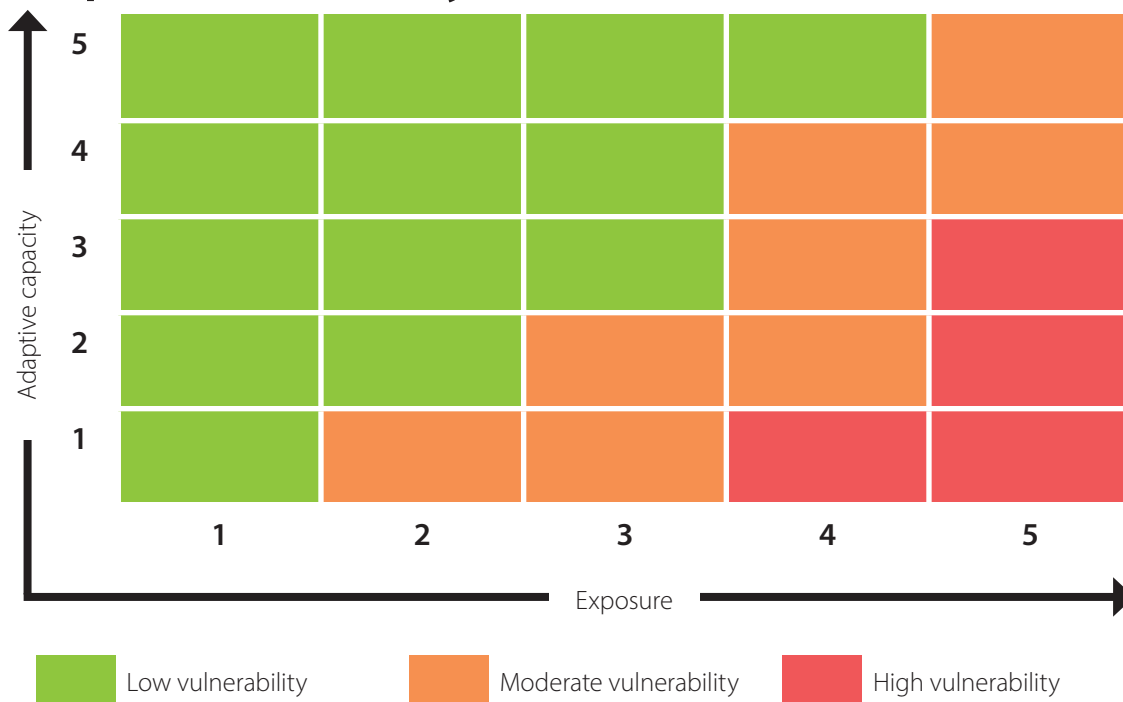
Risk ≠ Vulnerability

Risk = likelihood x consequence

Vulnerability = nuanced function of exposure and adaptive capacity

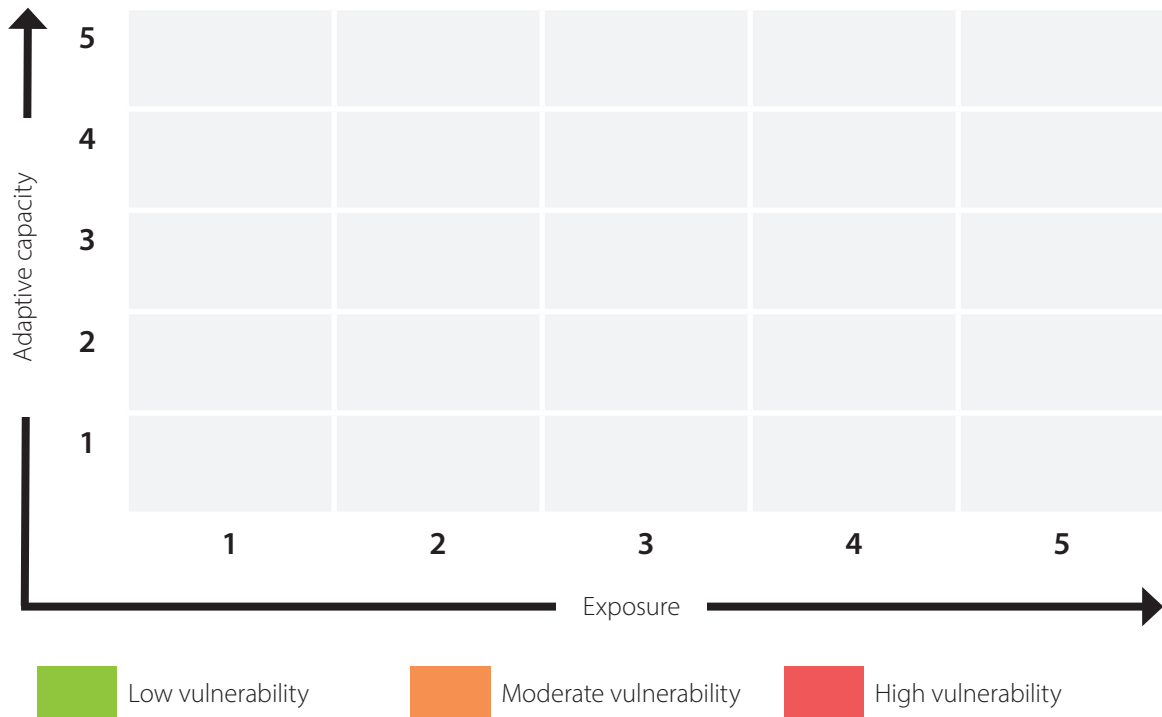
Figure 10

Sample vulnerability matrix



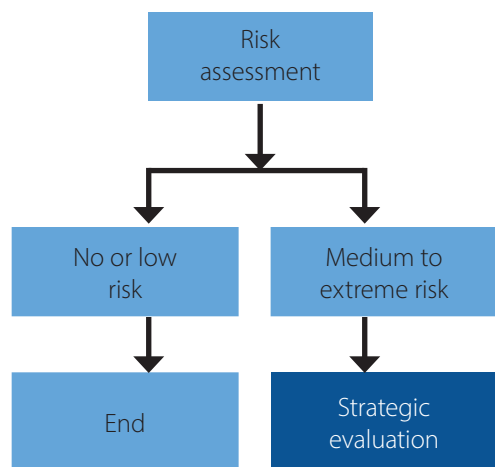
Exercise 4

- a. Shade in the blank vulnerability matrix below according to your own thresholds for low, moderate and high vulnerability.



- b. Based on the vulnerability matrix you came up with and the values for exposure and adaptive capacity you assigned to each impact statement in Exercise 3, fill in the following table indicating the vulnerability level for each statement.

Impact statement	Exposure (1-5)	Adaptive capacity (1-5)	Vulnerability level (low/medium/high)



For this stage, it is useful to reflect on the climate data you previously gathered and the uncertainty in projections. It is impossible to know today which emissions scenario is most likely to occur, but you can assess the likelihood of hazard occurrence while respecting that uncertainty.

An increase in the number of very warm days under RCP 2.6, for instance, is a likely minimum that you will need to prepare for. Likewise, pay attention to where the different scenarios show the same hazard. If increases or decreases in precipitation are evident in each RCP, these are deemed likely regardless of which scenario proves most accurate.

Unlike many forms of risk, the impacts of climate change are anticipated to intensify over the lifespan of the assets you are planning today. The intensification only makes typical

asset risks due to age and deterioration worse.

Likelihood measurements should consider timelines for both acute events that exert sudden stress and chronic ones that exert constant stress on the asset or service system. Some impacts, such as sea level rise, are chronic and happen slowly (but steadily) over time, so that you can anticipate how long it will take to exceed the capacity of an asset like a sea wall. A severe storm, by contrast, can happen at any time. Figure 11 provides a scale you can use to measure likelihood for acute and chronic events.

The consequences of an impact can vary based on what is affected. As with the scoping questions provided to develop your impacts statements, consider what the impact will mean for health and safety, service interruption, financial impact and environmental harm. Additional criteria, such as resident displacement or asset damage, can be added. It is important to remember that risk assessments involve estimating what will happen if you fail to ensure proper operation and maintenance.

Risk should be evaluated based on specific evaluation factors that reflect outcomes local governments are particularly eager to avoid. Considerations associated with each **risk evaluation factor** include:

- Public safety: health and safety of members of the public, typically measured by serious

Figure 11

Likelihood analysis

Type of event / Likelihood	1 – Very low	2 – Low	3 – Moderate	4 – High	5 – Very high
Acute event	Not likely to occur in period	Likely to occur once between 30–50 years	Likely to occur once between 10–30 years	Likely to occur at least once per decade	Likely to occur once or more annually
Chronic event	Not likely to become critical in period	Likely to become critical in 30–50 years	Likely to become critical in 10–30 years	Likely to become critical within a decade	Will become critical within next 5 years

Exercise 5

Score each impact statement against one of the following two likelihood ranges in Figure 11, depending on whether they are acute or chronic events.

Impact statement	Type of event (Acute/Chronic)	Likelihood score

injury and loss of life.

- **Service interruption:** the consequences associated with and length of a service interruption, which may influence quality of life, economic productivity, economic activity and recreation potential.
- **Financial implications:** the cost to the local government, the local economy and

residents.

- **Environmental harm:** loss or degradation of environmental amenity or ecosystem services.
- **Asset damage:** physical damage done to local assets, which may influence factors such as the speed of recovery of service delivery and financial implications. Wherever possible, asset condition data should inform this factor.

How much risk can you live with?

A local government's risk appetite and risk tolerance are major influences on how it will respond.

Risk appetite is the level of risk that an organization is willing to accept before any action is deemed necessary to reduce the risk.

Risk tolerance is the degree of residual risk an organization is comfortable with following risk treatment.

The distinction lies in whether or not the risk has been treated yet. The sustainability of essential services and critical assets in the short term (in response to a climate hazard event that could occur today) and the long term (in response to climate changes over time) should inform your risk appetite and tolerance.

Figure 12 gives an example of how to analyze consequence along these five factors. You may want to decide on particular thresholds for the criteria in your risk assessment, depending on your community's economic capacity, recovery capabilities and other characteristics.

Once you have scored each impact statement along each risk evaluation factor, you have two options to calculate the overall consequence score.

1. Use the highest consequence score assessed among all factors criteria (with the understanding that the impact, if it were to occur, would affect the other factors as well, but to lesser degrees).
2. Take an average of consequence scores.

Figure 12

Consequence analysis example

Impact statement: Riverine or overland flooding, resulting in disruption or damage to city-owned assets (e.g. buildings, roads, underground infrastructure)

Degree / Factor	Risk evaluation factor				
	Public safety	Environmental harm	Service interruption	Financial impact	Asset damage
1 – Very low					X
2 – Low	X		X		
3 – Moderate				X	
4 – High		X			
5 – Very high					

The choice of which scoring method to use is one your asset management team will have to make as the scores can be quite different. Method 1 may over-prioritize some risks by emphasizing abnormally exposed criteria. Method 2 may underemphasize some risks by offsetting very exposed risk criteria against those that are unexposed.

Taking the example above, the overall consequence scores could be calculated as follows:

1. Consequence = 4 (the highest degree marked for any of the five factors)
2. Consequence = $(2+4+2+3+1)/5 = 2.4$

Next, determine the **risk score** for each climate impact statement by multiplying the likelihood and consequence scores together. Having this risk score will help you prioritize which climate impact statements receive the most immediate response strategies.

Understanding which impact statements represent extreme, high, moderate and low risks is a critical prioritization procedure for developing effective risk response plans. Higher levels of risk correspond to a greater urgency to act and, broadly speaking, a higher priority for local action.

- Low risks are not of immediate concern to the organization but should be monitored and re-analyzed in successive risk assessment processes to ensure that they do not become greater concerns.
- Extreme, high and moderate risks must be ranked and prioritized, with unacceptable risks identified. In addition to the risk associated with each impact statement, you can consider other factors such as risk appetite and tolerance.

An interpretation of the risk levels is depicted in Figure 13.

As in the vulnerability assessment process, you can assess the risk associated with each climate impact by mapping it out on a matrix, according to its consequence and likelihood. The figure in Exercise 7 provides a template risk evaluation matrix with a balanced risk appetite. This means that about as many cells of the matrix are allocated to high risks as low. A community more comfortable with risk may increase the number of green cells, whereas one that wants to take an aggressive approach to minimizing risk may increase the number of orange and red cells.

Exercise 6

a. Score each of your impact statements against the consequence criteria shown in Figure 12. For impact statements that affect more than one service area, be sure that the scoring incorporates the perspectives of each service area.

Note that a consequence need not affect all criteria to be considered significant.

Repeat this table for each impact statement

Impact statement:

Degree / Factor	Risk evaluation factor				
	Public safety	Environmental harm	Service interruption	Financial impact	Asset damage
1 – Very low					
2 – Low					
3 – Moderate					
4 – High					
5 – Very high					

Impact statement:

Impact statement:

b. Next, score the overall consequence of each impact statement – taking into account all risk evaluation factors together. Compile the consequence scores for all impact statements in the following table.

Method (maximum/average):

Impact statement	Consequence score

Figure 13

Risk level interpretations

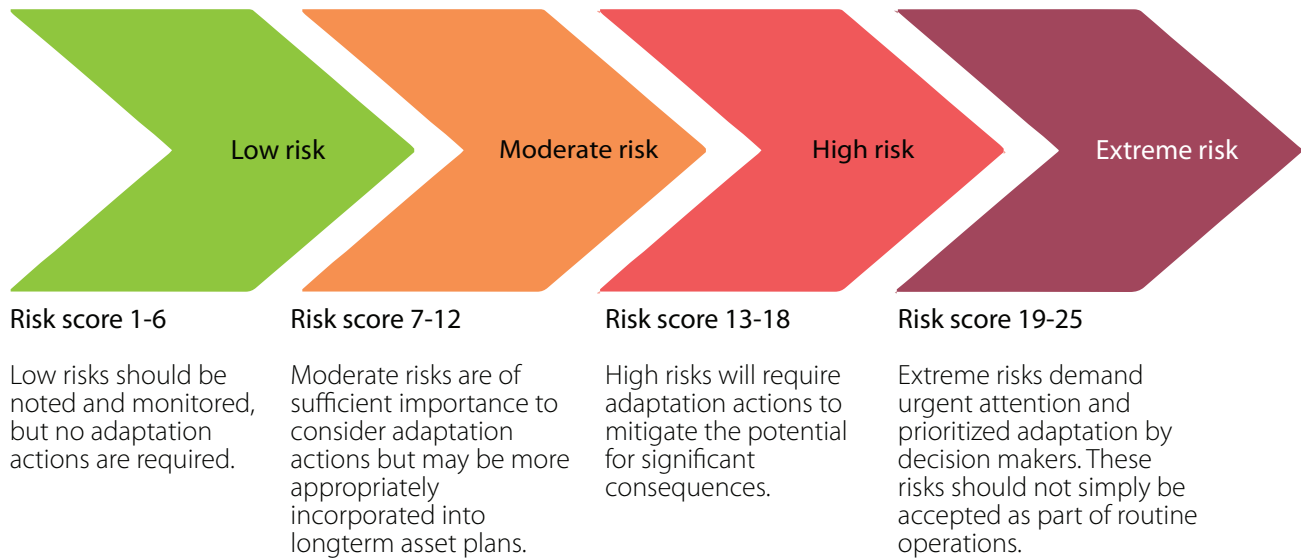


Figure 14

Risk level examples (Nepal)

Risk level	Example
Extreme	Intensification of rainfall events (likelihood 3–5) will lead to more frequent instances of flash flooding in mountain valleys, causing damage to assets and increasing loss of life (consequence 4–5).
High	Intensification of rainfall events will increase slope destabilization causing more landslides (likelihood 3–4), threatening assets and people, and partially damming valley streams (consequence 4).
Moderate	Higher temperatures will increase the frequency and intensity of wildfire events (likelihood 3), damaging local land in proximity to the city (consequence 3)
Low	More frequent drought conditions (likelihood 3) will reduce the quality of recreation fields (consequence 1).

Exercise 7

a. Compile the risk scores for all impact statements in the following table.

Impact statement	Likelihood score	Consequence score	Risk score

- b. Plot each climate impact statement on the figure below. Are there groupings of risks associated with particular climate hazards?

Sample risk evaluation matrix

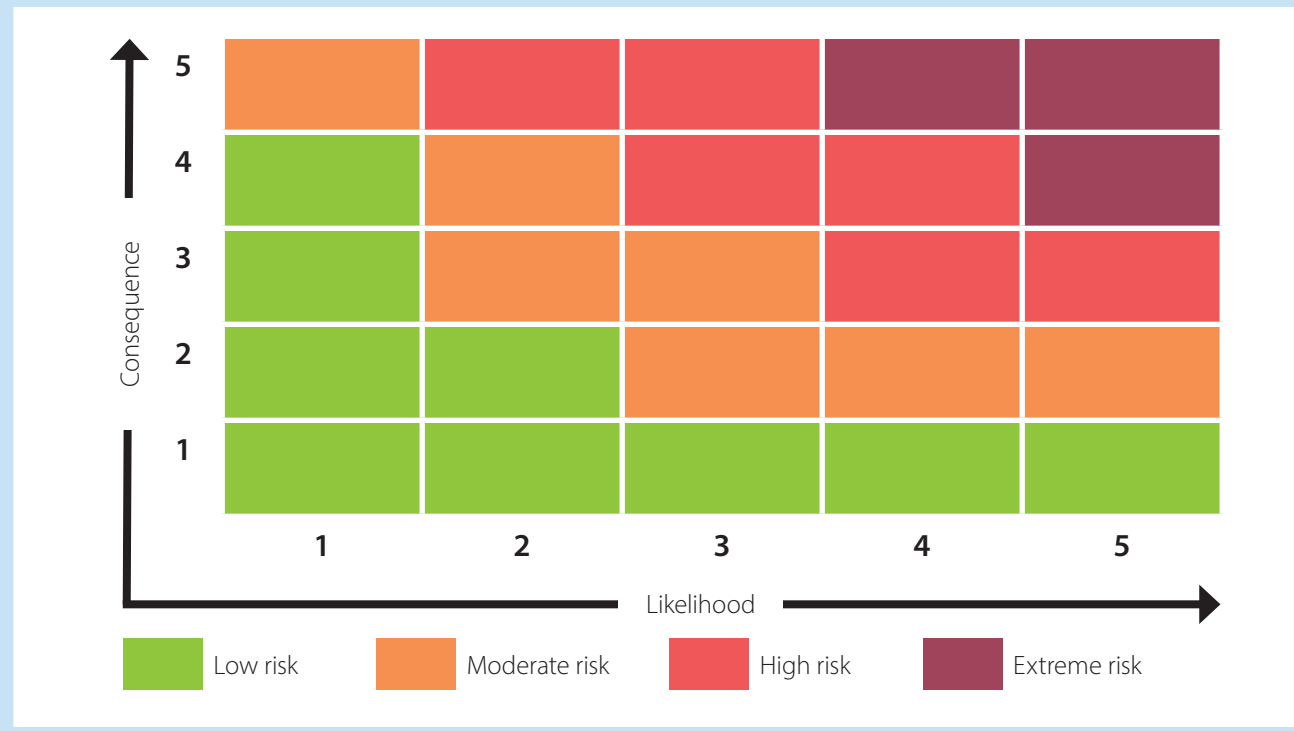
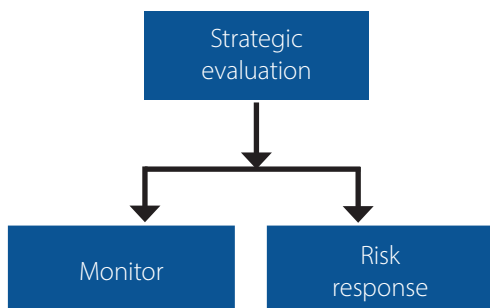


Figure 14 includes examples of risks from each corresponding risk level, extrapolated from climate projections for Nepal, including an explanation for the level assigned.³³

6.5.5 Strategic evaluation



Some risks may be more or less acceptable to your community, regardless of their respective standing in risk scores. This can be due to local preferences, risk appetites or other factors.

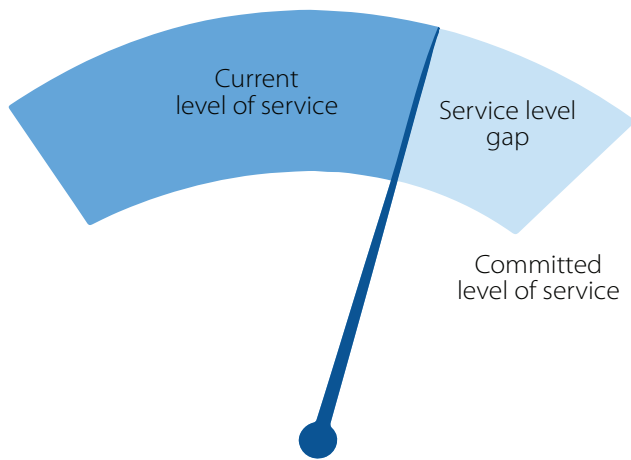
For instance, the likelihood of a particular impact occurring that would cripple an

essential service or critical asset may be low, resulting in a moderate risk score. However, due to the city’s high degree of reliance on that service or asset, it may be prioritized over risks with higher scores.

Strategic evaluation of identified climate risks ensures that your risk treatment priorities align with the community’s broader strategic priorities. Your critical assets, committed levels of service, and the interdependencies that exist between asset systems can all inform your strategic evaluation process.

As introduced in Chapter 2, Section 2.3.3, **levels of service** refer to the quality of service provided by an asset or group of assets compared to your goals. They usually relate to some combination of adaptability, availability, reliability, responsiveness and sustainability, among others. Factors affecting levels of service include customer

expectations, regulatory requirements, policies and objectives, available resources and financial constraints.



Levels of service are an effective control on risk. Understanding how current service level performance compares to the committed level of service provides a baseline to determine how the impacts of climate change are likely to further challenge service delivery goals.

In addition, a spatial understanding of service level gaps avoids potential pitfalls of relying only on critical assets to inform risk assessments.³⁴ Areas of the community that lack stormwater drainage infrastructure despite a service commitment for a certain degree of capacity, for instance, would not be revealed in a critical asset-focused risk assessment.

When evaluating risks, you should consider your assets as part of a system. Infrastructure systems are interconnected and interdependent.

Consider a road running over a creek, channeled through a large culvert. By assessing the impacts associated with a flood on all three assets in conjunction—the road, creek and culvert—you can more readily assess the service impacts that would occur as a result of a road washout. Outcomes might include transportation disruption, damage or disruption to underground utility lines and other

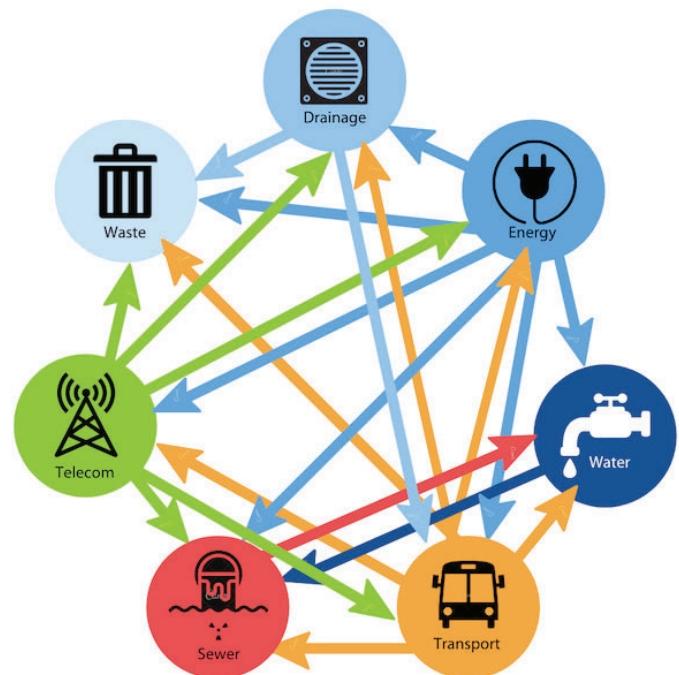
connected assets.

Consequently, it is equally important to calculate direct as well as indirect impacts of climate hazards, so as to capture the crucial interdependency of some systems. **Infrastructure interdependencies** can be categorized into four primary types, as shown in Figure 15.

The interdependent nature of infrastructure systems means that weak points have a greater potential to disrupt broader service delivery processes. Conversely, strategic resilience-building interventions strengthen the system as a whole. Looking at climate change risks together with other asset and strategic risks may allow you to identify projects or responses that manage more than one risk across multiple, interdependent asset classes.

Figure 16

Sectoral interdependencies



Adapted from C40, pp. 52 ³⁶

Figure 15

Types of infrastructure interdependencies



Physical interdependencies

occur when services delivered by one system are required by another infrastructure to operate.

For example, transit systems rely on transportation system infrastructure. If a road washes out, buses cannot operate.



Geographic interdependencies

occur due to the potential impact of a local environmental event on infrastructure systems located in close spatial proximity.

For example, if a culvert is not big enough to handle a flood event and leads to a road washout, water and telecommunication lines that follow the road corridor will likely also fail.



Cyber interdependencies

exist when the state of infrastructure depends on information technology systems.

For example, a power outage can cause an interruption in the operation of pump stations.



Cascading interdependencies

arise when disruptions to a system cause second-order impacts via connections that are not physical, cyber or geographic in nature. In other words, failure in one system can trigger effects on the environment, society and economy.

For instance, a storm event can cause a power outage and water accumulation. If a pump system fails, households and industrial sites can flood, causing damage, forcing evacuations and introducing contaminants into the environment.

Adapted from C40, p. 3³⁵

Exercise 8

Rank your impact statements that scored extreme, high or moderate in the risk assessment phase in order of prioritized risk treatment. Think about these risks within the context of your organization's broader strategic plan and your asset management policy's climate resilience objectives. Also consider spillover effects on other assets due to interdependencies. For example, you can ask:

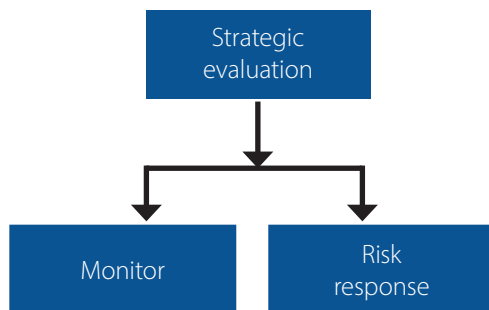
- *How does an impacted asset affect the service delivery of other assets?*
- *What assets in close geographical proximity would be affected?*
- *Was it at least partially due to a failure of IT systems at the local or national level?*
- *What other second-order effects would there be, for the environment, society or economy?*

Provide a rationale for the prioritization of any impact statement not ordered by its raw risk score.

Order of priority	Impact statement	Raw risk score	Rationale

Geospatial mapping tools are the most commonly used approach to understanding climate risks to interdependent infrastructure systems. But even without this technology, workshops that include operations staff from multiple service areas can typically identify important interdependencies. In this setting, they would be tasked with reflecting on the consequences of past extreme climate events.

6.6 Responding to climate risks



The risks you have prioritized in order of urgency will form the basis of your risk response

strategies. The greater and more urgent the risk, the more resilient you will want to make exposed services and the asset systems that enable them.

However, building climate-resilient asset systems does not mean reducing climate-based risks to zero. Rather, the idea is to use built and natural infrastructure to reduce risks to a level in which the system can continue to function effectively and fully serve the needs of the community within a changing climate.

Generally, response strategies can be reduced to two primary options:

1. Monitor without intervention
2. Intervene with a risk treatment option

Typically, risks with lower prioritization levels can be maintained with existing controls and monitored over time. If circumstances change or significant progress is made on addressing high-priority risks, you can always work your way down to risks for which ongoing monitoring is occurring and consider their treatment options. Controls on low priority risks can also be attached to other asset projects, such as the gradual replacement of heat-sensitive

pavement on secondary roads as they are scheduled to be resurfaced.

Developing **adaptation strategies** is an iterative process of trying to determine optimal approaches. Processes of creating, selecting, planning and implementing adaptation strategies must be consistently adjusted for perceived effectiveness and whether residual risk exceeds community tolerance. Selecting the most appropriate adaptation options involves balancing the costs, level of effort, project dynamics or disadvantages in relation to their capacity to obtain

objectives. Climate-resilient adaptation measures include:

- Building new assets
- Increasing the capacity of assets to accommodate climate-induced changes in demand
- Increasing system redundancy for increased resilience should one component of the system fail
- Adapting existing by-laws, codes, regulations, policies, development plans, and operating and maintenance practices to increase resilience

Living Labs: Testing future assets at small scale to lower investment and management risks

Living labs are a way to improve local management of future public assets by lowering investment and management risks. They allow local innovations to be tested, adapted and co-created at a small scale to evaluate their scale-up potential. Local governments gain a sense of the technical, financial and economic parameters before entering the investment phase. The labs engage a network of local actors with knowledge to develop and fine-tune the innovations to suit local conditions. In this scheme of things, local governments are seen as enablers rather than regulators of local social and economic development.

The Global Fund for Cities Development (FMDV), an urban development investment initiative, is working with Kampala Capital City Authority (KCCA), to promote living labs in the strategic planning of the city's development. Two small-scale solutions are being tested. One living lab promotes electric urban mobility, the other retrofits energy consumption of local education facilities. Both aim to facilitate domestic production of clean, environmentally sound technologies in Uganda, as described in the National Development Plan III, the Uganda Vision 2040 and the Sustainable Development Goals.

The project on electric urban mobility builds on the lessons learned by local motorcycle manufacturers. A business model for electric solar-powered motorcycles is being designed to not only bring financial gains to local *boda* (motorcycle taxi) drivers in the short term but also train the predominantly male drivers to work

with charging station managers, many of whom are female. KCCA hopes that other business sectors, such as delivery companies relying on road transportation, will emulate the innovation to reduce overall air and noise pollution in the city.

The second project involves installing a system of solar panels to improve long-term connectivity within local schools. Through the lab, KCCA will be able to test the national Quality Assurance framework for solar technology. In partnership with vocational schools and local universities, students and businesses will also receive hands-on learning about solar energy use. Drawing from a common need throughout the city for climate-smart and affordable energy solutions, the living lab pools resources to not only benefit the schooling environment but also improve cash flow among businesses looking to commercialize solar-powered technologies. In the long run, this project builds economic and environmental sustainability.

Contribution provided by the Global Fund for Cities Development (FMDV) and the Kampala Capital City Authority for the purposes of this handbook. Adapted from the Programme on Integrated Local Finances for Sustainable Urban Development (PIFUD) factsheet, which you can find here: <https://kcca.go.ug/pifud-key-project-documents>.

FMDV is a global network of local governments dedicated to promoting and developing solutions to finance and invest in urban development. In recent years, it has worked with 1,500 local governments from 100 countries and has contributed to mobilizing \$1 billion USD.

- Updating capital plans to reflect asset capacity or vulnerability, or system risk
- Incorporating natural assets in asset management processes to ensure their effective operations
- Designing and managing assets to offer multiple resilience benefits. (See box on living labs.)
- Adopting an adaptive design approach that allows the original design to be modified over time to address changes in climate change scenarios, while keeping capital expenditure to a level that is lower than that required for the asset useful life design option.

6.6.1 Non-capital interventions

Many solutions are not capital projects. Instead, interventions relying on policies or regulations, or changes to operations and maintenance practices, can yield substantial benefit in terms of reducing risk. Better yet, non-capital interventions frequently cost less than the public investment in new assets.

The majority of maintenance activities in local governments tend to be reactive. Local government staff spend a great deal of time fixing things that are broken or about to break, revealing a common picture of local government assets in a poor state of repair. This reactive approach hinders the building of resilience across an interdependent asset management system, let alone on the climate front. Enhancements in maintenance activities can improve the climate resilience of assets in two ways.

The first is to reduce the likelihood of asset failure. Every asset naturally progresses from new to worn to failure simply through standard weathering and use. Preventative maintenance programs are intended to extend the asset's useful lifespan through renewal treatments that improve its condition as the asset ages and wears. By definition, a preventative approach sustains assets in a good state of repair. Proactive maintenance and enhanced

monitoring programs greatly decrease the risk of failure resulting from standard deterioration and external shocks.

The second way that maintenance programs can improve resilience is through enhancements in capacity. Some assets, such as culverts, can become blocked over time. Likewise, sediment can collect in stormwater ponds, decreasing their absorptive capacity. More frequent maintenance can ensure their design capacity is available to accommodate climate events.

Operations can also have an important role in climate resilience. Decisions about how to use or control assets, natural or built, can influence the risk associated with services or people. Take, for instance, an urban tree management program. If the community's urban-rural interface is heavily forested, you may be able to significantly reduce wildfire risk by integrating firebreaks around critical assets such as a landfill or the primary access road. On the other hand, retaining trees in the urban centre can provide important cooling benefits. As you can see, co-benefits often arise from taking creative measures to manage your community's assets.

Non-capital interventions can influence short-term and long-term risk. During drought conditions, introducing an operating policy that lowers water pressure can reduce demand on already strained water supplies. A precautionary policy to sandbag critical assets in conjunction with alerts from a flood early warning system can prevent costly damage to assets that services rely on.

Another important non-capital intervention is collaboration with citizens. For example, during a drought, citizens can be asked to refrain from non-essential water use, or different areas of the city can have access to water in different hours of the day. This is the same for electricity and other services. Many parts of the world already implement such practices, which are based not on laws (due to difficulty

in monitoring) but on collaboration with the population. The efforts also help raise awareness of how climate change directly impacts everyday life.

Important development decisions made today with a view to securing long-term sustainability can forestall a great deal of trouble later. Preventing new residential, industrial or commercial development in areas at high risk of flooding, for instance, will avoid the need to install highly exposed assets to service those developments. Likewise, by retaining natural infrastructure in developed areas, you can reduce the need for engineered assets to convey stormwater.

6.6.2 New or retrofitted assets

New asset installations or modifications of existing assets will be necessary aspects of your risk mitigation strategies. To ensure that new or renewed assets do not share the vulnerabilities you have identified through this process, they must be designed to be climate-resilient—that is, planned, designed, located, built and operated to anticipate and respond to changing climate conditions.

Some risks—in particular, urgent, short-term risks—may require the development of stand-alone infrastructure to reduce the exposure or increase the adaptive capacity of services or asset systems, in turn reducing their vulnerability. For instance, highly exposed coastal areas may require the installation of sea walls (hard engineering or grey infrastructure) or mangroves (environmental, soft engineering or green infrastructure) to protect against storm surge and coastal erosion.

There is a growing realization that engineering adaptive solutions is more likely to achieve the objectives of sustainable infrastructure. These solutions can adjust to changes over the asset's useful life or can be modified and repaired by asset owners using local knowledge and resources. For example,

a reinforced concrete or masonry seawall could become redundant should wave action undermine the foundations. However, a seawall comprising riprap (loose rock) is able to flex and adapt to the changing profile of the foreshore.

There are significant opportunities to manage climate risk during times of asset renewal or replacement. In these cases, the replacement or retrofit should be designed to mitigate risks that the asset was previously exposed to. Road resurfacing projects can select pavement grades resilient to heat stress, while facility retrofits or repairs can incorporate interventions such as installing light-colored roofing materials to reduce the urban heat island effect.

By delaying the installation of a new asset until another component of the interdependent asset system requires renewal, you can typically save costs compared to doing these projects separately. For example, you might wait to install a seawall until a coastal road needs to be redeveloped. Choosing whether or not to undertake the renewal of an asset ultimately requires a clear understanding of the tradeoffs involved in the former and risks in the latter. Through strategic evaluation, you can make smarter, more cost-effective decisions.

As your community grows and development necessitates new assets, make sure not to introduce the same risks into new developments. Asset vulnerability can be mitigated by locating assets in areas that are less exposed to climate hazards, such as avoiding new construction in flood plains. New assets should be built, still within your budget to accommodate climate impacts when they occur, up to the price point you can tolerate. Asset development should also consider the resulting impacts on risk elsewhere. For example, removing natural infrastructure can increase the risk of flooding in other parts of the community.

As you can see, strategic evaluation plays a role throughout the entire process of devising

risk response strategies, in deciding both *when* and *how* to act.

Engineers typically take into account information on hazards and potential impacts when determining the lifespan requirements of public assets. While this includes climate information, the design parameters are typically based on past records. The climate projection platforms introduced earlier in this chapter (Section 6.2) provide sufficient detail to identify risks and propose adaptation strategies. But they are insufficiently granular to inform engineering design.

Designing climate-resilient assets should be an open process with the project engineer. You need to clearly communicate known exposure and risks, and effectively balance risk tolerance with desired levels of service and cost. Adhere to codes and standards for climate-resilient assets wherever they are available.

6.6.3 Low-carbon resilience

While the primary intention of this chapter is to encourage asset management that enhances climate resilience, many adaptation strategies can be designed to enable co-benefits. Efforts to reduce GHG emissions ultimately support climate risk mitigation by ensuring that the world ultimately experiences one of the less severe climate change scenarios.

Low-carbon resilience focuses on developing integrated strategies that reduce both GHG emissions and vulnerabilities to climate change impacts (see Figure 17). For example, large infrastructure projects like sea walls may result in substantial emissions but can also provide significant risk management benefits. In terms of energy, some renewable sources are climate resilient or at least resilient to one or more of the potential effects of climate change, e.g. geothermal, hydrokinetic and solar. Sourcing energy in such a way can support adaptation and mitigation efforts.



Photo © Linda Newton

The Paris Agreement committed the world to limit global temperatures to well below a 2°C increase from pre-industrial times. In order to achieve this collective goal, all countries must endeavor to reduce their GHGs wherever possible. Given that temperatures will continue to rise, a low-carbon resilience framework encourages the application of a mitigation lens. Municipalities that operate within this framework aim to build resilient assets that deliver services over a longer life cycle.

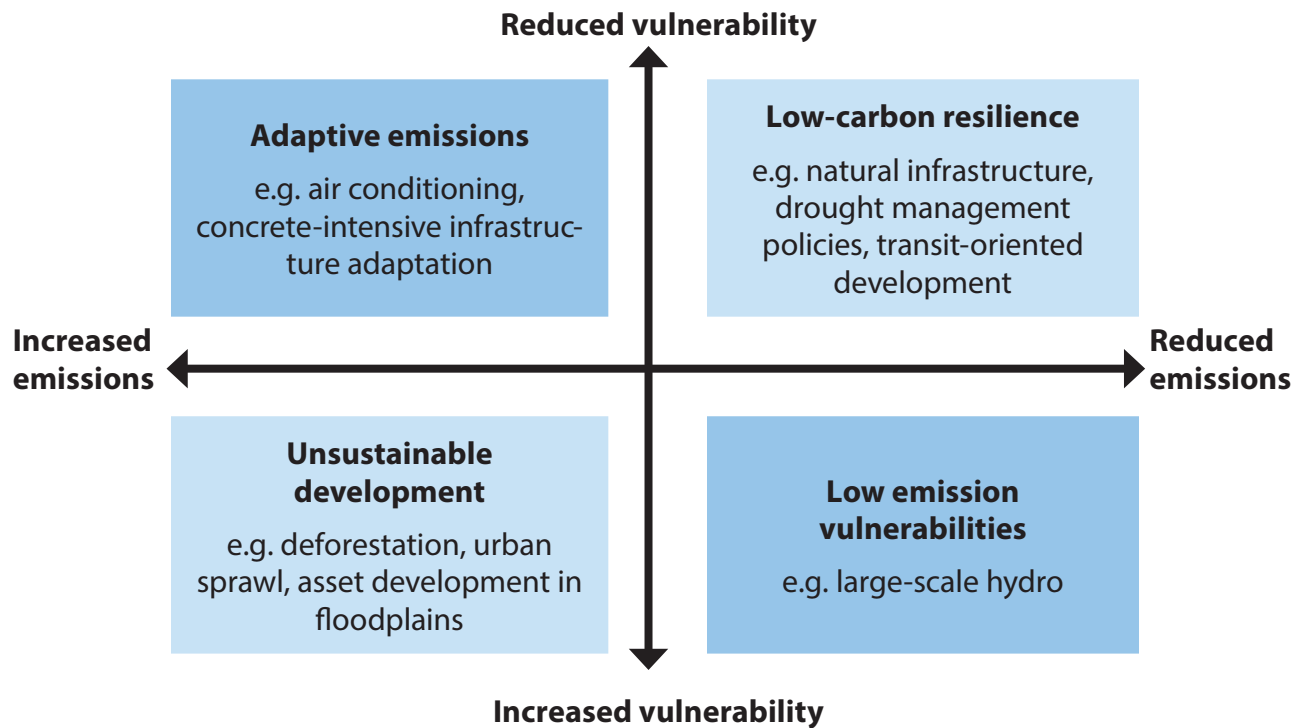
While it will not always be possible to follow a low-carbon resilience framework, it provides an ideal that we can all strive for. With a problem as imminent and global as the impact of carbon emissions, incorporating low-carbon resilience into your community's climate adaptation strategies will benefit not only local residents, but also populations around the world. You will be taking part in a solution to a global problem, one that rests on the small but mighty acts of hundreds of thousands of local communities.

The following steps can help achieve climate mitigation-adaptation co-benefits:

1. Identify low-carbon resilience as an objective as early as possible when devising adaptation strategies.
2. Engage and apply solutions from all sectors and disciplines available (e.g. energy, waste management, water treatment,

Figure 17

Low Carbon Resilience



Adapted from Nichol and Harford, pp. 7–8³⁸

- transit services, facilities, engineering, operations).
- 3. Provide clear short-, medium- and long-term goals, ideally tied to the asset management policy.
- 4. Identify implementation opportunities.³⁷

6.6.4 Building back better

Despite your best efforts, you will never be able to make your community disaster-proof. The damage caused by Hurricanes Sandy and Harvey in the United States demonstrates that even very wealthy and well-resourced communities can be overwhelmed by extreme climate events.

At the same time as your local government employs resilience-building interventions to mitigate the severity of potential climate impacts, you must also prepare for post-disaster reconstruction. It is important that the

opportunity for climate-resilient renewal be incorporated in the recovery process. Otherwise, by rebuilding asset systems exactly as they existed before a disaster event, you replicate the vulnerabilities that exposed the previous system. You would then leave it prone to the same damage from which you are trying to recover. To avoid this pitfall, it is critical to **build back better**.

Reconstruction, rehabilitation and renewal can, to a considerable degree, be planned ahead of disaster events, provided you understand what events may occur. These should include asset recovery plans that cover both the most probable and most severe impact statement scenarios.³⁹

A climate risk assessment process provides critical information for informing post-disaster reconstruction. Adding the specific context of a disaster analysis report to a planning process already informed by a risk assessment is far

more efficient than starting the process in the midst of a chaotic recovery period. Increasing resilience to reduce risks during pre- and post-disaster can be achieved in five main steps, as shown in Figure 18.

Adaption strategies need to mitigate the impact of prioritized risks that require an intervention. Several considerations will influence adaptation strategies, including:

1. How does the objective of the adaptation strategy balance with the community's overall economic, social, environmental and cultural objectives?
2. What is the goal of the adaptation strategy? Is the goal to maintain the current level of risk, reduce the level of risk despite climate change, or limit the increase in the level of risk due to climate change?
3. How effective will the adaptation strategy be in achieving the goal?
4. How feasible is the adaptation strategy? Do you have the capacity to implement it? Would any changes be needed in the regulatory framework to ensure that measures can be taken quickly if needed (e.g. conduct emergency

Figure 18

Steps to building back better

1

Require that technical project assessments include information from the climate risk assessment to inform solutions that consider safety, practicality and affordability. This can be done prior to a disaster event.

2

Include an assessment of the disaster's impacts in the project planning process. Include descriptions of:

- The disaster event
- Damage to physical assets
- Service delivery losses or interruptions
- The experience of operations and maintenance personnel
- Any available updates to hazards frequency, severity and impacts

3

Improve the physical resilience of assets by using sufficient engineering design standards that factor in the disaster's characteristics and future climate risks.

4

Ensure quality control of asset planning and construction so that the design intent is not compromised.

5

Operate and maintain the assets to prevent unnecessary risk. For instance, critical pieces of resilient infrastructure should be operated within their design parameters and maintained to a level that allows them to meet their levels of service.

Adapted from Grozdev, pp. 14-15⁴⁰

environmental assessment, fast track procurement process)?

5. Does the adaptation strategy introduce risk controls on more than one climate risk or asset system?
6. Is the adaptation strategy a no-regret or low-regret solution? Will it yield near-term benefits even in the absence of climate change?
7. How affordable is the adaptation strategy? How does the level of risk reduction relate to the cost of implementing the adaptation strategy?
8. What is the optimal timeline for introducing the adaptation strategy? Is the risk urgent, suggesting that a preventative measure implemented now will reduce costs compared to fixing a problem after it happens? Or will the risk become more urgent in the future, suggesting that

monitoring may be the best intermittent solution so that the local government can build financial capacity?

9. Are new capital projects necessary, or can retrofits or process changes adequately control the risk?
10. How acceptable is the adaptation strategy to the community? Have public or private consultations been held?
11. Do you have enough information to proceed with an adaptation strategy?
12. Is the adaptation strategy flexible? Given the uncertainty involved in planning for future climate change, is there potential to adjust the strategy?
13. What co-benefits does the adaptation strategy provide?^{41 42 43}

Exercise 9

Review the top three priority impact statements you identified in the climate risk assessment earlier, and develop 1–2 adaptation strategies for each.

To help inform the development of your strategies, consider the impact statement and answer the questions below based on influencing dynamics. Depending on the issue, it may take multiple actions to reduce the risk to an acceptable level.

Adaptation strategy scoping exercise

Priority impact statement (and #)	Influencing dynamic		Adaptation strategies
<i>Example: Increased frequency and duration of hot days, resulting in increased damage to roads, culverts, sidewalks, trails, parking lots and outdoor recreation facilities</i>	Balanced with other community objectives? ✓ Yes ___ No	Objective? ___ Maintain current risk ✓ Reduce risk level ___ Limit risk increase	<i>a. New roads and road resurfacing must meet minimum temperature threshold of X°C</i>
	Effective? ✓ Yes ___ No	Feasible? ✓ Yes ___ No	
	Multiple protections? ___ Yes ✓ No	Low regret? ✓ Yes ___ No	
	Affordable? ✓ High ___ Low	Timeline? ___ Near term ✓ Long term	<i>b.</i>
	New assets? ___ Yes ✓ No	Acceptable? ✓ Yes ___ No	
	Information? ✓ Yes ___ No	Flexible? ✓ Yes ___ No	
	Co-benefits: (List) None		

Priority impact statement (and #)	Influencing dynamic		Adaptation strategies
Priority #1	Balanced with other community objectives? ___ Yes ___ No	Objective? ___ Maintain current risk ___ Reduce risk level ___ Limit risk increase	a.
	Effective? ___ Yes ___ No	Feasible? ___ Yes ___ No	
	Multiple protections? ___ Yes ___ No	Low regret? ___ Yes ___ No	
	Affordable? ___ High ___ Low	Timeline? ___ Near term ___ Long term	b.
	New assets? ___ Yes ___ No	Acceptable? ___ Yes ___ No	
	Information? ___ Yes ___ No	Flexible? ___ Yes ___ No	
	Co-benefits: (List)		
Priority #2	Balanced with other community objectives? ___ Yes ___ No	Objective? ___ Maintain current risk ___ Reduce risk level ___ Limit risk increase	a.
	Effective? ___ Yes ___ No	Feasible? ___ Yes ___ No	
	Multiple protections? ___ Yes ___ No	Low regret? ___ Yes ___ No	
	Affordable? ___ High ___ Low	Timeline? ___ Near term ___ Long term	b.
	New assets? ___ Yes ___ No	Acceptable? ___ Yes ___ No	
	Information? ___ Yes ___ No	Flexible? ___ Yes ___ No	
	Co-benefits: (List)		
Priority #3	Balanced with other community objectives? ___ Yes ___ No	Objective? ___ Maintain current risk ___ Reduce risk level ___ Limit risk increase	a.
	Effective? ___ Yes ___ No	Feasible? ___ Yes ___ No	
	Multiple protections? ___ Yes ___ No	Low regret? ___ Yes ___ No	
	Affordable? ___ High ___ Low	Timeline? ___ Near term ___ Long term	b.
	New assets? ___ Yes ___ No	Acceptable? ___ Yes ___ No	
	Information? ___ Yes ___ No	Flexible? ___ Yes ___ No	
	Co-benefits: (List)		

6.7 Putting climate-resilient asset management into practice

The prioritization of adaptation strategies can be effectively integrated into asset management planning. Recall that a systematic approach to asset management balances cost, levels of service and risk, with the aim of sustainable service delivery. This established framework prioritizes adaptation strategies in line with the community's broader objectives. Within this framework, your local government can make informed decisions regarding:

- Where there is an adequate case to invest in an adaptation strategy and the appropriate timing
- Where to invest in capital or operational adaptation strategies to manage risk and improve resilience
- Where to accept changes in levels of service
- How to minimize investment costs while maintaining other priorities
- How to compare and integrate climate adaptation strategies within the context of other community risks.⁴⁴

6.7.1 Creating a climate-resilient asset management action plan

Once you have identified a prioritized list of actions (last column of table in Exercise 9), you are ready to move from planning to operationalizing. Start with the top priority adaptation strategies and work your way down. Incorporate these actions into your asset management action plan, as introduced in Chapter 4, and be sure to include the following attributes:

1. *Action:* Identify specific action items necessary to address priority climate risks. The number of actions included, and their scope, should be small enough that the local government has the resources,

capacity and planning timeline to see them fulfilled. If you do not get to all priority actions, remember that they can be added later, when resources become available.

2. *Rationale:* Refer to the results of your climate risk assessment in Exercise 8 to identify the gaps between today's reality and your risk management objective. Wherever possible, identify aspects of the community's committed levels of service, strategic plan and asset management policy that demonstrate alignment with the objectives of the local government.
3. *Time frame:* Identify the time frame to implement the action. Operational changes can be implemented almost immediately and are ongoing. Short-term projects may take under two years, medium-term projects between 2–6 years, and long-term projects more than 6 years.
4. *Ownership:* Who is responsible for implementation? At a minimum, your asset management team should assign responsibility to each identified service area to ensure the action is accomplished. Ideally, you should delineate specific staff roles. Be sure to bring those individuals into the planning process prior to their being assigned responsibility to build a greater sense of ownership in the action's success.
5. *Resources:* Identify the people, training, technology or assets your team requires to complete the action.



Photo © Linda Newton

6. *Funding*: What financial resources does your team need to complete this action? Are the costs up-front, recurring or both? What is the funding source?

As it was first laid out in Chapter 2, the process of engaging the right human and technological resources for asset management is again critical here. Your government needs the supporting organizational structure, with designated focal points and reliable channels for communication, to ensure climate adaptation strategies materialize and are effective. A good way to start is to include on the asset management team someone who specializes and can advise on climate risks facing your community on your asset management team.

When you integrate adaptation strategies into the asset management action plan framework and process, you can incorporate your objectives into annual budgets, project timelines, long-term financial plans and other project implementation pathways. In this way, senior management can understand and manage the financial life cycle of a multi-year tactical implementation plan across projects.

Early planning maximizes investment efficiency and allows the proper entities to allocate sufficient resources (or address misallocations) for a project well ahead of time. This demonstrates how budgeting, planning and governance fit together to ensure that your team fulfills proposed climate adaptation objectives.⁴⁵

6.7.2 Making the economic case for climate resilience

Once you have developed and integrated adaptation strategies into your asset management planning process, you must ensure that the government commits the necessary financial resources for their implementation. One of the core tenets of asset management is the effective balancing of cost, risk and levels of service. Consequently, the value associated with financial investments, determined through exercises

such as the cost-benefit analyses described in Chapter 2, Section 2.4.4 *Decision support*, is a key consideration in how to manage a local government's budget.

A key element of financial analysis is to make the costs of risk visible, and the work you have done to assess risks provides an important baseline in determining the value of resilience-building investments.

Historically, local governments have overlooked the financial value of adaptation measures due to factors such as an incomplete understanding of risk and the difficulty in estimating the cost of damages avoided by the investment. It is not easy to account for costs that you do not incur.

The risk assessment process allows you to identify who and what is at risk as well as the risk rationale, while the use of climate data to gain a realistic idea of how hazards will develop and change will also help improve risk visibility. Taking into account the co-benefits of an infrastructure investment, such as those described in the natural infrastructure discussion — another aspect frequently left out of value assessments — can also improve the business case of adaptation projects.

In order to facilitate a more ready investment in climate resilience and adaptation, the Global Commission on Adaptation assessed the economic case for projects that reduce climate risk. The Commission is an international initiative to encourage leadership in climate resilience, overseen by former UN Secretary-General Ban Ki-moon and co-chaired by representatives of the Bill and Melinda Gates Foundation and the World Bank. Their 2019 report found that the rate of return on investments in resilience building is very high, with benefit-cost ratios ranging from approximately 2:1 to 10:1. On average, enhancing the climate resilience of existing infrastructure and building new climate-resilient infrastructure yields an economic case where the benefits outweigh costs by 4:1.⁴⁶

The business case for specific initiatives can be

Exercise 10

Beginning with three of the adaptation strategies you developed, fill in the following table to make them compatible with your asset management action plan.

Risk response action planning

Action	Rationale	Timeframe	Ownership	Resources	Funding
New roads and road resurfacing must meet minimum temperature threshold of X°C	Prevent asset damage and deterioration due to high temperatures	Ongoing	Director of operations	<ul style="list-style-type: none"> Research into appropriate minimum temperature threshold Supply of new asphalt or pavement grade 	Small annual budget increase required per year for higher-quality material

significantly greater. According to the World Resources Institute’s Aqueduct Floods tool, every \$1 spent on flood protection assets in India that increases the standard of protection of an 11-year flood to a 25-year flood corresponds to \$248 in avoided damages. Likewise, investing \$1 in moving flood protection in Bangladesh from a 3-year storm standard to a 10-year standard yields \$123 in avoided damages (see Figure 19).

This return on investment means that every dollar invested in adaptation could result in multiple times the value in net economic benefits. This difference in the net benefits between outcomes resulting from a resilient project versus from business-as-usual operations has been termed the ‘resilience dividend’.

To build a stronger business case for resilient projects like the climate-ready interventions developed above, you can easily include the resilience dividend through an additional column in the cost-benefit analysis, indicating this amount for each project. You can also use a more comprehensive and complex tool like the Resilience Dividend Valuation Model.⁴⁸

Ultimately, devising a consistent financial argument for avoiding status quo decisions rests on the mandating the inclusion of climate-resilient asset design at a fundamental level, as explored throughout this chapter.

The Climate Change and Sustainable Development Sector at the Inter-American

Development Bank has developed a similar methodology to provide its project teams in Latin American and Caribbean countries with practical guidance on navigating climate risks (see box).

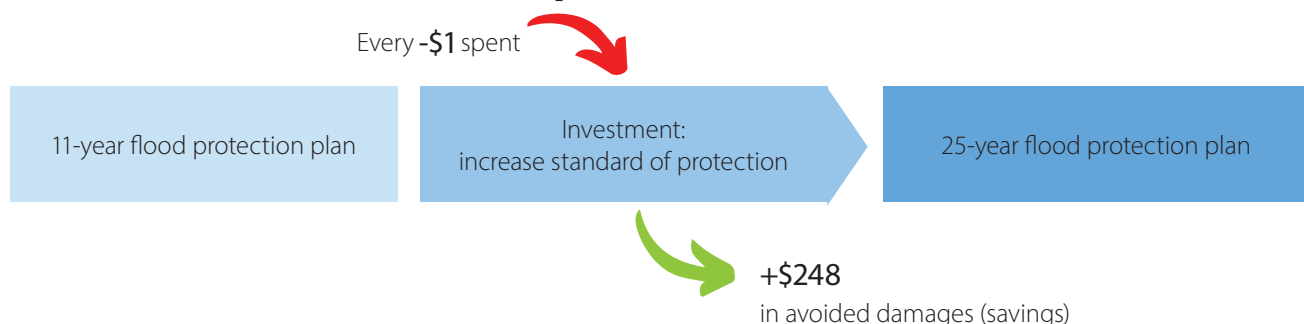
6.8 How climate-resilient asset management enables disaster risk reduction

Disaster risk reduction is a systematic approach to identifying, assessing and responding to vulnerabilities and risks in order to prevent or mitigate the effects of disaster events, which are expected to increase in magnitude and frequency as a result of climate change.⁴⁹ While not identical, disaster risk reduction and climate-resilient asset management are complementary processes.

The assessment of risk is a key first step in both. The Sendai Framework for Disaster Risk Reduction, which is monitored and supported by the United Nations Office for Disaster Risk Reduction (UNDRR), stresses as its first priority the understanding of disaster risk. This is based on a local assessment of hazards, exposure, vulnerability, adaptive capacity, details of the local assets and environment, past experience and future challenges—all details that this chapter has explored.⁵⁰ While comprehensive

Figure 19

Benefits vs. costs example



Adapted from World Resources Institute⁴⁷

risk management should include other risks such as earthquakes, health risks and technological risks like chemical plant explosions, knowing your climate risks places you in a better position to respond to others.

The UNDRR Disaster Resilience Scorecard for Cities emphasizes the need for increasing infrastructure resilience as one of its “10 Essentials”.⁵¹ Effective management of local

government assets, which necessitates climate preparedness and readiness, enhances the overall resilience of your organization to disaster risks in a number of ways. Asset response strategies detailed in this chapter offer ways to improve performance and reduce the likelihood of failure during disasters like severe climate events. Having up-to-date inventories of local government assets and their conditions allows for the accurate deployment of

Disaster and climate change risk screening and assessment of infrastructure projects in Latin America and the Caribbean

The Inter-American Development Bank (IDB) is committed to assessing disaster and climate change risk and identifying opportunities for resilience and adaptation measures in the projects it finances. For this purpose, the IDB has developed a Disaster and Climate Change Risk Assessment Methodology that also takes a phased approach that allocates resources commensurate with project risk.

The methodology was applied to a transportation project aiming to improve the connectivity in southern Ecuador through the rehabilitation of a road.

During the first phase, the road location was screened for natural hazards using a web map application. This quickly identified its exposure to earthquakes, intense rainfall and landslides. Considering this infrastructure’s criticality (moderate size and scope of structural elements and complexity), the project was classified as moderate-risk.

During the second phase, area- and project-specific information was gathered, which found that the road had suffered service interruptions due to landslides and that, although there had been some hazard studies done at the country level, more localized studies had not been conducted for the design of the project.

Based on this, the project team decided to conduct more detailed qualitative analyses to help gauge these risks better. In a subsequent site visit, disaster risk experts identified critical points and conditions, and created a landslide inventory using both site and remote sensing data. The inventory distinguished different types of landslides as well as possible impacts to nearby communities.

The findings from the qualitative analysis motivated a quantitative assessment (phase three), to identify and compare between concrete risk mitigation measures. In this last step, two risk models were created for torrential discharge and landslides triggered by earthquakes and intense rainfall. These models enabled the calculation of estimated losses (direct and indirect) and the proposal and evaluation of several risk mitigation measures, with cost-benefit ratios used to prioritize them.

Applying the methodology allowed the project team to address these issues gradually and seamlessly with the project cycle.

Although the methodology’s title refers to IDB projects, it can be applied to any infrastructure project. More on the methodology here:

- Executive summary: <https://publications.iadb.org/en/executive-summary-disaster-and-climate-risk-assessment-methodology-idb-projects-technical-reference>
- Full methodology: <https://publications.iadb.org/en/disaster-and-climate-change-risk-assessment-methodology-idb-projects-technical-reference-document>
- Online course: <https://www.edx.org/es/course/analisis-de-riesgos-de-desastres-naturales-y-cambio-climatico-en-proyectos-de-infraestructura> (currently in Spanish, with English version to come)

Contribution provided by Sergio Lacambra Ayuso, Daniela Zuloaga Romero, Maricarmen Esquivel Gallegos and Doris Melissa Barandiaran Salcedo from the Inter-American Development Bank for the purposes of this handbook. Adapted with the authors’ permission.

local government resources during disaster response. And asset management's focus on sustainable service delivery provides a consistent case for building resilience in the face of future challenges and risks.


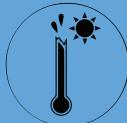
Asset management, like disaster risk reduction, is a team sport. The integrated and interdependent nature of local government services and assets means that effective asset management requires coordination, consultation and buy-in from each service area, to enable the assignment of responsibilities. Building these structures of accountabilities and communication networks allows for a streamlined integration of disaster resilience



into coordinated operations. This is effective for both proactive resilience-building and the critical communication of information during disaster response and recovery.

Both asset management and disaster risk reduction are ongoing processes, not one-off tasks. The risks and capacities of organizations change over time, and adverse events occur regardless of progress. How well your local government manages to recover from them will change perceptions and tolerances of risk. As you implement and repeat the processes described in this chapter, your readiness in the field will grow, and with it, your ability to respond to disaster events.

Appendix A: Climate change hazards to local assets

Climate hazards			
Storm surge	Sea level rise	Coastal erosion	Flooding
			
Transportation	Buildings	Water infrastructure	
<ul style="list-style-type: none"> • Capacity of culverts and storm sewer systems more frequently exceeded • Underpass flooding • Basement flooding • Vehicle damage • Road damage or collapse • Bridge damage or collapse • Heightened risk of inundation or damage of causeways, bridges and low-lying roads • Greater need to move or rebuild coastal roads at higher elevation to avoid damage 	<ul style="list-style-type: none"> • Damaged or flooded structures • Increased mold growth Property destruction • Loss of office space • Communications or power interruptions • Damage to information and communication technology equipment • Coastal assets flooded or damaged 	<ul style="list-style-type: none"> • Saltwater intrusion into ground-water aquifers • Introduction of human or animal waste to water source • Release of toxic chemical • Damage to pumping stations • Breakage of exposed pipes, inter-connections with roads 	
Waste management	Marine infrastructure	Natural infrastructure, land and parks	
<ul style="list-style-type: none"> • Increased flooding of dumpsites in low-lying areas, causing coastal pollution • Inundation of waste management facilities • Erosion of dumpsites in low-lying areas, causing coastal pollution • Increased demand for waste management collection if homes or businesses are flooded • Waste collection access issues on flooded roads • Increased leaching into ground-water and soil 	<ul style="list-style-type: none"> • Flooding of marine assets • Increased force exerted on docks • Increased need for protective assets • Cargo ships unable to access port infrastructure • Fishing vessels unable to access harbor infrastructure • Increased instability of coastal assets 	<ul style="list-style-type: none"> • Deterioration of coastal wetlands • Undercutting of coastal cliffs • Beach loss • Coastal habitat damage • Inundation of low-lying land • Salt intrusion in surface freshwater sources • Salt intrusion in aquifers • Deterioration of wetland ecosystems • Riverbank erosion or sedimentation • Pollution transfer and waste runoff 	
	Electrical infrastructure		
	<ul style="list-style-type: none"> • Flooding and damage to low-lying infrastructure • Accelerated erosion • Inundation of underground infrastructure • Damage or failure of dam infrastructure 		

Climate hazard Drought 		
Water infrastructure	Natural infrastructure, land and parks	Marine infrastructure
<ul style="list-style-type: none"> • Increased water demand and pressure on infrastructure • Increased water quality issues • Dam failures • Loss of potable water sources 	<ul style="list-style-type: none"> • Hard, dry soil • Lower water levels in lakes, rivers, reservoirs and interior wetlands • Increased dust • Plant, fish and animal deaths • Higher risk of flash floods • Higher risk of wildfire 	<ul style="list-style-type: none"> • Reduced surface water levels
		Electrical infrastructure
		<ul style="list-style-type: none"> • Decreased efficiency for thermal cooling • Reduction in hydroelectric generation
Climate hazard Extreme temperatures 		
Transportation	Buildings	Water infrastructure
<ul style="list-style-type: none"> • Pavement softening and rutting • Reduction in the maximum load weight that can be safely transported • Asphalt surface more prone to damage during heatwaves • Increase in bleeding (upward movement) in older pavement • Increased challenges in pavement construction • Shortened life expectancy of roads Bending of rail lines • Worsened urban heat island effect 	<ul style="list-style-type: none"> • Foundation damage due to clay soils drying out • Premature weathering • Increased indoor air temperatures 	<ul style="list-style-type: none"> • Reduced water quality • Reduced water availability • Increased demand for water • Increased algal growth
		Waste management
	<ul style="list-style-type: none"> • Decline in air quality at waste management facilities • Accelerated decomposition of organic material • Increased risk to workers through vermin, pests, odor, heat and dust • Increase combustion risk • Increased water demand for workers and site operations 	<ul style="list-style-type: none"> • Reduced generation efficiency • Reduced transmission efficiency • Increased peak demand • Increased weight in lines
Natural infrastructure, land and parks		Marine infrastructure
<ul style="list-style-type: none"> • Fish and coral deaths • Higher risk of wildfire 		<ul style="list-style-type: none"> • Increased algal growth

Climate hazard		
Wildfires		
		
Transportation	Buildings	Water infrastructure
<ul style="list-style-type: none"> • Pavement damage 	<ul style="list-style-type: none"> • Smoke damage • Building damage or destruction 	<ul style="list-style-type: none"> • Loss of water quality
Waste management	Natural infrastructure, land and parks	Electrical infrastructure
<ul style="list-style-type: none"> • Damage to facilities • Inability to access facilities 	<ul style="list-style-type: none"> • Damage or destruction of burnt trees with increased susceptibility to disease and pests • Damage to soil • Animal food source destruction • Greater risk of flooding 	<ul style="list-style-type: none"> • Damage to transmission lines and poles • Ionization of the air by particulate matter • Electrical infrastructure can cause wildfires
Climate hazard		
Severe weather		
		
Transportation	Buildings	Water infrastructure
<ul style="list-style-type: none"> • Damage to vehicles from hail • Damage to vehicles from high winds and debris • Damage to signage and traffic signals from high winds 	<ul style="list-style-type: none"> • Reduced structural integrity of building components • Accelerated deterioration of building façades • Premature weathering or corrosion • Increased mold growth • Broken windows from hail • Damage to façades from strong winds • Reduction in design safety margins • Increased fractures of building foundations • Increased risk of catastrophic failure • Decreased durability of materials • Increased repair and maintenance costs • Electricity outages 	<ul style="list-style-type: none"> • Stormwater infrastructure capacity more frequently exceeded • Increased demand for wastewater treatment facilities • High risk of urban drainage system failure and flooding
Waste management		Natural infrastructure, land and parks
<ul style="list-style-type: none"> • Damage to waste collection vehicles and facilities 	<ul style="list-style-type: none"> • Vegetation damage from wind and hail • Enhanced risk of landslides 	
Electrical infrastructure	Marine infrastructure	
<ul style="list-style-type: none"> • Damaged generation and transmission infrastructure • More frequent tree contact damage 	<ul style="list-style-type: none"> • Fewer days to safely use marine infrastructure 	

Climate hazard

Landslides



Climate hazard		
Landslides		
Transportation	Buildings	Natural infrastructure, land and parks
<ul style="list-style-type: none">• Damage to roads• Damage to vehicles from hail	<ul style="list-style-type: none">• Damage or destruction to buildings	<ul style="list-style-type: none">• Damage to vegetation• Formation of artificial dams
Water infrastructure		Electrical infrastructure
<ul style="list-style-type: none">• Damage to assets		<ul style="list-style-type: none">• Transmission interruptions

Adapted from Jessica Doyle, et al., pp. 12-16; Jonathan Bebb and Jim Kersey, pp. 41-51. [52](#) [53](#)

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Chapter 7

Strengthening public health emergency preparedness and response

Key takeaways

- ▶ Aligning emergency operations plans and procedures with asset management strategies strengthens institutional preparedness for disasters, shocks and emergencies, but it is not enough; key stakeholders need to build operational readiness to act accordingly in times of uncertainty.
- ▶ Proactive asset management provides a first line of defense. When faced with situations of unanticipated scale and immeasurable impact, governments can use Emergency Response Asset Management Action Plans (ER-AMAPs) to mobilize key assets and resources for quicker, more effective response and containment.
- ▶ A strong and inclusive recovery requires revisiting the local asset management framework and identifying the measures and interventions that will maximize public infrastructure investments and community wellbeing for generations to come.

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The terms in **bold** can be found in the Glossary.

This handbook has focused on the core elements of best practice in asset management. This chapter applies key tools, processes and lessons covered in previous chapters to the challenge of strengthening crisis preparedness and emergency response within asset management systems. There are many types of crises that can induce a state of emergency and/or cause serious disruption to the functioning of a community.¹ They range from climate hazards discussed in the previous chapter to natural disasters, economic downturns and humanitarian crises.

This chapter focuses primarily on infectious diseases and public health emergencies. However, the notion that good asset management is a first line of defense when the delivery of essential public services is under attack applies widely to many major events, as does the guidance for mitigating and addressing them. **Infectious disease preparedness** is defined as actions taken in advance of an outbreak or epidemic to ensure adequate control measures that prevent the worst impacts, facilitate fast and effective relief, and create a path of recovery from immediate public health, economic and social consequences.²

Your local or national government's tangible assets — physical infrastructure, buildings, equipment, property and land — are the first line of community defense against the potential harm from communicable person-to-person diseases, vector-borne and zoonotic diseases outbreaks and other acute public health events. **Vector-borne and zoonotic diseases**, such as malaria or avian flu, are caused by the transmission of pathogens that spread through vectors, like mites or mosquitos, or through direct contact between animals and people. During a local public health emergency or disaster, asset managers and service operators serve as frontline emergency responders, in addition to other groups, like policemen or medical doctors, who usually have more visibility. A key lesson from the **coronavirus disease 2019 (COVID-19)**

pandemic is that core local government assets are an important resource for formulating and implementing local disease control responses as well as social and economic recovery.

In this chapter, you will learn about infectious disease preparedness in asset management systems and how to apply an **emergency response asset management action plan (ER-AMAP)** to a major disease outbreak. You will also review how certain assets can be included in economic and social recovery programmes following a major disease outbreak or epidemic event and the importance of transforming your asset systems in light of high consequence and emerging infectious diseases with pandemic potential.

7.1 Strengthening infectious disease preparedness in government asset management systems

Assets play an important role in achieving disease prevention and broader health outcomes at the individual, household, community, city and national levels. Some government assets, like water treatment plants, sealed water supply reservoirs and wastewater treatment facilities, are vital to preventing exposure to biological hazards and toxic chemicals that threaten community health. Your government may also share operational responsibilities and financial obligations with other stakeholders, like in the private sector, for the basic assets involved in infectious disease prevention and control. These assets can include health care facilities, testing equipment, vaccine storage, early warning systems and the specialized treatment facilities for medical waste.

Despite impressive progress on vaccines and therapies, considerable damage and losses from infectious disease outbreaks seem to occur regularly. Many towns and cities around

the world have not been adequately prepared to respond to epidemic and pandemic-prone acute respiratory infections caused by coronavirus or the influenza virus. When communicable disease outbreaks follow a major natural disaster or industrial accident, the consequences can be catastrophic for vulnerable groups like infants, children and the elderly.



Photo © Henitsoa Rafalia/World Bank

Since the COVID-19 pandemic, strengthening infectious disease preparedness is now a major priority for asset managers in local and national governments around the world. Infectious disease preparedness in asset management systems is an essential part of general emergency preparedness, but with an emphasis on measures to deliver efficient and appropriate response and relief actions implemented in a timely and precautionary manner.³

Infectious disease preparedness efforts often focus very narrowly on health care facilities and systems. This chapter will emphasize a broader perspective on infectious disease preparedness in government asset management systems. The tangible outcome of this work is **emergency operations plans (EOPs)** and procedures, along with training and education for local leaders, asset managers, service operators and other internal and external stakeholders. EOPs are formal plans that identify and coordinate standard precautions and measures to be taken, the resources required and who is responsible for what actions in the event of an emergency in an effort to reduce room for failure, anticipate potential scenarios and minimize the degree of impact. The following sections will explain how to develop EOPs for public health emergencies.

This broader perspective recognizes that many of the assets under national and local government control can help prevent or control viral and bacterial infections that are contagious and known to spread rapidly. The purpose of preparedness work is to reduce as many direct and indirect effects of public health emergencies (see Figure 1) caused by disease outbreaks as possible.

There are six basic steps to introduce or improve infectious disease preparedness in your asset management system (see Figure 2).

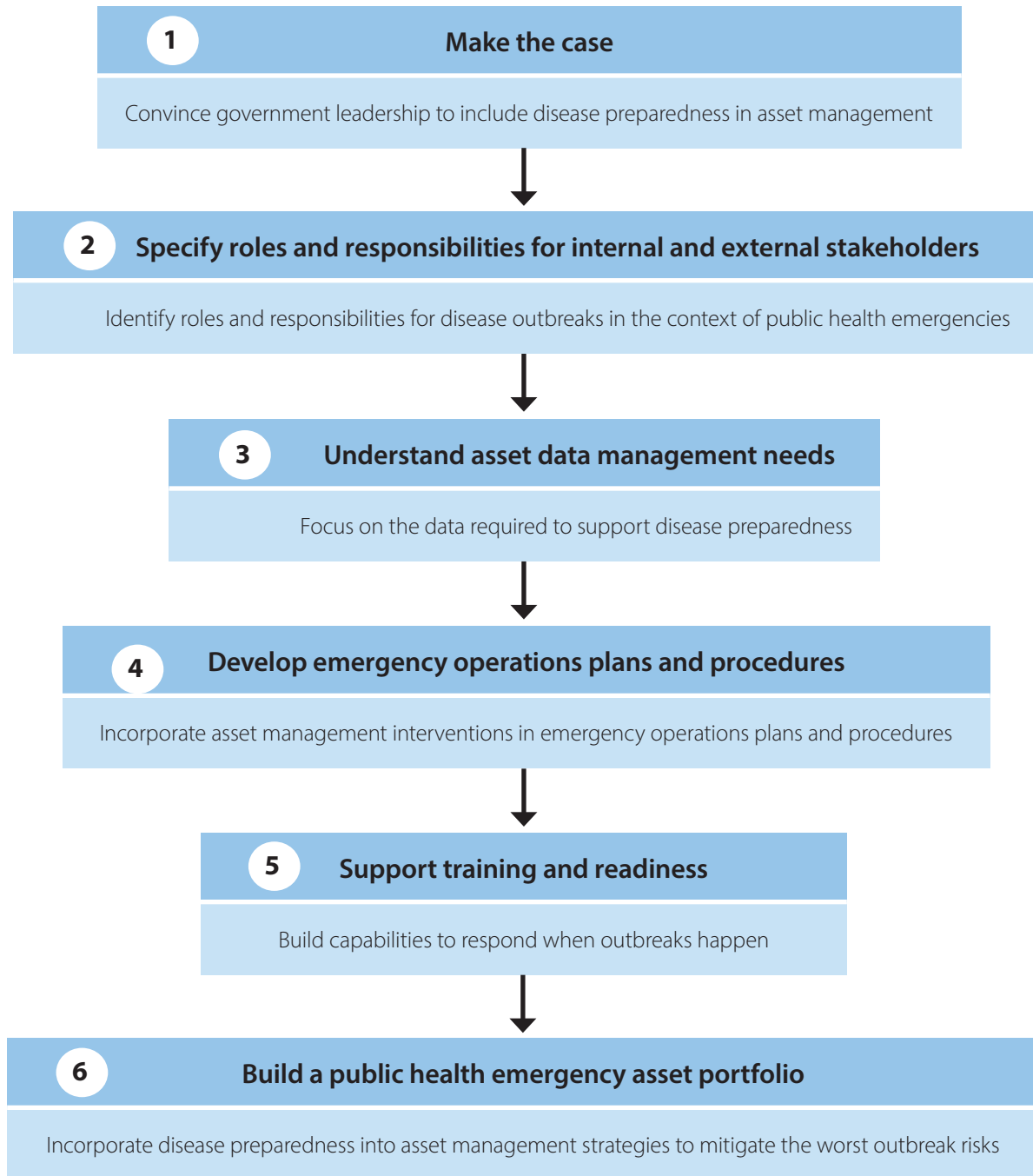
Figure 1

Effects of public health emergencies

Direct effects	Indirect effects
<ul style="list-style-type: none"> • Fatalities • Injuries • Illness • Lost income • Relocation costs 	<ul style="list-style-type: none"> • Threats to public safety • Social unrest • Negative impact on psycho-social development of children and youth • Unemployment • Damage or destroyed public facilities

Figure 2

Six steps to increase infectious disease preparedness



7.1.1 Step 1: Make the case for disease preparedness

The first step to increasing infectious disease preparedness in government asset management systems is making the case for it. This is

not always easy. Relevant national and local authorities might not have the technical background to make the connections between assets, infectious disease prevention and public health. The immediate benefits of preparedness are not always visible. Political

leaders and budget officials who control the allocation of financial resources to asset management activities might prefer to focus on other needs.

1

Make the case

Convince government leadership to include disease preparedness in asset management

It is difficult to predict how national and local government assets contribute to the incidence of infectious outbreaks, their transmission speed and geographic spread, and the outcomes of diseases. It is even harder to do this for emerging pathogens with epidemic and pandemic potential.

Your national public health and safety framework might identify bacterial or viral pathogens of priority concern. Though these laws, policies and regulations might not directly address government assets, they often contain provisions that shape how national and local governments and businesses should prepare for certain infectious disease threats.

Still, a key lesson you will learn from Chapter 8 on the enabling environment is that implementation and the ongoing process of improving asset management practices must largely happen at the local government level, if it is to be effective. Data from previous local outbreaks can be a useful source of information for communicating the urgency of increasing infectious disease preparedness across local asset systems. Other local factors strongly associated with the emergence and spread of infectious diseases include:

- Rapid changes in land use
- Sharing a local environment with wild animals
- Low supply of safely treated water
- Low clinical diagnostic capacity.

Making the case should therefore focus on how preparedness planning can help improve

asset management performance, reduce vulnerability in local populations and mitigate the worst social and economic consequences of local disease outbreaks. These are standard goals in broader public health emergency management, but they can be easy to disregard. Other benefits of infectious disease preparedness — and emergency preparedness in general — include:

- Saving lives
- Protecting poor and other vulnerable groups in slums and informal settlements
- Reducing stress on the health care system and protecting critical assets and resources
- Avoiding the spread of severe negative health outcomes across communities
- Minimizing or preventing financial losses
- Reducing economic recovery time.

Finally, making the case for strengthening infectious disease preparedness requires access to senior leaders. In local governments, this includes the mayor, council leaders, the town clerk, chief public health officer and chief engineer. Connecting your proposed disease preparedness activities to an existing asset management strategy is a good place to start.

7.1.2 Step 2: Specify roles and responsibilities

2

Specify roles and responsibilities for internal and external stakeholders

Identify roles and responsibilities for disease outbreaks in the context of public health emergencies

As you learned in Chapter 1, asset management involves working with a variety of internal and external stakeholders. Some internal stakeholders, like health department officials or water treatment engineers, may already be aware of the local risk context for disease outbreaks. They will be key partners in your preparedness work. Other internal stakeholders may have no basic education or

training about infectious disease biology, modes of transmission or human exposure to pathogens.

The updated International Health Regulations of 2005 define a **public health emergency of international concern** as, “an extraordinary event which is determined, as provided in these Regulations: (i) to constitute a public health risk to other States through the international spread of disease and (ii) to potentially require a coordinated international response”.⁴

National governments are not always best placed to conduct local asset management. However, in many areas of infectious disease control and emergency response, it is essential to rely on technical, financial and personnel inputs and resources from national authorities. International health regulations confer many responsibilities and requirements for pathogen surveillance on health ministries and specialized agencies in national governments.

National health and emergency management policy and regulations often include guidance on the division of roles and responsibilities between levels of government. National health and emergency policy frameworks might also include standards on how and when you collaborate and communicate with communities, civil society organizations and local businesses. You should reference national and subnational regulatory frameworks as you set out to work with local stakeholders.

Early efforts to work with internal and external stakeholders to define roles and responsibilities should aim to:

- Build a shared vision around managing local threats of infectious disease.
- Identify technical, financial and community resources for working together.
- Assess level of commitment by different asset managers and operators to address public health, disease prevention and

control, and emergency response in asset management systems.

- Set work activities for collecting data (see next section) and timelines for agreeing on roles and responsibilities.

If infectious disease preparedness is a major local priority, you should consider forming a special working group or intersectoral task force to lead activities on defining roles and responsibilities for emergency preparedness and response. This group or task force could be led by your asset management champion. The mandate for this group is to engage all relevant internal and external stakeholders of your local government.

7.1.3 Step 3: Understand asset data management needs

3 Understand asset data management needs

Focus on the data required to support disease preparedness

The two main goals of your disease preparedness work are to (1) develop or update emergency operations plans and procedures and (2) provide training and education to increase operational readiness in the event of a major outbreak. Neither of these goals can be achieved effectively without understanding asset data management needs relevant to your local disease risk context.

Defining asset data needs for emergency operation plans should be led by public health officers, infectious disease scientists and national health emergency officials. For vector-borne diseases like malaria, yellow fever, chikungunya, dengue and schistosomiasis, asset data for outbreak preparedness could span water management and treatment as well as waste treatment and landfills. The relevant assets and service operator information might go beyond just typical medical

equipment and health facilities, depending on the local disease risk context.

You should work with both internal and external stakeholders to understand what they consider relevant asset information for disease control during public health emergencies.

Disease control functions can include:

- Event-based surveillance, laboratory diagnostics and early warning systems
- Testing, quarantine, vaccination, treatment and contact tracing
- Risk communication, public information and community consultation
- Health checkpoints, mobility controls and regulations on the use of buildings and public spaces.

A key initial step in supporting the development of an emergency operations plan and related procedures is updating asset condition data to the fullest extent possible. Regular physical inspection of local assets is expensive and might exceed your operations budget, but it is important for developing an emergency operations plan and procedures. You should prioritize physical inspection of health and emergency assets given their consequences of failure in normal times, let alone during disease outbreaks. The objective is to understand and record the broad functionality of your assets under different levels of stress from a major disease outbreak. On-site inspection means you can examine buildings and equipment for how they might function under different scenarios or levels of need. You can refer to Chapter 5, Section 5.3.3.2 for ratings used in on-site condition assessments.

Which assets should be physically inspected in advance of developing or updating an emergency operations plan and procedures for disease outbreaks? Start with health care and emergency medical service assets since they are priority assets for outbreak response and the consequences of their failure during a major outbreak are serious.



A municipal health center in Kushtia, Bangladesh
(Photo © Bidhan Krishna Das)

It is important to remember that the asset condition data you collect should be based on specific scenarios or levels of need for disease outbreaks, which are guided by the latest information on the bacterial or viral pathogens of priority concern in your locality. Figure 3 lists some initial assets to get you started. You should refer to the table covering physical condition ratings and descriptions from Chapter 5 to identify which criteria to use during the inspection.

For physical assets, you should track at a minimum the number of each type of asset (e.g. ambulances), as well as the location and condition of each individual asset.

These suggestions are only starting points for understanding asset data management needs for local public health preparedness. You need to ensure that information collected in your asset register database is up to date, complete and can be accessed in-person or remotely by public health officials and decision makers. Complete asset data are a key resource to improve the provision of critical public health services needed to address public health emergencies, as illustrated by efforts to combat HIV/AIDS in Indonesia (see Box).

Figure 3

Minimum data required for emergency operations planning

<p>Emergency medical and health facilities. These facilities involve those physical assets considered critical to disease prevention and outbreak control. These assets are formally recognized as falling under the local health care system.</p>	
Emergency medical services—number and location	Ambulances
	Response vehicles
Critical health facilities—number and location	Hospitals and clinics
	Emergency first-response
	Coordination control hubs
	Local emergency services sites
	Morgues and burial grounds
	Water treatment and distribution points and facilities
<p>Community resources and utility assets. Depending on the severity of the outbreak, you may need to rely on and repurpose public buildings and land in the vicinity to provide surge-level emergency health services. For instance, you may need to increase or prohibit access to locations or facilities where transmission risk is high, depending on the relationship between crowding and the mode of disease transmission.</p>	
Community resources—number and location	Schools
	Public buildings
Utility assets—location	Roads and bridges
	Water treatment plants
	Wastewater collection, conveyance and treatment assets
	Solid waste management facilities, in particular medical waste
	Power lines, generation and transmission facilities
<p>Population mobility and human settlements. Preparedness for health emergencies requires special sensitivity to vulnerable populations, such as those with special needs or those living in neighborhoods or locations that can be more susceptible to vector-borne diseases. Highly contagious diseases like cholera, severe acute respiratory syndrome (SARS, MERS, COVID-19) and Ebola focus attention on population data around more dense informal settlements where it might be difficult to comply with physical distance and quarantine regulations.</p>	
Population data	Population distribution within city
	Residential property concentrations
	Commercial property concentrations
	Timing and movement—where people work, live and crowd
	Location of special needs populations are in relation to critical assets

Assessing the condition of assets to combat HIV/AIDS in Indonesia

To combat the increasing rate of HIV/AIDS infection in Papua and West Papua, Indonesia, in 2012 and 2013, UNOPS supported the Rapidly Expanding Access to Care for HIV (REACH) in Tanah Papua Program under the Clinton Health Action Initiative. To start, 316 hospitals and health clinics were assessed to determine the availability of infrastructure services and the condition of facilities to support provision of health care services.

The study identified facilities with restricted or no permanent electricity supplies; those relying on wells, rainwater, rivers or other water sources of uncertain quality; and sites with poor waste management

practices due to a lack of modern or affordable means. Under REACH, all assessment information was captured in a GIS database, which presented the information visually to improve strategy development and decision-making. The results from the assessments informed critical upgrades to the facilities to ensure the appropriate level of health care services could be provided to combat the spread of the virus.

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7.1.4 Step 4: Develop emergency operations plans and procedures

4

Develop emergency operations plans and procedures

Incorporate asset management interventions in emergency operations plans and procedures

National emergency or disaster policies and regulations typically define what must be included in an emergency operations plan. Requirements might include:

- People and agencies involved in the response to a disease outbreak
- A list of predetermined responsibilities and actions
- Threshold conditions that activate when and where specific responsibilities and actions take effect.

Figure 4 summarizes these three key elements.

Which people and agencies are most important for the emergency operations plan will depend mostly on your local context. Larger governments might have more health staff in specialized areas and across multiple asset

categories (education, health, water, waste), while smaller municipalities in rural areas might rely solely on a single chief engineer. In defining relevant people and agencies, do not overlook private sector and community-based providers or organizations. These sources of assets and facilities are important if surges in health-care demand happen following an outbreak.

At a minimum, EOPs for infectious disease agents should focus on standard precautions when an outbreak is suspected. Standard precautions will differ depending on the asset, although some general actions are common across different facilities and equipment. For instance, if an acute respiratory infection outbreak is suspected, physical distancing and enhanced respiratory and handwashing hygiene practices might be put into effect across all assets. Standard precautions at a health clinic might include more frequent use of **personal protective equipment** across waiting, examination, treatment, and critical care rooms.

You can start determining standard precautions by first focusing on either health clinics or other priority assets or facilities, like schools or water treatment plants. If you have the resources, aim to develop many EOPs and

Figure 4

Key elements of emergency operation plans and procedures



connect them to improve preparedness across many infrastructure systems.

The final step in writing emergency operation plans and procedures is to outline when and where emergency responsibilities and actions must be activated. To facilitate early and coordinated action, think about **activation triggers** — conditions under which predetermined plans, procedures or response packages would be automatically implemented.



Photo ©Tobin Jones/UN Photo

Activation triggers depend on selecting indicators related to illness or public health that trigger certain actions or release of resources. Asset managers should collaborate across different service operators and higher levels of government to identify the thresholds for these indicators. You should also check to make sure triggers and predefined procedures are consistent with national and subnational emergency management policies and strategies.

Conditions associated with a trigger will depend on your local context. Some factors to consider are local health-care capacity and levels of infectious disease outbreak readiness across stakeholders, local areas and the emergency response and health sectors. Elements and activities that could be assigned to different triggers include:

- Predefined work orders
- Predefined purchase agreements
- Predefined contractor engagements

- Predefined community consultation procedures
- Special human resource or personnel regulations
- Special allocation or reservations for equipment.

For instance, if an outbreak exceeds the number of seasonally predicted cases, predefined contractor engagements or reservations of equipment could be mobilized for rapid roll-out of coordination with emergency health services, risk communication or the expansion of testing locations and isolation sites.

The purpose of defining a trigger and assigning asset management activities is to streamline decision-making and reduce response time if an infectious disease outbreak grows beyond the control of health-care systems. By defining these activities and connecting them to threshold conditions, asset managers can create protocols that support broader government efforts to ensure services continue to function under stress.

The other benefit of defining triggers and procedures is to set expectations and create an initial structure in which future decision-making processes can emerge, even amidst the uncertainty created by disease outbreaks and other emergencies, like natural disasters, that may precede them.

7.1.5 Step 5: Train for operational readiness

5 Support training and readiness

Build capabilities to respond when outbreaks happen

Developing emergency operations plans and procedures is necessary for preparedness, but it is not sufficient. Disease outbreaks create stressful conditions for hospital and emergency medical services. They also impact asset

managers and frontline operators, either directly through infection or indirectly through increased pressures in their work environment. Are your asset managers and frontline operators prepared to respond under the most difficult conditions?

Readiness to implement emergency operation plans and procedures requires periodic training and education. Your asset managers or operators may not regularly interact with the internal and external stakeholders they will work with during a public health emergency. Personnel turnover of your frontline staff means that new operators will require basic education on disease biology, modes of transmission or human exposure to communicable diseases. Untrained asset managers and operators might cause service disruptions or unknowingly contribute to community transmission.

To increase operational readiness, work with relevant internal and external stakeholders to plan drills or exercises to practice emergency procedures and test the effectiveness of the emergency operations plan. You will need to design a drill that replicates real world circumstances. Doing so requires resources. You may need to bring on external consultants or advisors from regional and national governments who have specialized knowledge in developing scenarios and designing exercises. Running drills or conducting exercises using simulations of outbreak events can give your asset managers and frontline staff the opportunity to practice their training and work with other staff. It can also reveal gaps in your emergency operations plans and unforeseen problems that could arise under emergency conditions.

The overall objective of training and education is to increase familiarity with emergency plans and procedures and reduce the level of uncertainty during an actual disease outbreak or epidemic event. It will not be possible to formulate answers to all the problems that might be identified during an exercise, or that might arise during a widespread disease outbreak or epidemic. Still, being more aware of the level

of readiness among your asset managers and operators — who will implement emergency operations plans and procedures — can help you identify areas of improvement, and can save lives in the future.

7.1.6 Step 6: Build a public health emergency asset portfolio

6

Build a public health emergency asset portfolio

Incorporate disease preparedness into asset management strategies to mitigate the worst outbreak risks

Major outbreaks of diseases with pandemic potential — Ebola, COVID-19, or pandemic Influenza — wreak havoc on local systems. How can asset managers be sure to institutionalize disease preparedness across asset management systems?

Portfolio management, as you learned in chapters 1 and 2, is a basic tenet of asset management. In the context of local disease preparedness, a portfolio is a related group of assets that contribute to early identification, early warning, emergency response and containment. The composition of this group of assets will not be the same in every town or city. For instance, major capital cities might have a larger variety of assets than smaller towns. Large cities might own laboratories and testing facilities. Primary health clinics in smaller towns might be dependent on regional laboratories or vaccine cold chain storage facilities further away.

Developing a **public health emergency asset portfolio** can be complicated and takes time, but it is an important step, especially if your local disease outbreak risk context is high. The purpose of a public health emergency portfolio is to identify operational, tactical and strategic asset management options that can be implemented collectively across the physical assets that would be required to prevent

or contain a major disease outbreak and recover faster and more equitably. The portfolio is likely to comprise assets from different infrastructure systems, e.g. solid waste and water supply and sanitation, along with the health-care facilities themselves.

Public health emergency asset portfolio: A related group of assets that contributes to early identification, early warning, emergency response and containment surrounding public health crises.

Which assets should be included in a public health emergency response portfolio? The following questions can help narrow down your selection:

- Which of your current public health assets can support detection, testing, contact tracing and disease surveillance capabilities?
- What other assets are essential to support emergency response to disease outbreaks?
- What are the conditions of these assets?
- For each asset, what are the consequences of failure for your capability to respond to a disease outbreak?
- Which assets can be used to communicate risks and promote awareness around hygienic practices and risk-reducing behavior at the individual and community levels?

Building a public health emergency asset portfolio enables you to see the trade-offs and opportunities from focusing your asset management activities on specific facilities and equipment. For instance, even if you have modern testing equipment in your primary health facilities and handwashing stations near all residential concentrations across the municipality, poor performance on maintenance and cleaning in live animal markets or abattoirs can create dangerous conditions for an unforeseen outbreak.

Another example is the trade-off between providing potable water (drinking water standard) and providing an adequate quantity of water that does not meet drinking water standards.

During the initial response to a public health emergency, the asset manager's focus on supplying adequate but non-potable water to communities for handwashing could be more beneficial than trying to ensure drinking water standards when treatment plants may be unable to cope with the additional demand.

A portfolio management approach to strengthening emergency preparedness and response gives you a better picture of needs, challenges and opportunities in your asset portfolio. For example, a portfolio-wide perspective can help you:

- Pre-position personal protective equipment, testing kits, handwashing or other hygiene material and equipment around high-risk locations.
- Compare the benefits and trade-offs from spending on different assets that ultimately achieve similar outcomes (e.g. considering lower-cost risk communication activities against higher-cost hand sanitizing equipment).
- Discover opportunities to allocate resources to otherwise neglected local assets, like emergency shelters or live animal markets.



Photo © Linda Newton

It is critical to consider your local context when defining the public health emergency asset portfolio. This is not only about focusing on local health-care assets. Safety problems with other assets or facilities — like food and commodity markets, public buildings, transportation, logistics and supply chains into and out of your local jurisdiction — can create hotspots or vectors for community transmission. By combining and managing assets as a public health emergency portfolio, you can introduce practices that will improve disease control and prevention and potentially reduce the pressure placed on your emergency operation plans and procedures.

Exercise 1

- a. Specify roles and responsibilities for internal and external stakeholders for disease outbreak in your government, in the context of public health emergencies (Step 2).

- b. Identify potential technical, financial and community resources your government needs to gather to strengthen disease preparedness across its asset management systems.

7.2 Mobilizing asset management activities to avoid a public health disaster

Incorporating public health emergency preparedness planning within your existing asset management systems can improve your capabilities to respond to the next major disease outbreak or epidemic event. This chapter has outlined some steps for initiating that work, along with more advanced options like building a public health emergency asset portfolio.

As an asset manager, you know that even the best plans cannot eradicate all the possible modes of transmission and spread that are connected with outbreak and epidemic events. After a natural disaster or industrial catastrophe that causes human injuries and fatalities and damages your physical assets, the likelihood and consequences of different viral and bacterial outbreaks can be extremely high.

Disasters involving these types of cascading effects are becoming more common. It means that even with your efforts at preparedness planning and operational readiness, major public health events can overwhelm your capacity to respond. These conditions increase the possibility of a local outbreak emergency escalating into a regional or national health disaster.

Acute public health events

Major disease outbreaks often begin as acute public health events. The World Health Organization defines an acute public health event as “any event that may have negative consequences for human health. The term includes events that have not yet led to disease in humans but have the potential to cause human disease through exposure to infected or contaminated food, water, animals, manufactured products or environments.”⁵

How do you respond to a major outbreak or epidemic event where the pathogen and mode of transmission is either unknown or unconfirmed? The response begins after an

Improving local health infrastructure amidst Ebola outbreak

In response to the 2014 Ebola virus disease outbreak in West Africa, UNOPS worked closely with the Government of Liberia to provide support in a number of areas. These included the rehabilitation of existing health infrastructure; provision of logistical support and improvement of waste management systems. The primary objective of these interventions was to create a safe environment for the public, patients and healthcare professionals. These measures allowed support workers to focus on the needs of communities affected by the virus without affecting the normal hospital operations.

UNOPS support was based on an infrastructure needs assessment which was used to create targeted interventions to respond to the crisis and support prevention of future disease outbreaks.

As part of the government’s Ebola emergency response project (EERP), a new Ebola triage and isolation facility was constructed at the F J Grante hospital in Greenville, Sinoe County. The project included a solar PV power system and the rehabilitation of the hospital generator. The new building ensured a safe operation environment for the Liberian health workers and improved the capacity of the local health facilities to deal with the effects of the Ebola outbreak. In terms of improving the hospital’s resilience to future public health emergencies, including the occurrence of Ebola, the subsequent April 2017 meningococcal outbreak in Sinoe County was successfully contained using the new facilities.

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infectious disease outbreak has been detected. This means the situation has progressed beyond simply an acute public health event. During this period, government might have extremely limited knowledge of viral, clinical, vector and host factors causing the observed illness or death in the affected population.

The options presented in this section are designed to support rapid action when preparedness tools like emergency operation plans and procedures are either not available or prove inadequate relative to the emergency. They help ensure that asset management responses are consistent with the level of assessed risk from the acute public health event. The severity and scale of the disease outbreak will dictate the response.

7.2.1 Sound decision-making amidst uncertainty

Major disease outbreaks and epidemics are often marked by great uncertainty. Local and national authorities must work together with communities and businesses to make complex decisions using incomplete, imprecise and dynamic information.

It is therefore important to ensure that asset response decisions are supported by evidence and sound reasoning—so that they can be explained, internally to asset managers and service operators, and externally to the wider public. Local asset managers can contribute to sound decisions by providing the latest data from asset inventories and other specialized information related to the social, economic, environmental and physical conditions of the affected area.

The condition of your assets will be a key factor that determines how, where and when government responds at the outset of a major disease outbreak or epidemic. However, the final decision to allocate resources to different asset management responses should be driven by evidence of the assessed health risk to the local population.

7.2.1.1 Using asset information for rapid risk assessment

Emergency asset response measures should be guided by epidemiological and contextual evidence collected as part of a rapid risk assessment led by public health authorities.⁶ Public health officials will lead a rapid health risk assessment to determine the level of risk to different communities. This can require data and information from local asset managers.

How can asset managers and service operators constructively contribute to rapid risk assessments? Accurately characterizing communicable disease outbreak risk in the context of an acute public health event entails three assessments: hazard, exposure and context (see Figure 5).⁷

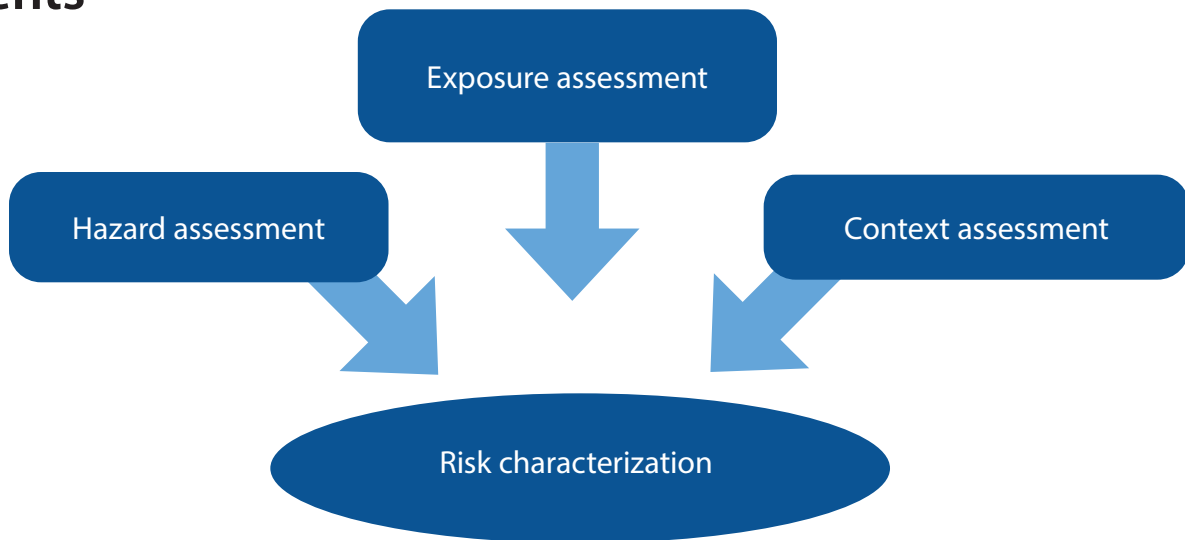
- *Hazard assessment* focuses on identifying the biological, chemical or physical agent that is causing adverse health effects.
- *Exposure assessment* focuses on the individuals, groups or populations exposed to the agent, their observed symptoms and the characteristics of transmission.
- *Context assessment* focuses on the environment in which the outbreak event takes place. Core members of the local asset management team are more likely to be involved with context assessment.

Collecting and analyzing the information required to accurately characterize levels of local risk requires collaboration among diverse internal and external stakeholders. For instance:

- Where local health authorities are responsible for public health services like diagnostic testing and therapeutic treatment, the asset management team should coordinate with them.
- If it is suspected that the outbreak is linked to a zoonotic disease, providing information to national or regional animal health sector focal points will be important.
- Scientists from national health ministries and emergency management agencies,

Figure 5

Assessing outbreak risks during acute public health events



Adapted from WHO

National guidelines on local outbreak risk assessment

National and regional government emergency management systems might include guidance and specific requirements on public health risk assessments for determining local asset management responses. This can include standardized procedures for rapid health risk assessment or for accessing national funding channels in response to a declaration of health emergency. New emergency laws and ordinances might supersede existing provisions, depending on the severity of the situation—for instance, if the disease outbreak comes alongside a natural disaster.

For example, in August 2020 Tropical Storm Laura devastated the Dominican Republic right in the middle of hurricane season as well as the COVID-19 pandemic.

Adding to several casualties and thousands of evacuations, the storm reportedly damaged 101 water systems and 152 electric systems.

The country proceeded to activate Emergency and Disaster Committees and other existing mechanisms, but also relied on new assessments to ensure the response protocol was adapted to COVID-19 and targeted the most distressed localities. The protocol reveals the importance of considering how to strengthen local capacity when it comes to repairing secondary roads, restoring water access, reinstating electrical power and other rebuilding efforts. For instance, a network of provincial directors administered road clearance and debris removal in the affected communities.⁸

often with support from the World Health Organization, lead more extensive risk assessments on highly infectious pathogens with epidemic and pandemic potential.

Let's focus on context assessment. As you learned in Chapter 2, risk is the interaction of likelihood and consequence of an impact

in a given place and time period. Context information provided by asset managers and service operators is important for health officials to adequately characterize what is an acceptable level of risk. Doing so will provide useful information to guide your emergency asset response.

Scientists, disease specialists and public health officials involved in the hazard and exposure assessments will request specific information on local assets depending on the characteristics. Four general questions related to local assets can guide context assessments (see Figure 6).

Answering these questions requires looking across the different assets under local control. For example:

- If public health officials suspect the outbreak stems from a vector under local government control, those involved in the hazard and exposure assessment might require specific information on related local assets.
- If a water-borne disease is suspected, they might ask for maintenance and performance data on water or wastewater treatment facilities or stormwater drains.
- If the disease hazard is assessed to be highly contagious or consistent with a disease typically found in another region, they might

request asset information on the location and use of entry and exit roads or paths into and out of the municipality.

7.2.1.2 Preventing critical asset failure

The sudden presence of a major disease outbreak will inevitably raise expectations that critical local assets (those most important to the delivery of the government’s objectives) perform at the highest level. This might mean identifying reactive operations and maintenance to accommodate unexpected changes in the level of demand.

Specific assets can be affected directly or indirectly by a major disease outbreak (see Figure 7). As you learned in Chapter 1, unmaintained assets can cause disruptions of essential services, exposing people to dangerous conditions and prompting social unrest.

To prevent failure of these critical assets, you will need to check the preventive maintenance schedules of your health assets and accelerate scheduled inspections and minor maintenance

Figure 6

Measuring the role of local assets through context assessments

Question	Sample responses
What factors associated with local assets under government control increase the local population’s vulnerability?	<ul style="list-style-type: none"> • Crowded market spaces • Lack of sanitation and handwashing facilities
Are there local assets that can be used to help identify suspected cases?	<ul style="list-style-type: none"> • Use of public land for testing sites • Local hospitals with testing kits • Public health communication equipment (mobile SMS)
Do any factors associated with local assets under government control reduce the local population’s risk of exposure?	<ul style="list-style-type: none"> • Quarantine sites and accommodation • Mobile food distribution networks • Water supply system and treatment facilities • Sanitation systems • Solid waste removal and containment
What is the availability and accessibility of government assets to support effective prevention measures and other non-pharmaceutical interventions?	<ul style="list-style-type: none"> • Traffic management • Public land to provide space for mobility • Insecticide spray equipment

activities that are necessary to prevent failure. How can you determine which assets to prioritize for immediate attention? You can conduct a rapid asset risk assessment to help determine initial priorities by quickly ranking the likelihood and consequence of failure for a specific asset for the emergency health response.

Local asset managers and operators can combine their specialized knowledge with the most recent data collected in the asset management registry database to quickly assess the likelihood of failure and the consequence of failure for responding to the outbreak event. You can score the likelihood and consequence of failure on a scale of 1 to 5 (1 being lowest; 5 being highest). Figure 8 gives a simple example of prioritizing assets on the basis of risk of asset failure.

Whichever asset receives the highest score should be considered for immediate maintenance and operations attention to prevent failure. Depending on the characteristics of

assessed risk for the outbreak, more than one critical asset may need to be prioritized in operations to prevent more catastrophic cascading failure across multiple assets. Failure in one asset can increase or magnify a variety of direct and indirect effects from initially small and controllable disease outbreaks.

It is also important to remember that your assets make possible a range health and emergency response services. Figure 9 presents the services that your assets can enable for the provision of healthcare and emergency response.

Depending on the characteristics of the outbreak and pressure on the health care and hospital system, pressure will also fall on maintaining and operating the services provided by assets other than your emergency medical facilities and equipment. These will be addressed later in the chapter.

Until modes of transmission are identified

Figure 7

Assets affected by disease outbreaks

Directly	Indirectly
Health facilities (hospitals and clinics, laboratories) Equipment Cemeteries Public facilities Transportation hubs	Waste collection Water supply systems Wastewater collection and treatment Electric power generation and distribution Food distribution Camps for internally displaced persons (IDPs) and refugees

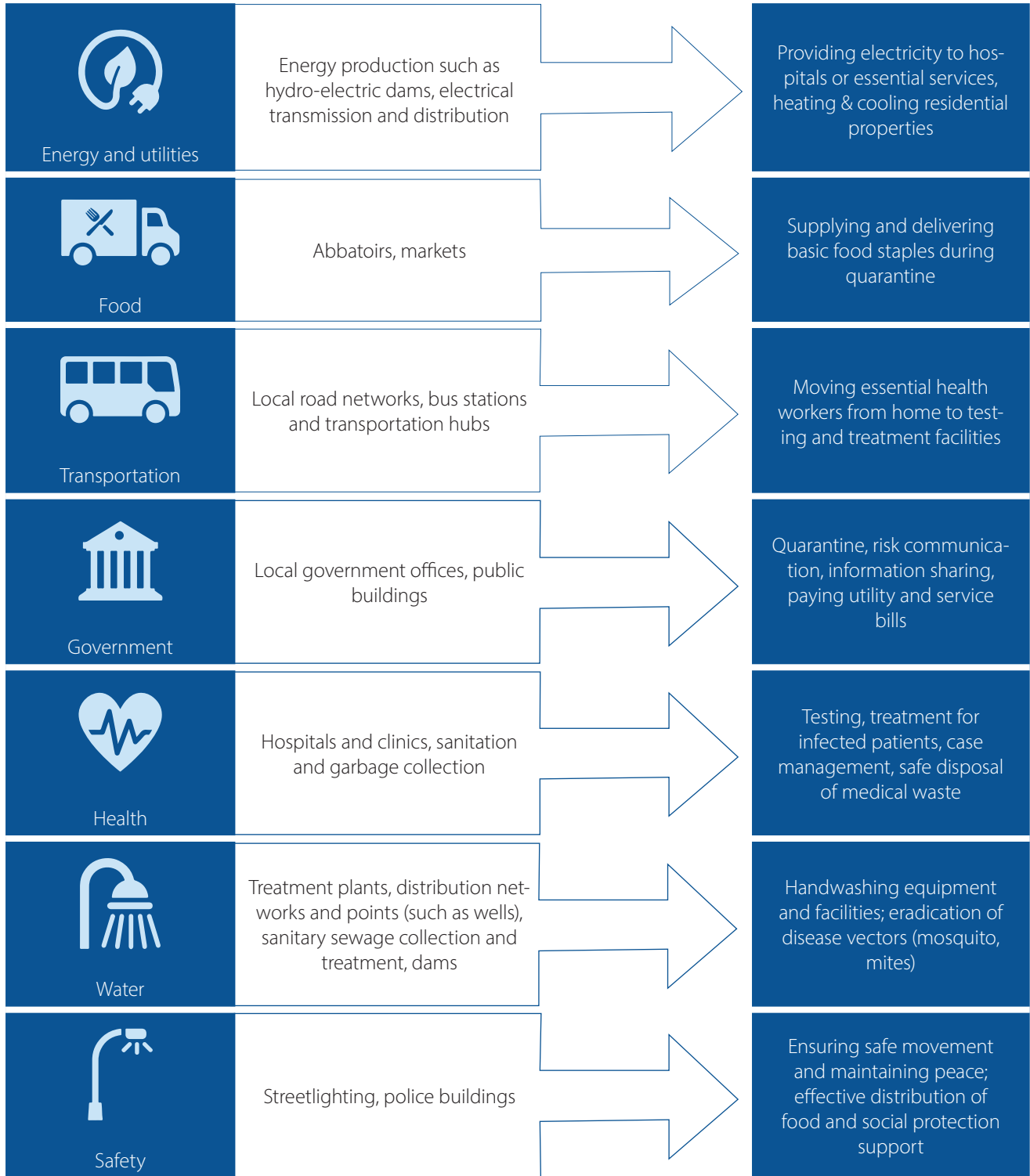
Figure 8

Assessing asset risk (example)

Asset	Likelihood of failure	x	Consequence of failure	=	Priority critical asset risk
Hospital	3	x	4	=	12
Water	1	x	2	=	2
Electricity	1	x	1	=	1

Figure 9

How assets can enable health and emergency response services



through a risk assessment, the precautionary principle should guide decisions about asset operations and maintenance for service continuity. Specific actions that risk severe harm to the public should not be taken without scientific evidence and high levels of confidence around the safety of populations affected by these actions.

7.2.2 Implementing the asset response

During major disease outbreaks or epidemic events, more people rely on assets in new ways and for many different reasons. Some of these reasons may be predictable, based on previous experience with diseases that are endemic to your community. Other reasons might come as a surprise and depend on the mode of transmission. Even if the actual incidence and geographic spread is low, outbreak events spark heightened community and local business concerns about asset conditions, and these can lead to unpredictable changes in how and when services are used. Public transportation use may decline rapidly, while residential water demand escalates beyond the capacity of your treatment and distribution network.

You learned in Chapter 4 that asset management action plans (AMAPs) are a way to close the gap between your organization's present asset management knowledge, practice and documentation against good asset management practices. In this section, we will focus on adapting the AMAP tool to help you organize, implement and monitor the asset response to a major emergency, such as a disease outbreak. A more streamlined version fit for the purposes of fast response under emergency conditions is the **emergency response asset management action plan (ER-AMAP)**. The ER-AMAP helps emergency responders and key decision-makers achieve high performance on key functions of emergency response when information is incomplete and levels of uncertainty are high.

Before writing an emergency asset response action plan, you should check for guidelines established in policies and regulations, such as public health protocols. You can use the following questions to start the development of your emergency asset response action plan:

- 1) Who will be responsible for writing the ER-AMAP?
- 2) What existing information can be collected and used?
- 3) Who are the relevant focal points in departments and agencies to collect new information?
- 4) How often will you update the ER-AMAP (daily, weekly, monthly)?
- 5) Who will monitor progress and implementation?
- 6) When will the ER-AMAP expire?

7.2.2.1 The purpose of your emergency response asset management action plan

ER-AMAPs should be used to fill in the gaps where an emergency operation plan covering relevant assets is missing, outdated or cannot be activated and put to use.

The first step is to identify the assets that will be covered in your ER-AMAP and agree on the purposes of your ER-AMAP. The selection of assets for your ER-AMAP should be guided by the conclusions of the rapid risk assessment, balanced by consideration of existing emergency operations plans.

Using the hazard and exposure assessments, you can list essential goods and services that must be continued. Work backwards to identify those assets under your control that ensure their availability to at-risk populations.

The main purpose of the ER-AMAP is to facilitate a fast and effective operational response to disease outbreaks and epidemic events.

This purpose should be broken down further into more concrete objectives and related actions based on the following factors:

- The assets you choose to cover in your ER-AMAP
- Your specific needs and financial resources
- Changes in decision-making authority due to emergency regulations.

Figure 10 lists some examples of purposes you might use in your ER-AMAP.

7.2.2.2 Updating emergency stakeholders, roles and responsibilities

In the next section of the ER-AMAP, you will include changes to internal and external stakeholders, their roles, and their responsibilities.

If the outbreak is severe, health authorities at the international, national or regional level might mobilize financial resources and materials to create a central command or operations center to guide the response. Emergency declarations often shift the authority for decisions upwards away from local officials, meaning you should update who can make decisions over the assets in your ER-AMAP.

7.2.2.3 Including transmission risk information in procedures

Your asset managers and service operators are frontline workers during a major disease outbreak. Their health and safety are essential to ensuring the continuity of social services during the emergency response period.

Figure 10

Objectives and actions in an emergency response AMAP

Key objectives for an ER-AMAP	Examples of related actions
Improve coordination	<ul style="list-style-type: none"> • Identify and document new emergency response roles played by asset managers and record responsibilities • Identify and document where local resources can be combined with assets owned by neighboring jurisdictions or national authorities • Communicate emergency operations and maintenance with neighboring jurisdictions and local authorities to execute collaborations across multiple localities
Protect the safety of frontline asset managers and operators	<ul style="list-style-type: none"> • Document new safety procedures or protocols for performing day-to-day asset maintenance or operations functions • Identify important roads and transport corridors to clear and maintain to safely move essential workers, residents and commodities across the municipality
Guide asset management responses through different emergency response phases	<ul style="list-style-type: none"> • Provide a baseline to assess whether the consequences of control measures are consistent with continuing risks to communities • Identify national public health emergency response resources that can close gaps in local actions • Record changes to emergency funding proposals associated with national emergency response resources

Depending on the contagiousness of the infectious disease outbreak and the mode of transmission, you might be required to update procedures for how your asset managers and frontline service operators maintain and operate assets. Updates could include the use of personal protective equipment, procedures for sanitizing facilities and equipment, or maintaining physical distance between service operators and end users.

7.2.2.4 Documenting emergency performance goals

Next, you can document your emergency performance goals.

Goals should be formulated to help prevent interruption of the services your assets provide, based on the evidence outlined in the rapid risk assessment. The goals should be stated in terms of reactive maintenance and operations activities that clearly indicate how they contribute to ensuring services continue to function within a specific time period. Continued functioning might require rotating the number of staff in offices or at facility sites more frequently.

7.2.3 Proactive operational planning to contain outbreaks

The emergency response asset management action plan (ER-AMAP) will help you implement and monitor reactive maintenance at the onset of the major disease outbreak. Bringing the outbreak under control, however, might require more extensive asset management changes at the operational level. As we learned in Chapter 2, operational planning entails the design of an asset, types of equipment needed for operations, and special training to create capabilities to operate and maintain equipment for the options chosen. Operational decisions after the initial reactive emergency response phase therefore aim to adjust existing service levels to bring disease transmission rates under control.

Major disease control measures like

quarantine or lockdowns, combined with the pressure to maintain the supply of lifesaving goods and services and support other social protection measures, will pull your asset managers and operators in many different directions. Major health emergencies require that all assets be made available to bring transmission under control, but also to mitigate adverse socioeconomic impacts of disease control measures.

Asset managers can use specialized knowledge to contribute to determining how the full range of assets, facilities and equipment under ownership by the local government can be used to support control measures. The general principle that guides these efforts is that asset support for control measures should be proportional to the level of risk.

Proactive operational measures entail retrofitting facilities and increasing asset performance. They can include:

- Regulating the use and operation of public facilities and land to surge levels of health care testing, vaccination and treatment.
- Increasing the availability of and access to water, sanitation and hygiene stations throughout the community.
- Retrofitting public buildings and transit facilities and equipment to minimize touching.
- Controlling road, logistics, transit hubs and warehouse facilities to guarantee delivery of medicines, food supplies and other basic goods.
- Repurposing and modifying public (community centers, emergency shelters) and private buildings (stadiums, offices) to provide temporary quarantine spaces, housing for homeless populations and childcare for essential workers.
- Modifying access to sidewalks, public parks and public land to control or limit crowding and provide additional space for safe forms of mobility.

You can use a simple matrix as an assessment framework to prioritize proactive asset

responses in line with available resources.⁹ Work with public health officials to combine information from the rapid disease risk assessment with the specialized knowledge of local asset managers. To help determine where you allocate your resources, multiply the likelihood by the consequence that a specific asset response will prevent further spread. Figures 11 and 12 below can help you to rank asset-based control measures.

The asset management team should use the latest information in the asset registry to provide input into discussions on the effectiveness of containment measures. A key contribution you can make will be on the

feasibility of asset measures for containment, given available human resources to execute the options and the condition of existing assets. To check the feasibility of a proactive emergency asset response, you can use:

- Maintenance records to determine if the physical assets involved in a proposed containment measure require immediate attention.
- Physical inspection data to determine if assets can be reallocated to new purposes to support a containment measure.

Once you have calculated your impact scores for the proactive response measures, you can plot them on a matrix such as that shown in

Figure 11

How likely is a control measure to prevent further spread?

Level	Definition
Almost certain	Is expected to prevent additional cases in most circumstances
Highly likely	Will probably prevent additional cases in most circumstances
Likely	Will prevent additional cases some of the time
Unlikely	Could prevent additional cases some of the time
Very unlikely	Could prevent additional cases under exceptional circumstances

Figure 12

Consequences of implementing control measures

Level	Definition
Minimal	No or limited negative impact on the economy, society and/or political climate; no ethical considerations
Minor	Minor negative impact on the economy, society and/or political climate; limited ethical considerations
Moderate	Moderate negative impact on the economy, society and/or political climate; some ethical considerations
Major	Major negative impact on the economy, society and/or political climate; significant ethical considerations
Severe	Severe negative impact on the economy, society and/or political climate; considerable ethical considerations

Figure 13

Risk matrix

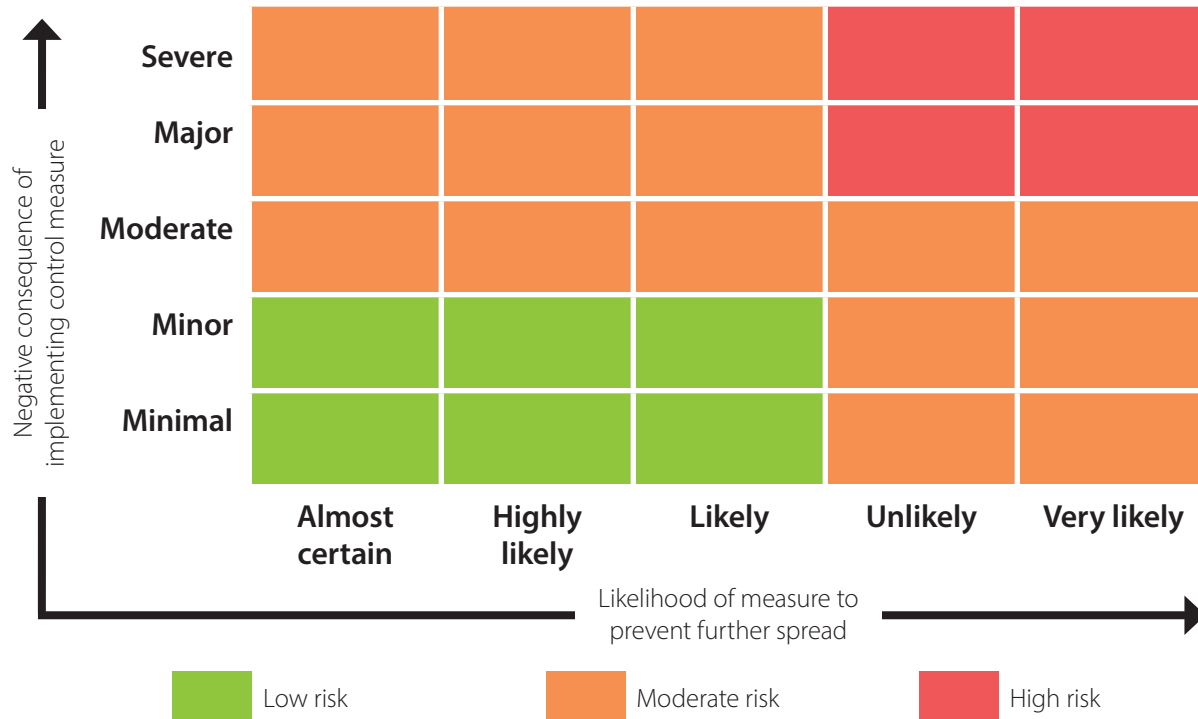


Figure 13. Options that fall into the green area should be prioritized, accounting for what is feasible and can be deployed fastest. Options that fall into the red area should be avoided.

7.2.3.1 Ensuring responses are consistent with risks

You should also keep in mind that other hazards or incidents can occur during the implementation of asset responses in support of broader disease control measures. Strong asset management responses like severely limiting mobility or closing off access to public markets might spark negative reactions or disagreement within affected populations.

This can happen when closing access to certain assets has an impact on direct access to food sources, household earnings and livelihood resources. The World Health Organization encourages involving legal officers in planning processes to help ensure that the

selection, implementation and enforcement of asset management responses do not infringe on human rights.¹⁰

7.3 Including local assets in social and economic recovery programs

Physical assets play an important role in reversing the damages and broader societal impacts of public health disasters. These are often the main goals of economic and social recovery programs. Local assets like roads, clinics, and streetlights enable activities geared towards recovery. Public buildings can display risk information. Local assets can be tactically integrated as options for new spending and investment to increase local employment, improve livelihoods and introduce new technology that makes towns and cities more resilient. Following a major

disease outbreak event, it is important for asset managers to consider how older planning and investment decisions should be revised to support economic and social recovery programs.

Economic and social recovery entails many different activities carried out along two general timelines: short term and long term. Short-term recovery activities begin with an assessment of damages and needs, along with emergency treatment, shelter and income support, and resumption of social service provision.

7.3.1 Revisiting the asset management framework

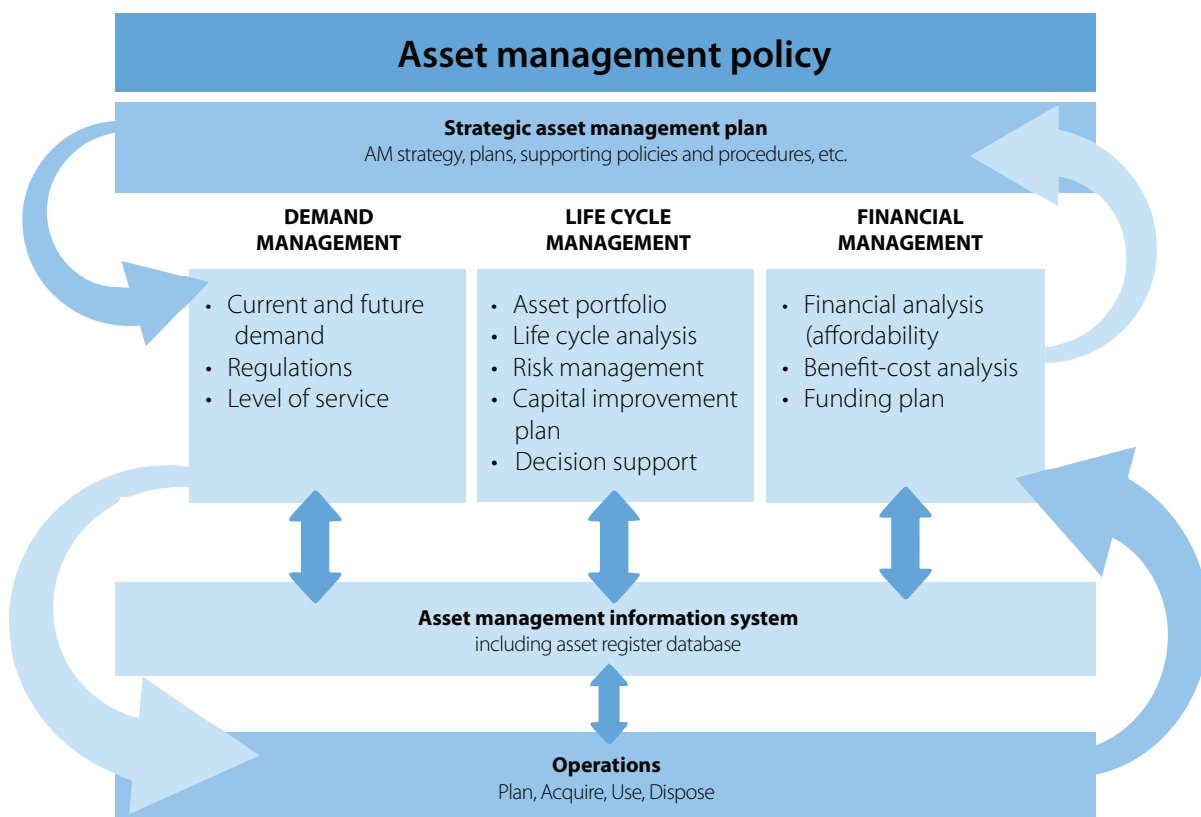
The urgency to build back better after a disease outbreak is an opportunity to revisit the three pillars of the asset management framework. Following many possible rounds

of reactive operational planning during emergency response efforts to contain the outbreak, economic and social recovery programs will look ahead and focus on a time period of 2 to 5 years. Recovery from a major disease outbreak provides the opportunity to make improvements across demand management, life cycle management and financial management. These are the three pillars of the asset management framework you learned in Chapter 2.

Some short-term recovery activities might already have been identified in disaster preparedness plans. Health clinics or other public buildings that might have been used to temporarily house, quarantine or expand testing and treatment capacity will have more than normal wear and tear and might need to be updated or expanded. For many of your emergency equipment or health assets, detailed physical inspection will be required. Physical

Figure 14

Asset management framework revisited



inspection means asset information teams will have the opportunity to identify corrective maintenance activities that might otherwise not be visible to local leaders. The next step will be to review depreciation schedules and/or calculate loss of service value to assets due to wear and tear. Depending on the assessment findings, asset disposal or replacement timelines might need to be changed.

If the outbreak occurred after a natural disaster, short-term recovery activities might require demolition and removal of condemned structures and debris along with safe disposal of medical and other waste. Major disease outbreaks highlight the need for new construction and retrofitting of infrastructure, but major construction projects should be limited until longer-term recovery planning processes can be defined and relevant stakeholders included. Because recovery activities can be so diverse, it is important to return to the asset management framework to guide decisions with long-term consequences.

Your local or regional government's economic and social recovery objectives will be a key influence over tactical planning within the asset management framework. This might require you to go beyond the emergency public health asset portfolio to examine where you are allocating resources and whether old acquisition and disposal timelines for other assets are still relevant. For instance, the COVID-19 pandemic has encouraged many local governments to prepare plans to move more local administrative and other public services online. This requires prioritizing information technology and procuring new hardware and software, along with updating asset registry databases. This is a major undertaking by all local governments.

You learned in Chapter 2 that the asset management framework guides asset management activities and is the link between national government and local government objectives and asset management. It is the roadmap providing a route from a major disease outbreak to economic and social recovery.

By revisiting the three pillars of the asset management framework, you can more efficiently improve services and maximize the broader social and economic benefits of recovery to your community from the assets under your control.

7.3.2 Tactical asset planning to build back better

Once you are ready to look past short-term recovery operations, you will need to focus on tactical decisions that are part of a 2- to 5-year recovery timeline. This section will briefly review options at the tactical planning level and examine what tactical-level decisions mean for investment and funding plans. Tactical planning decisions are an opportunity to align the ideas and desires of those most affected by the disease outbreak with recovery goals and projects.

You learned in Chapter 1 that the tactical planning level involves decisions around the type of asset, the organization of service provided by the asset, and its cost. What does this mean for how asset managers can contribute to economic and social recovery?

Photo © Linda Newton

Above all it means you should consider how



to increase the labor intensity of your asset projects, maintenance and operations. Construction projects like retrofitting public buildings, community centers, parks or other public spaces can be designed to employ more local laborers. Similarly, you can accelerate some projects to increase or repair borewells and water supply systems, roads,

stormwater drains and waste management systems. All of these options can be designed with the objective of increasing employment for local workers.

There are many additional benefits that you can generate from increasing the labor intensity of local asset projects, maintenance and operations:

- First, employment of local workers helps the local economy, which might have contracted during a major local outbreak event.
- Second, increasing opportunities for local work increases operational life of key assets, since local employment helps improve local skills to maintain, repair or upgrade the assets when necessary. These local skills and capabilities are particularly important during future public health emergencies because they allow for quick actions to surge necessary services that flow from your assets.

Increasing local food security is also an option that can be pursued at the tactical level. Localities with large concentrations of vulnerable populations often rely on expensive imported food products, when changes to local land use management might open up more opportunities for local food production that generate local income and employment.

Finally, major disease outbreak and epidemic events underscore the need for upgrading local assets where people come into close

proximity with zoonoses or vectors that carry zoonotic pathogens: public markets, slaughterhouses and live animal markets.

If the economic impact of the outbreak will negatively impact local budgets, special consideration at the tactical planning level should be paid to revenue-generating assets. Options to consider around tactical planning for revenue-generating assets include:

- Assessing revenue collection administration procedures and performance across different revenue-generating assets to identify underperforming assets
- Redeveloping underused land to generate more revenue and increase financial value for the community
- Investing in digital payment infrastructure that reduces in-person contact and retrofitting local payment sites to reduce crowding

Tactical planning options focus on a 2- to 5-year time period, so these decisions largely determine how equitable and gender-inclusive the recovery will be.

Consider the example of markets, since revenue-generating assets are a key entry point for local recovery programs.

Acknowledging that disease outbreaks and other health shocks magnify these common forms of gender-based discrimination, tactical planning to build back better finds opportunities to elevate women, their needs and their creative solutions to problems in

Managing markets to reduce gender bias and maximize community benefits

It is crucial that local governments ensure markets are safe spaces for women.

Many marketplace vendors are women. Marketplaces offer women the opportunity to advance their socioeconomic status, protect their livelihoods and improve overall well-being. But the gender bias

built into markets' organizational structure and management culture impedes women from taking these opportunities. In fact, local marketplaces can fail to even ensure women's safety. Women vendors are more likely to face threats, extortion, theft of their earnings, and violent displacement from their sites. Market managers may harass them for taxes and charge

double, forcing them to move away and take up another market position. Women also experience more sexual harassment and violence.

Marketplaces are often managed by local governments, comprised of elected leaders who are most often men, and frequently run by male local government employees. If their main concern is performance, measured by the fees and taxes they collect, the community may lose out on many other benefits from the market that go beyond revenue generation. Not only that, a new market may reinforce systemic social inequalities, with implications for who benefits—and who is harmed—by the new project.

The multiple benefits that markets provide to the community include, but are not limited to:

- **Childcare:** Vendors leave their children in the care of other vendors when they need to leave the market to complete other business.

- **Socializing:** Vendors are able to meet family members and friends at markets as they sell their produce.
- **Money lending:** Vendors are able to lend and borrow small funds from other vendors and repay them once produce is sold, or to barter produce or services to make repayments.

When planning and designing a new market—or any asset—governments should consult a variety of stakeholders (for example, vendors, social workers, health workers) in a bottom-up process. Community engagement can help put in place mechanisms to ensure that when the new asset goes into operation, benefits to the community are maximized and potential harms minimized.

Contribution provided by Kerry McGovern, of K McGovern & Associates, for the purposes of this handbook. Adapted with the author's permission.

recovery programs.

Figure 15 summarizes some of the short-term and tactical activities your local government may consider in a recovery plan:

7.3.3 Revising investment and funding plans

Tactical asset planning for economic and social recovery following a major disease outbreak requires making revisions to capital, operational and financial plans. Appraising options across different sectors like health, water and sanitation will involve consultations with managers who will be responsible for the asset, along with community leaders. A key question that will come up in these discussions is how will the local budget cover the costs of capital investments and new asset operations proposed as part of the economic and social recovery programs?

How you pay for capital investments and new operations will depend on different country conditions:

- Generally, fiscal transfers from national government-based emergency relief funds should be prioritized before spending your

own-source revenues.

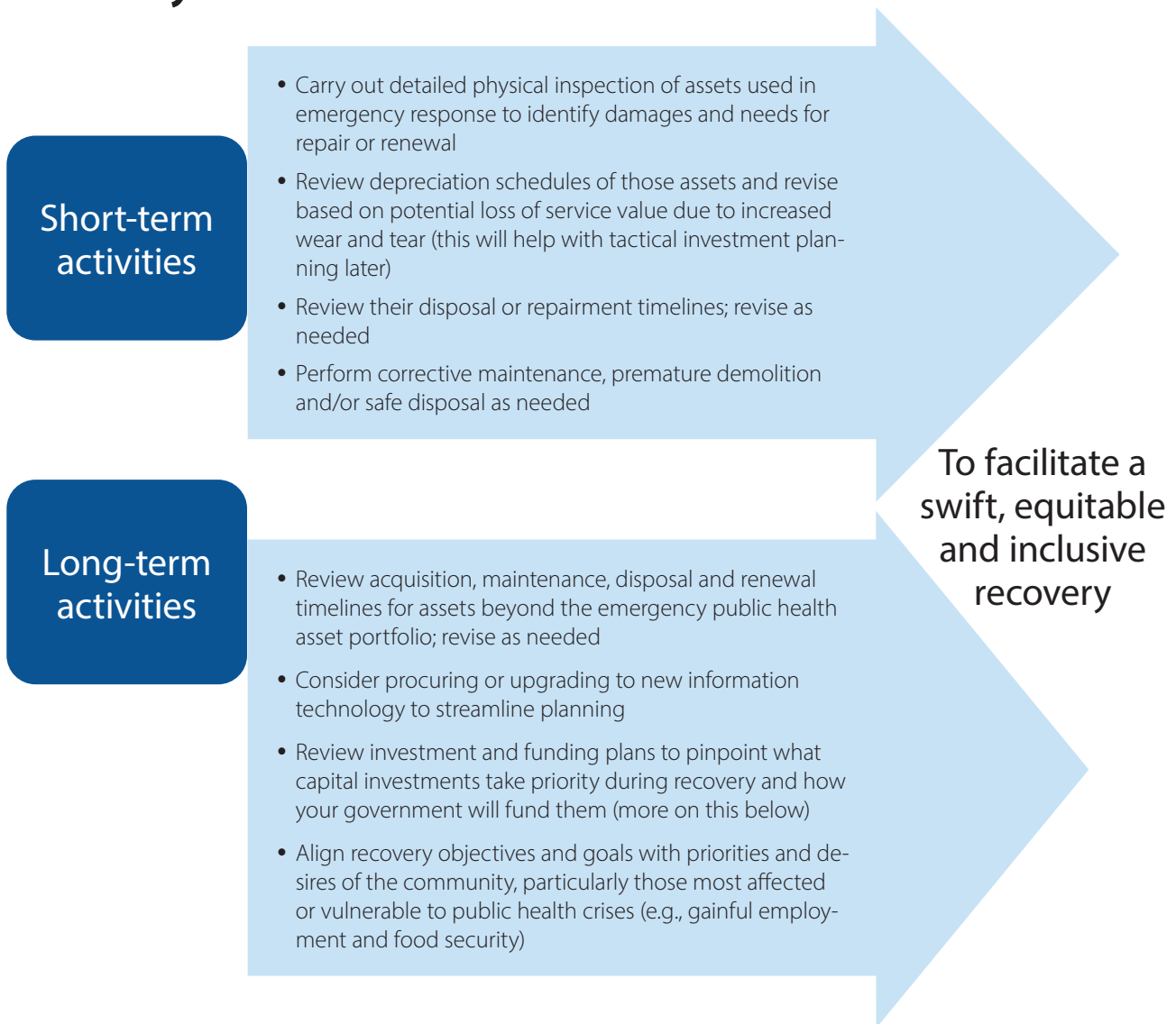
- Other options include donated funds from philanthropic organizations, other government donors and grants multilateral relief agencies.
- Own-source revenues such as property taxes, license fees and utility surcharges can be the most flexible source of funding, but they may not generate sufficient income to cover the cost of major recovery activities.
- If your local government has borrowing authority, loans can close any funding gap. Loan terms should be carefully assessed relative to existing debt levels and might require changes to long-term repayment plans.

To support economic recovery from the COVID-19 pandemic, some national governments have used operational expenditure block grants to fund local government support to local factories for hygiene and disease control. In Bangladesh, the national government used these funding tools to cover the costs of local governments purchasing sanitizing materials, masks and gloves, as well as printing risk communication information and messages on social distancing.¹¹

Some options for financing interventions

Figure 15

Short- and long-term activities for public health crisis recovery



during the transition into social and economic recovery phases are listed in Figure 16. The feasibility of these options depends on local and national political economy factors. Local authorities should consider renegotiating provisions or restrictions tied to sector capital grants so that they can repurpose existing funding flows. Careful attention must be paid to avoid triggering conditions outlined in legal or regulatory frameworks that might limit access to future funding channels from the

central to local level. Although there will be urgency to allocate available resources to economic and social recovery activities, the basic lessons around investment and funding plans from Chapter 2 will still apply. Identify the resources you have, estimate the spending gap, prioritize central and local own-source revenues to efficiently and effectively fill the gap.

How these funding sources help increase the speed and effectiveness of your crisis response program depends on a variety of

Figure 16

Funding instruments for recovery measures

Objectives and activities	Funding instruments
Increase the capacity of the local health care system	
Hire additional medical staff	Conditional or discretionary recurrent expenditure grants, operational expenditure block grants for light equipment and temporary staff
Procure medical and personal protective equipment	
Retrofit existing facilities and building new ones	Sector capital grants, public works capital grants, discretionary capital grants
Provide transportation for medical staff	Sector recurrent expenditure grants, operational expenditure block grants
Community awareness and mobilization	
Produce and disseminate information awareness materials online and offline	Conditional or discretionary recurrent expenditure grants, operational expenditure block grants
Set up local call centers to provide information and other mechanisms for public mobilization	Discretionary recurrent expenditure grants, operational expenditure block grants
Social protection measures	
Establish and operate food and non-food (particularly medicine) delivery systems for elderly and disabled	Philanthropic grants, conditional or discretionary recurrent expenditure grants, own-source revenues, operational expenditure block grants
Support providers of safe accommodation to victims of sexual or domestic abuse and their children	
Establish and operate meal centres and distribution points	
Retrofit public facilities to provide temporary shelter to homeless and other vulnerable populations	
Continued provision of social and economic services	
Expand or retrofit service delivery facilities	Conditional or discretionary capital grants, operational expenditure block grants
Retrofit public spaces to facilitate business operation	Discretionary capital grants, own-source revenues, public-private partnerships, operational expenditure block grants
Provide utility services to local businesses (depending on the provision modality)	Conditional recurrent expenditure grants, own-source revenues, operational expenditure block grants
Build quarantine centres	Conditional capital grants (important not to divert discretionary resources for this task carried out on behalf of central government)

Adapted from UNCDF

conditions. For instance, national disaster recovery funds may be disbursed very quickly and have short spending timelines. Health sector transfers that have extensive conditions attached to their use might take longer to access and use.

In response to the COVID-19 pandemic, some national governments have adopted new regulations to accelerate public investment in disease control and prevention at the local level. For instance, in Vietnam, the national government permitted provincial and local governments to engage in direct procurement and transformed public-private partnerships into 100 percent public investment projects.¹²

***“Collectively, as a global community we need to think how to support local governments to create their own revenue systems, as well as how they access financing mechanisms. (...) The establishment of a proper international fund for local infrastructure with both soft and hard pipelines in support of local service provision is today more necessary than ever.*”**

Parks Tau, Deputy Minister of Cooperative Governance and Traditional Affairs, South Africa and Former President, United Cities and Local Governments

Exercise 2

- a. Consider how older planning and investment decisions should be revised to support economic and social recovery programs to build back better from the COVID-19 pandemic.

- b. Identify short-term recovery activities from COVID-19 (i.e. assessment of damages and needs, emergency treatment, shelter and income support, and resumption of social service provision) for your local government.

7.4 Additional entry points for disease outbreak-resilient asset management

As local asset managers grapple with the many uncertainties and lessons learned following the COVID-19 pandemic of 2019-2020, increasing preparedness for high-consequence and emerging infectious diseases is urgently required. This chapter has underscored some basic entry points and key considerations for local asset managers and national governments interested in limiting the potential harm from communicable person-to-person and vector-borne diseases, zoonotic disease outbreaks and other public health disasters.

The COVID-19 pandemic has focused new attention among public health officials, infrastructure providers and asset managers on the severe damages and losses that can be caused by high-consequence and emerging infectious diseases with pandemic potential. For instance, there is now much greater concern around asset regulations for improving conditions of wildlife facilities and live animal and food markets. Asset management responses to major disease outbreaks present many opportunities to learn from experience and consider additional entry points to better respond to public health threats.

7.4.1 Engage communities

Your physical assets contribute to the wealth of your communities. They make it possible for vulnerable people to use services that improve their livelihoods and well-being. Community engagement can help improve your local asset management strategies, particularly after a disease outbreak.

Communities know what they need, so the real challenge is mobilizing the resources and willingness to ask them. Effective community

engagement builds partnerships with existing social and community structures. Having survived a disease outbreak, poor and marginalized people know how to mitigate the impacts of the worst consequences of infectious diseases in their neighbourhoods. Collecting and updating asset information to improve management performance after a health emergency is also a good entry point to get vulnerable groups involved and build community partnerships to support preparedness.

7.4.2 Connect public health to climate resilience

The continued threat of high-consequence and emerging infectious diseases is closely linked to climate change and changing patterns of land use, particularly in fast-growing secondary cities where urban settlements spread out and overlap with animal populations. Disease preparedness can be advanced as a key element of resilience planning, particularly when combined with strategies for reducing the local risks of broad exposure to multiple, overlapping climate hazards.

As discussed earlier in this chapter, the lessons learned responding to outbreaks can guide tactical and strategic asset planning exercises. They also can support efforts to mainstream climate adaptation and disaster risk reduction measures across short- (operational), medium- (tactical), and long-term (strategic) asset management plans (Dustin's chapter p. 41). Experiences with major disease outbreaks can encourage local governments, businesses and communities to prioritize resilience to the broader array of climate-related shocks and stressors that threaten vulnerable communities and businesses.

7.4.3 Influence the enabling environment

Lessons learned and performance gaps identified during a disease outbreak are also

valuable to improving national policies, laws and programs related to asset management. Where coordination and feedback between local authorities and partners in national government are strong, incorporating these lessons into revisions of national policy or intergovernmental financial frameworks can improve the enabling environment for asset management at the local level.

Collaboration between different ministries or sectors is essential to build coherent and integrated asset management strategies at the local level. As the experience of the COVID-19 pandemic showed, health outcomes are not simply the result of health care facilities. The production of good health outcomes depends on a wide array of water, sanitation, land and other infrastructure.

Changes in the division of responsibilities and authority between levels of government under declarations of public health emergency (for example, around procuring and deploying personal protective equipment or hiring health professionals for disease prevention) should be used to build back better through national asset management policies. Requiring local governments to write emergency operation plans and procedures is an important step to improving the stewardship of assets in a world where disease pandemics threaten to reverse the hard-won improvements that your asset management strategies, practices, and performance have made to the income, livelihoods, well-being and financial wealth of your communities.

Exercise 3

- a. Discuss how to engage your local community effectively by building partnerships with existing social and community structures.

- b. Explore lessons learned and performance gaps identified during the COVID-19 outbreak and how to address them for future health emergencies.

Endnotes

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Chapter 8

Establishing and sustaining a national enabling environment

Key takeaways

- ▶ An enabling national legislative and policy environment can unlock the benefits that flow from good stewardship of public assets. Such an environment consists of legislation, policies and programmes that not only reflect but reinforce the commitment and support of senior local and national stakeholders.
- ▶ National policymakers should keep in mind the assorted priorities, objectives and compositions across a local government sector to ensure that country-wide asset management policies and interventions align with the actual needs of local governments, who stand at the forefront of service delivery.
- ▶ Convening a multi-stakeholder technical advisory committee can guide and sustain the efforts of national and local officials to establish a supportive environment for asset management.

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The terms in **bold** can be found in the Glossary.

This chapter describes how an enabling legislative and policy environment at the national level can unlock the benefits that flow from good stewardship of public assets at the local level. We will outline steps your country can take to create a positive regulatory and policy environment in which local governments can practice good asset management.

Unlike the rest of this handbook, much of this chapter addresses considerations and actions at the national level. For this reason, it is particularly useful for practitioners and policymakers in central government. To the local-level reader, this chapter aims to provide information and insight that can be used to engage with national-level counterparts.

8.1 Balancing central and local responsibilities

Asset management is, and should be, primarily a local affair.

Municipal workers and asset managers are best placed to understand the day-to-day operational and tactical needs of public assets. Their understanding makes them more aware of the direct benefits and challenges involved in infrastructure and service delivery. Meanwhile, the mayor, elected officials and other community representatives fill more front-facing roles and will oversee resource allocation.

Through communication with operational and tactical staff, sometimes directly with the community (i.e. in town halls), these local leaders are well positioned to make strategic decisions that often involve making trade-offs—for example, between building a new school or water treatment plant, or how to plan maintenance to get the most out of a bus fleet while preserving resources for other assets, such as traffic lights or respirators. These functions are summarized in Figure 1.

At times, local governments delegate responsibilities to private contractors, e.g. garbage disposal. They can also pool their money,

Figure 1

Examples of asset management tasks and roles in local government

Level	Asset management tasks	Roles
Operational	<ul style="list-style-type: none"> Respond to operations and service request Conduct maintenance Conduct inspections 	<ul style="list-style-type: none"> Supervisor Operator Mechanic Technician
Tactical	<ul style="list-style-type: none"> Develop capital plans Optimize maintenance plans 	<ul style="list-style-type: none"> Director Manager Engineer
Strategic	<ul style="list-style-type: none"> Allocate budget for capital and operating expenses Endorse infrastructure investment plans 	<ul style="list-style-type: none"> Mayor City director City council or committee Chief Accounting Officer

expertise or both to overcome resource limitations and help their organizations run more efficiently (see box on inter-city collaboration). Inter-city and regional collaboration is particularly desirable when infrastructure assets and systems cross municipal boundaries, as with road, traffic or water systems.

Within local government, responsibility and accountability for asset management resides at the senior management level. According to the International Organization

for Standardization: “Top management may appoint an individual to oversee the development, implementation, operation and continual improvement of an asset management system, however, it is important that ownership and accountability for asset management remains at the top management level.”¹ Previous chapters highlight a similar distribution of asset management efforts between the executive and staff levels of a government or an organization.

The advantages of inter-city collaboration

Local governments, especially in smaller cities, can significantly improve asset management and economic performance by sharing resources with one another. Collaborative asset management agreements enable local governments to overcome the limitations of having small or even overstretched staffs and budgets. Cities can compensate for their inherent competitive disadvantages by collaborating and networking amongst each other.² In turn, cities are able to better integrate and leverage public assets, resources and knowledge to enhance physical (e.g. roads and utilities) as well as digital, social and other assets and connections.

One example of such collaboration is the Vancouver Area Smart Trek initiative, which began in 2000 as a way for secondary cities in southern Washington State, USA to pool information technology systems in order to improve and expand transportation services. It was later expanded to include collaboration and cost-sharing arrangements in water supply, education, conservation, recycling and emergency services.³ Participating cities have seen reductions in transaction costs for the procurement and maintenance of public assets, infrastructure and services, and in doing so, have been able to improve their growth and development prospects.

Meanwhile, local governments in Ecuador have been able to achieve economies of scale and improve the efficiency of asset use through collaboration in water, sewerage and solid waste asset management, ecological reserves conservation and traffic planning.

Inter-city collaboration is encouraged and coordinated at the sub-provincial level by a *mancomunamiento*, a public entity with its own legal identity.

In southwestern Loja Province, a *mancomunamiento* conducts weekly water quality tests for seven municipalities. Regular, automatic contributions from the municipalities ensure a steady operating budget while providing the municipalities with a routine service, freeing them from having to budget and pay for each individual test.

And in northern Ecuador, 15 municipalities participate in the North Region Traffic Association, which has created a public company, Movidelnor, to issue driving permits, inspect vehicles and enforce speed limits, and to conduct studies in support of municipal or inter-city planning and programme design. The company owns its assets, which include vehicles and inspection centers. It derives its operational budget from rates, penalties and fees.

According to the Association of Ecuadorian Municipalities, planning is a key element for the success of the *mancomunamientos*. Local governments need to clearly define their common objectives and expectations when it comes to sharing assets. In addition, it is important to agree on realistic operational, maintenance and capital investment plans.

The VAST example was provided by Brian Roberts and Joshua Drake from Cities Alliance for the purposes of this handbook, adapted with the authors’ permission. Similar examples are discussed in *Connecting Systems of Secondary Cities*, published in 2019 by Cities Alliance.

The examples from Ecuador were provided by the Human Settlements Unit of the UN Economic Commission for Latin America and the Caribbean, adapted from the *Manual de Gestión Mancomunada para la prestación de servicios—Asociación de Municipalidades Ecuatorianas (AME)*.

8.1.1 The role of central governments in asset management

National development goals, policies and regulations impact local services and local asset management. Central governments around the world have committed to implementing the Sustainable Development Goals (SDGs). However, officials and stakeholders at all levels recognize that this ambitious and far-reaching effort cannot fall only on central governments to achieve. Given the local nature of services like public health and sanitation, local governments are invaluable partners in adopting and carrying out national strategies driven by the SDGs. It has been estimated that up to 65 per cent of the SDG targets are the responsibility of local and regional governments.⁴

Consider SDG 6, which commits governments to “ensure availability and sustainable management of water and sanitation for all”.



In most countries, the responsibility to deliver water and sanitation services to the community falls largely on local governments. It is typically not a core service of the central government.

The implications for asset management are clear: Local governments will have to plan for, acquire, operate, maintain and finance the long-term infrastructure needed to meet national targets for clean water and sanitation laid out by the central government.

In the case of Nepal, the central government has developed a strategy, *Nepal Sustainable Development Goals: Status and Roadmap 2016–2030*, which describes six targets for SDG 6 and lays out indicators for each target.

The first target states: “By 2030, achieve universal and equitable access to safe and affordable drinking water for all.”

Some of the indicators for this target include:

- Proportion of population using safely managed drinking water
- Households with access to piped water supply
- Basic water supply coverage

While the central government has set an overarching national strategy, it is at the local level that governments implement the targets, using the indicators to measure progress. In turn, the central government should find ways to maximize and sustain local governments’ contributions to achieving this SDG.

Around the world, central governments influence how assets are managed. For example, they establish baseline levels of service by establishing design and operational standards. They also guide local infrastructure investments through, for example, national urban policies. In addition, central governments typically provide capacity-building support in the form of written guides, toolkits, grants, training and pilot studies.

Central governments usually retain the ultimate legislative and financial authority. Their involvement in asset management decision-making at the local level is guided by the principle of **subsidiarity**. The principle holds that decisions should be made closest to where their effects will be felt. As UN Member States declared in 2016, in their *New Urban Agenda*: “We will take measures to establish legal and policy frameworks, based on the principles of equality and non-discrimination, to enhance the ability of governments to effectively implement national urban policies, as appropriate, and to empower them as policymakers and decision-makers, ensuring appropriate fiscal, political and administrative decentralization based on the principle of subsidiarity.”⁵

So, what might subsidiarity look like in practice? What does an enabling environment look like, and how do central and local governments go about establishing one? We now turn to these questions.

8.1.2 Direct and indirect support for local asset management

Central government support for local asset management falls into two broad categories, direct and indirect, as outlined in Figure 2.






Smaller, often rural, communities typically receive more support from the national or subnational (e.g. provincial, district or state) levels than do larger ones, and this support is more often direct.

Each level of government has roles to play in the development of an enabling environment, and we will explore them in this chapter. The distribution of roles will depend on many factors, but the following scoping questions can help:

- What is the central government’s goal for advancing local asset management?
- Are there other levels of government (province, state, region, district) under which local governments are governed? Do we use them to coordinate local government services?
- Which assets are currently governed by which level of government?
- To what extent does your government currently follow the principle of subsidiarity?
- What resources are available within the central government to support local governments?
- What are the asset management capacity gaps and the support required by local governments?

Figure 2

Central government support for local asset management

Forms of direct support	Forms of indirect support
 <p>Data management</p> <ul style="list-style-type: none"> • Maintaining databases of asset inventory • Producing maps of asset inventory  <p>Advisory services</p> <p>Evaluating asset condition and remaining value</p> <p>Providing advice on maintenance programmes and capital investment plans</p> <p>Examples of direct support include:</p> <ul style="list-style-type: none"> • A province hosting digital asset inventories on behalf of rural communities lacking the means or technology to do this. • A district or larger municipality offering the analytical services of a technician and engineer to smaller communities at nominal cost. 	 <p>Capacity development</p> <ul style="list-style-type: none"> • Curating guides and best practices • Funding development of tools • Subsidizing AMAP development and use of expert consultants • Subsidizing training from third parties  <p>Legislative, regulatory and policy environment</p> <p>Reviewing and revising existing norms, rules and regulations to promote local asset management</p>  <p>Intergovernmental transfers</p> <p>Grants and loans that finance and incentivize sustainable local asset management</p> <p>Examples of indirect support include:</p> <ul style="list-style-type: none"> • A national association forming a program of capacity development cohorts to build and disseminate knowledge with central government funds. • A province embedding council endorsement of AMAPs in local infrastructure grant program requirements.

Exercise 1

a. List some of the concrete asset management tasks in your central or local government and the roles responsible for carrying out those tasks.

Level	Asset management tasks	Roles
Operational		
Tactical		
Strategic		

b. Conceptualize an inter-city collaboration between (one of) your local government(s) and another municipality.

c. What are some forms of direct and indirect central government support that you receive/extend?

Forms of direct support	Forms of indirect support
<ul style="list-style-type: none"> • • 	<ul style="list-style-type: none"> • •

8.2 Designing an enabling environment

Advancement of asset management across local governments is a process of continuous improvement that can take many years. The central government should establish clear criteria for a path to performance improvement that it expects local governments to follow. The criteria can evolve over time as local governments' needs and the central government's expectations change. Along this path, the central government should institute incentives and a support programme to nurture asset management. A multi-year budget commitment is required from the start to support the enabling environment.

8.2.1 Underlying goals of and practical approaches to central government support

A common goal of central governments in supporting local asset management is to maximize the value of past, present and future investments through good stewardship of assets so that they provide reliable and affordable services to the entire population.

An important first step in developing an enabling environment is to establish clear central government objectives. These express and reinforce the central government's motivation to support long-term positive change across the local sector. The objectives not only build a strategic rationale for asset management but help local governments shape their own objectives and operational principles, as described in Chapter 2, Section 2.2.

We will explore five practical approaches that the central government can take to support local asset management. The outcomes of each approach can help guide the central government in setting objectives for building and enabling local capacity. The approaches are shown in Figure 3.

Figure 3

Five approaches to advance local asset management



Each approach focuses on a different aspect of local asset management, as described in Figure 4.

Beware that as you use these approaches to advance asset management in your country, you will likely encounter a related question: should the central government legislate an enabling environment or keep it programme-based?

A legislated enabling environment is possible through national laws and regulations that dictate requirements and parameters for local asset management. A programme-based environment is characterized by capacity development incentives and initiatives.

Both methods can be effective in advancing the development goals of central and local governments. The answer to the question above will depend on your country's experience with each of these options, though it is

best to apply an approach that uses a combination of both.

The legislated enabling environment formalizes central government expectations that are necessary for local action. The legislation should include direction that makes local officials, such as mayors, accountable for asset management. Accountability means that asset management is more than a compliance exercise. For example, AMAPs being written to comply with national direction but not implemented for lack of involvement by local elected officials is a result of low accountability for asset management. This behavior likely will not advance the achievement of local or national development goals.

The programme-based environment should make capacity development support accessible to all local governments. The desired outcomes, as outlined for each approach in Figure 4, should be clearly and broadly communicated to help ensure a positive impact from the programmes.⁶

The five approaches are complementary, not mutually exclusive. For example, the good governance approach can be combined with the mechanisms of the asset reporting and financial reporting approaches. In this enabling environment, local governments could be expected to evaluate the state of their assets, use that information in a financial analysis and report the findings to elected officials in order to guide decision-making around the budget.

In cases where the central government requires the use of common tools by local governments, it must also provide training and support in the proper usage of these tools. Such support should be ongoing and evolve with changes in staff and technology.

When developing your country's distinct approach to asset management, it is important that you do not create a 'tick in the box' exercise for funding eligibility or compliance. This might not encourage local governments to

implement meaningful change in their asset management practices. You can mitigate such behavior by building incentives into whichever approach(es) you take and explaining the value of the outcomes from the perspectives of both central and governments. This ensures that local governments improve their asset management practices in a meaningful way and feel a sense of ownership in doing so. That way, the enabling environment is an effort that local governments *want* to keep building on.

8.2.2 Assigning budgeting authority

We keep with the idea that investment decisions involving trade-offs should be made locally. In designing and rolling out an enabling environment for asset management, you need to consider how the accountabilities and financial responsibilities referred to in Section 8.2 are distributed across varying levels of government. Key questions about asset management governance include:

- What level of accountability for asset management is currently placed on local government officials?
- Can local government officials make decisions on budget allocations?
- If so, what portion of the budget is subject to their decisions?

For instance, local governments that have Asset Management Action Plans (AMAPs) must have some degree of financial autonomy to implement them. In other words, they need to be able to acquire the necessary operating and capital funds and put them towards improving the management of a priority asset, as specified in their AMAPs. When local governments maintain some level of financial authority, they are able to take decisions on budget allocation with less dependence on outside funding and any attached conditions. Local officials are then held more accountable to ensure that they follow through on the

Figure 4

Five approaches—select mechanisms and outcomes



Outcomes

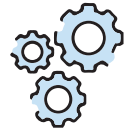


Mechanisms

Asset reporting

The central government:

- Outlines and standardizes a method to track asset condition, asset value and assess risk.
- Specifies how data will be inputted (the input form) for asset data collection.⁷
- Hosts the information in a central database with mapping capabilities for linear assets (e.g. roads, water pipelines) and other assets as needed.



Local governments assess their asset inventories and report asset information, including condition, to the central government on a periodic basis.

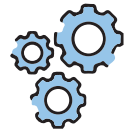


The central government has more detailed, structured and reliable information to guide their asset management policy and planning.

Local governments have a regularly updated inventory of their assets that includes their condition, value and risks, and can access a map of their linear assets.

Investment planning

The central government prescribes a method for identifying, scoping, describing and prioritizing projects (e.g. using data on asset condition), and specifies how data will be inputted (the input form) for project data collection.^{8]}



Local governments:

- Report a list of infrastructure projects identified as necessary for their community by asset type.
- Request project funding based on risk or other method prescribed by the central government



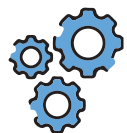
The central government can follow a more structured, standardized process to assess need and allocate infrastructure funding.

Local governments can make use of data on asset condition and other measures to support capital investment planning, and can create evidence-based lists of prioritized projects.

Financial reporting

Local governments:

- Submit financial plans and/or a rate application—the former can also be used as a basis for the latter.
- Include in their submission a short-term financial plan and a short-term capital investment plan, each spanning three to five years, along with a long-term financial plan that spans 20 years or more.⁹
- Report financial indicators such as operating surplus ratio and more.¹⁰





The central government has a better view of the differences in financial capacity and expectations across the local government sector. This helps them engage in more sound national financial planning, including for infrastructure grant programs, existing intergovernmental transfer mechanisms, etc.

Local governments have knowledge of their short- and long-term financial position, and can evaluate the impact of investment decisions on their financial position and indicators.

Capacity development

The central government:

- Mandates or creates incentives for projects and efforts that target underlying resource and capacity challenges. There is an emphasis on the ability of local governments to deliver quality services to their communities.
- Completes status checks on improvements through follow-up surveys



Local governments:

- Measure their asset management readiness using a standardized method such as the *Asset Management Diagnostic Tool* (see Chapter 3).
- Design and implement *Asset Management Action Plans* (on AMAPs, see Chapter 4).



Local governments:

- Improve their organization and asset management practices according to their own objectives, capacity and pace.
- Adopt and develop asset management practices that work for them.

Good governance

The central government mandates or creates incentives for projects and efforts that systemic political challenges (i.e. electoral cycles) that prevent local governments from operating with a long-term view.

Local governments adopt policies that specify their elected officials' involvement in asset management and expected asset management processes, including:¹¹

- AMAP endorsement by elected officials
- AMAP implementation support
- Annual review by elected officials of progress in implementing the AMAP with a strategy to address factors that impede progress
- Consideration of the AMAP in budgeting



The central government can realign incentives away from short-term decision making at the local level.

Local governments:

- Face public expectation that they will play a role in asset management.
- Must report on progress, or lack thereof, and explain how asset management needs are reflected within the local budget.

implementation of the AMAP, to the benefit of their communities.

Many local governments have at least partial financial autonomy to decide on the allocation of revenues across budget items. They may also have the ability to generate own-source revenues, e.g. taxes, user fees and business licenses. Typically, though, these revenues neither meet operational costs nor match the size of the local government's asset inventory, which drives the need for outside financial support. Sound asset management can help mobilize such support: As illustrated in Chapter 1, well-managed assets reduce expenditures, increase revenue sources and bolster the financial health of a local government. As a result, central governments and the private sector will deem the local government more creditworthy and feel increasingly comfortable to invest at a larger scale. The box "Strengthening asset management to access debt financing" illustrates the benefits of improved creditworthiness that results from

effective asset management.

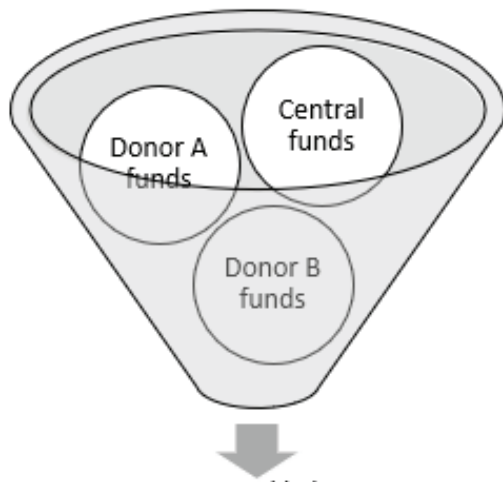
Grants from the central government or donors are essential sources of funding for infrastructure assets for local governments in developing countries. However, the funding is usually in high demand such that the central government or donor can effectively decide, or *earmark*, how local governments spend the money. Consequently, the funds may be wasted on infrastructure projects that were not local priorities. Moreover, local officials and communities may not feel as strong a sense of ownership in projects with predominantly outside funding.

Figure 5 illustrates the trends that result from earmarked funds, which prioritize central government or donor interests while dismissing local and evidence-based decisions on investments.¹²

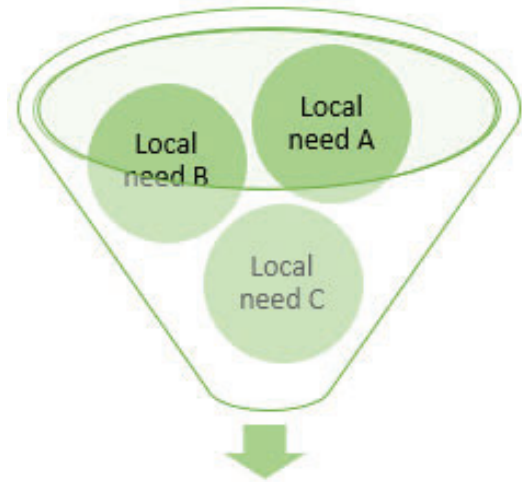
Realizing the sustained benefits of asset management can prove challenging if decisions about local capital and operating budgets are not founded on local asset management needs.

Figure 5

Central vs. local prioritization



Programmes more likely to prioritize central government and donor goals without consideration or at the expense of actual local needs



Evidence-based programmes more likely to prioritize local needs

8.2.3 The elements of success

Creating an enabling environment for local governments of all structures and sizes depends on building in the right incentive mechanisms and engaging in strategic collaboration with stakeholders (see Figure 6). In this section, we explore the importance of such factors and how to put them in place.





8.2.3.1 Align funding incentives



The right incentives can form the foundation of an enabling environment. They need to be aligned with the range of local priorities and principles of local decision-making and long-term planning. You can refer to existing legislation, such as a

Figure 6

Elements of success

 Align funding incentives	 Involve stakeholders	 Keep asset management multidisciplinary	 Make asset management accessible
Align incentives with local priorities and principles of local decision-making and long-term planning.	External stakeholders can contribute to creating and implementing an enabling environment.	Asset management can benefit from integrating a broad spectrum of skills, perspectives and professional backgrounds.	Long-term adoption of asset management entails different strategies for local governments with different capacities. Each strategy comes with its own tradeoffs and benefits.

Strengthening asset management to access debt financing

One important benefit of strengthened asset management is that it can help local governments gain access to debt financing for infrastructure development when other sources of financing are limited. This happens through two principal mechanisms. First, the demonstrated ability of local governments to effectively manage public assets and finances and to adopt a longer-term perspective on their financial position improves their credit rating, or their creditworthiness in the eyes of potential creditors. Second, an inventory of local government assets and a solid plan of how to manage, maintain and use them can provide valuable collateral for local governments to borrow against. A responsible and forward-looking management of local government assets can thus be a crucial step towards gaining access to debt financing, which in turn can help ensure the maintenance and expansion of the stock of local government assets in the long run.

Most local governments, with the exception of some larger cities, are currently not in a position to obtain loans or issue municipal bonds on the open market, and probably will not be able to for years to come. However, in Cameroon, Madagascar, Morocco, Tanzania and an increasing number of countries, institutional lending mechanisms have been put in place—often with the involvement of central government or development partners—that facilitate local government access to debt financing for infrastructure development while providing safeguards that help bring down interest rates and lower the risk of default. These lending mechanisms are often accompanied by technical assistance and capacity-building for borrowers to further strengthen their ability to effectively manage their liabilities and assets.

Contribution provided by Gundula Löffler, Research Fellow at Overseas Development Institute, for the purposes of this handbook. Adapted with the author's permission.

'Local Government Act' or even the country's constitution, to understand what falls under the mandate of local governments. With incompatible incentives, local governments may favor subsidized projects over those they had prioritized based on local needs. This reverses progress achieved under the local government's AMAP by redirecting resources to meet programme requirements stipulated by a higher authority.

In its intergovernmental transfer programmes, the central government should consistently encourage local governments to take a long-term, strategic approach to their investments in line with their AMAPs. These programmes should demonstrate an ongoing commitment to community-driven work that aims to place the majority of funding decisions in the hands of local governments. Your country can achieve this in several ways.

1. Build asset management into the assessment criteria for intergovernmental transfers.

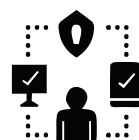
Existing programmes usually focus on a particular project to be funded. Instead, the national government can allocate funding based on how the local government has been managing its assets, including those outside the project in the wider asset portfolio. A broader assessment can shed light on why a funding application was submitted in the first place. Was it due to, say, inadequate maintenance? If so, poor stewardship of public assets should not be rewarded with subsidies, no matter how worthy the project may be. Once the underlying issue is addressed, for example, through the design, adoption and at least partial implementation of an AMAP, applications should be reassessed.

2. Scale expectations for local asset management according to the size and financial position of individual local governments.

A local government's size and financial stature are strong indicators of its ability to adopt asset management practices. Stakeholders

should therefore understand that one local authority might not have the same capacity or resources for asset management as another. Evaluations should consider and adjust for these differences, with assessment criteria designed not to discourage applicants but to drive them to improve current practices. By encouraging local governments to apply the Asset Management Diagnostic Tool (see Chapter 3) and AMAPs (see Chapter 4), the central government can understand some of the disparities between goals, resources and current practices within the local government sector.

8.2.3.2 *Involve external stakeholders*



External stakeholders can contribute to creating and implementing an enabling environment. Figure 7 shows three groups of external stakeholders and explains how they might be useful.

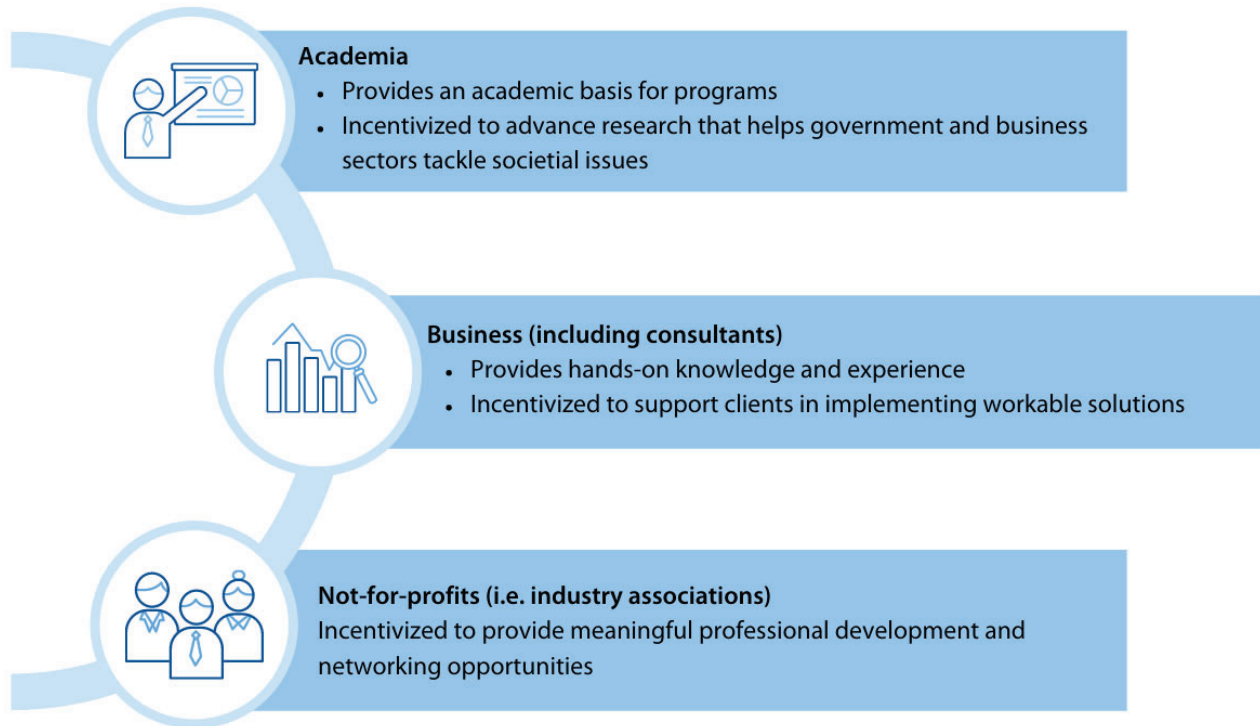
You will need to ensure the participation of potential partners or sector leaders with experience advancing values that align with asset management, such as improved governance. For example, a sector leader could be someone from academia, a non-profit (including NGOs) or industry who has helped improve access to potable water and sanitation.

Start by identifying businesses that provide infrastructure services and asset management advice, associations that offer professional development opportunities and not-for-profits that focus on municipal infrastructure. In countries where these stakeholder groups actively engage on asset management, central governments should consult them when developing and implementing the enabling environment.

The central government can also utilize existing networks, such as local government associations, that span multiple or all regions to jointly design the enabling environment for asset management. Such collaboration

Figure 7

External stakeholders and why they can be useful



can engage a large portion of the local government sector and secure political buy-in from stakeholders who have influence with member governments. This engagement takes a bottom-up approach and will ensure a sustainable enabling environment.

8.2.3.3 Keep asset management multidisciplinary



Asset management is not only a multi-stakeholder process but a multidisciplinary one. It can benefit from integrating a

broad spectrum of skills, perspectives and professional backgrounds. Therefore, the development and implementation of the enabling environment should explicitly encourage multidisciplinary efforts. The central government can do this in different ways.

1. Encourage a common understanding of assets and asset management among stakeholders with diverse perspectives.

After all, what an engineer or a land-use planner considers an ‘asset’ may not be the same as an accountant’s or an operator’s definition. A **technical advisory committee** can help establish common terminology, objectives and processes that all units of levels of government can understand and share. (We cover how to establish a technical advisory committee in Section 8.4.)

2. Promote multidisciplinary training to reinforce the common language as well as to prevent any one profession or group from dominating.

Communities of practice are a proven way to help practitioners of all professional backgrounds share lessons learned and develop solutions. The most effective communities of practice represent all the administrative, technical, and financial skills critical to sustaining local government services and assets.

A community of practice can be a collection of local governments working on shared issues.

Alternatively, it can comprise industry associations working together to develop resources and best practices. In either case, a community of practice can make it easier for central governments to roll out asset management programmes across the local government sector because members often come from all different backgrounds and have unique networks of their own.

8.2.3.4 Make asset management accessible



The journey to long-term adoption of asset management entails different strategies for local governments with different

capacities. Each strategy comes with its own trade-offs but also its own benefits, as shown in Figure 8.

It might prove difficult to determine when and how to account for the diversity of local organizations in your country. Let us look at some ways to make it easier.

1. Look for patterns.



During working sessions with stakeholders, explore the asset management challenges local governments experience and look for patterns between similarly sized municipalities. Use common scenarios when asking questions to identify the core issues and explain why they occur. For example, ask about experience of local staff having to make trade-offs between maintenance or rebuilding. Once you have grasped the core issue, understand why it arose, how it was resolved and how it could have been resolved differently.

2. Involve a technical advisory group.

This group can help review the findings from stakeholder engagement to determine how the enabling environment might differentiate between small and large local governments. Conduct follow-up consultations to validate what you have determined and get additional insight into the needs of different local governments. This will help your enabling environment produce outcomes suitable to governments of many shapes and sizes.

Figure 8

Trade-offs and benefits for small and large local governments

 <p>Small local governments</p>	<ul style="list-style-type: none"> • Small local governments may have few staff members, requiring each of them to play multiple roles. • The small size of these organizations can make it easier and more efficient to improve on existing practices and see a positive impact. They often seek support from the central or regional government to implement simple asset management solutions and methods that fit their size. • Because smaller local authorities make up a significant portion of any country's local government sector, ensuring that asset management is accessible to them can have a significant positive impact on service delivery across the country's population.
 <p>Large local governments</p>	<p>Large local governments have the benefit of greater resource capacity, but this comes with greater complexity. They often require more coordination to, for example:</p> <ul style="list-style-type: none"> • Determine the trade-offs between new and existing investments (e.g. new garbage trucks or building repairs). • Carry out initiatives involving more than one organizational department (e.g. finance and engineering). • Complete inter-jurisdictional planning.

“Many medium-sized municipalities and most small municipalities and Indigenous communities do not always have the necessary capacity to introduce asset management. This challenge is even greater in Canada’s smallest communities, some of which face high staff turn-over rates and limited access to training.

Infrastructure Canada, p. 13 ¹³

Exercise 2

- a. Choose one or more of the five approaches in Figure 4 and discuss how the approach(es) can advance local asset management in your country.

- b. Answer the key questions about asset management governance for your government:

i. What levels of accountability for asset management is currently placed on local government officials?

ii. Can local government officials make decisions on budget allocations?

iii. If so, what portion of the budget is subject to their decisions?

- c. Which external stakeholders can contribute to an enabling environment in your country? (You can refer to Figure 7 for some suggestions.) Who in academia, business or the not-for-profit sector specifically could participate?

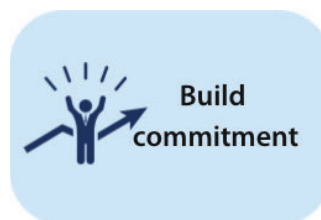
8.3 Establishing the enabling environment

How can a central government develop an effective environment for local asset management across its local government sector? The following phases and steps are collectively drawn from the experiences of central and local governments, not-for-profit organizations and businesses in Australia, New Zealand and Canada. Their experience is relevant to developing countries because it entails elements and processes common across all countries.

As shown in Figure 9, establishing the enabling environment involves three general phases.

In the first phase, you build commitment by formally obtaining political support and identifying key stakeholders who can advise you throughout this process. In the second phase, you identify and implement the approaches and mechanisms discussed in Section 8.3.1 that work for your country. In the last phase, you sustain the enabling environment developed. Just as you are following in the footsteps of countries with established enabling environments, others will follow in yours. Your efforts will demonstrate how to mitigate risks and ensure the continued advancement of local asset management across the sector.

8.3.1 Build commitment



To create an enabling environment best suited to your country, you need input from stakeholders who can help promote asset management

and put it into practice across the local government sector. Assembling a technical advisory committee of experts will prove essential to this. (See box titled “Establishing a technical advisory committee”.)

Before getting started, it is crucial that senior government officials with the right level of decision-making authority commit to asset management. Their commitment can provide some leverage and credibility to local governments, particularly those that are smaller and in rural areas, when they engage with groups outside your central government.

8.3.1.1 Establishing central government support

At the early stages of developing the enabling environment, local government officials may consult central government officials with decision-making powers and keep them regularly updated on their progress. Depending on the jurisdiction, these officials might be the Minister, Permanent Secretary, Vice Minister

Figure 9

Enabling environment development phases



or State Minister with responsibility over local government, infrastructure or other sectors from which local government programmes are issued. As key representatives of central government, they hold significant authority over the local government sector. Their decisions can influence how the enabling environment takes shape — and their continued commitment will ultimately determine whether it flourishes or fails. Therefore, they need to be engaged at every phase.

In the initial phase of building commitment, a good starting point is to discuss national investment and expenditure priorities. This can open up meaningful dialogue between elected officials, civil servants and local government stakeholders on, for example, how other countries enhance their infrastructure budgets. Ongoing dialogue is an opportunity

for both central and local governments to strategically propose new, more effective asset management practices. Once senior central government officials buy into local asset management efforts, they should formulate concrete, overarching goals for the enabling environment to guide these efforts (see Section 8.3.1). Goals provide an incentive for investing time and effort into the enabling environment.

In the next section, we look at the concrete involvement of a technical advisory committee in developing and supporting the enabling environment.

Establishing a technical advisory committee

Technical advisory committees, also known as technical working groups, have guided many central governments in developing an enabling environment for local asset management. Working with such a committee is the best way to identify gaps and capacity development priorities for asset management within your country's local government sector.

These committees can prove pivotal in determining the approach and mechanisms for creating an enabling environment. Subsequently, they can advise on ways to measure progress within the enabling environment. They also help ensure that the enabling environment actually meets the asset management needs of the local and central levels of government.

- When setting up a technical advisory committee, consider the following:
- The committee needs to be well rounded. It should include academics, consultants, local association representatives and local government employees drawn from different departments and positions.
- Where possible, committee members should be members of their professional community known for their contributions to local infrastructure management.
- Stakeholders that may negatively influence the process (e.g. those with strong vested interests) should not sit on the committee. They include individuals with political affiliations and solution vendors (i.e. firms that promote a proprietary tool).
- You should also avoid having elected local officials on the committee. Their involvement could hinder the process in which asset management capacity gaps need to be discussed openly and independently within committee proceedings. These gaps are within the administration of local government and should not become the topic of political discourse. Training local elected officials on asset management is an effective policy tool you can implement once you have created the enabling environment.

Local government professions and groups

- Finance officers
- Association of municipalities
- Public works operators
- Managers' association
- Land-use planners
- Engineers

8.3.2 Develop the enabling environment



Expanding on the previous phase of building commitment, the development of an enabling environment consists of five

key steps (see Figure 10):

- A. Exploring the state of local asset management and how it relates to central-level objectives.
- B. Consulting the local government sector.
- C. Proposing an approach for the enabling environment.
- D. Consulting again with the local government sector about the proposed approach.
- E. Implementing the programme.

These five steps are fundamental, and the order in which they are completed can vary depending on the needs and circumstances prevailing in your country. Some steps might need to be repeated, for example, in order to incorporate the many stakeholders involved. Figure 11 lays out five different sequences for developing the enabling environment based on the five steps. You can select the one that you think works best, or create your own.

While completing the five steps, there should be follow-up meetings between senior central government officials and practicing local governments to ensure the work continues to align with the set goals for local asset management (see Section 8.2.1). This can sustain support from the central government and give it opportunities to provide direction at key moments where decisions about next steps are needed.

Feedback from senior government officials should not focus on methods—the *how*—for developing the enabling environment or

Figure 10

Steps to develop an enabling environment

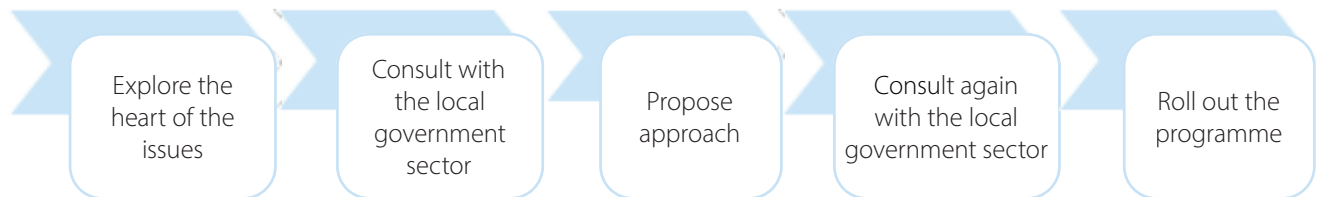
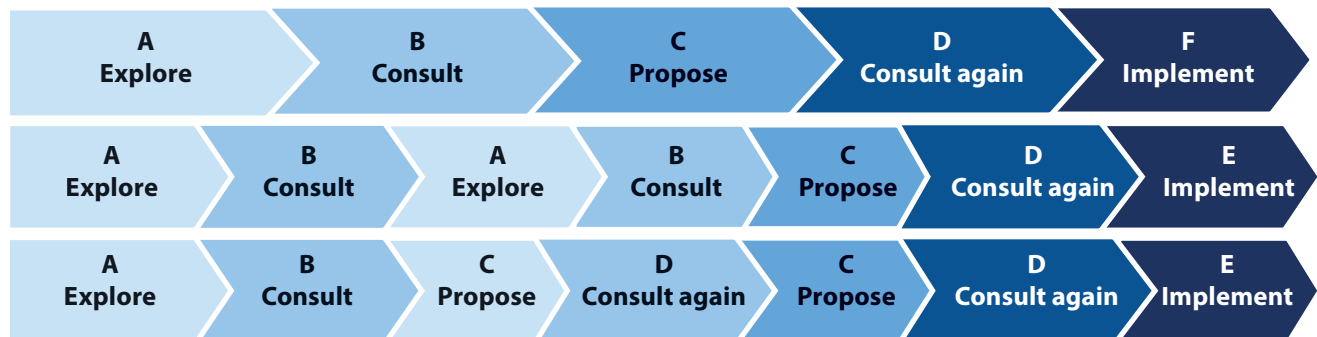


Figure 11

Potential development sequences



advancing local asset management. Rather, their input should focus on the desired outcomes—the *what*—of the enabling environment. Senior officials will lead most effectively by keeping everyone’s attention on the goal, not by unilaterally determining policy options.

8.3.2.1 Exploring the issues

Explore the heart of the issues

This exploration step aims to set local asset management challenges in the context of central government objectives. Here, you also identify

long-standing pain points and convert them into opportunities for improvement. This can reinforce the need and demand for an enabling environment. Engaging in such dialogue helps to gather background information with which to design the enabling environment and a programme to achieve and sustain it.

To gather this information, you should establish a technical advisory committee and assign someone as the central government technical focal point for an enabling environment. Then, you should familiarize committee members with asset management basics, as presented in chapters 1 and 2. This will ensure a wide spectrum of central and local stakeholders shares a common understanding of the basics before applying it to their own experiences. Take note of committee members’ questions and comments as they learn about asset management. These will give you your first glimpse into local realities.

During follow-up working sessions, examine with the committee how local governments currently experience each aspect of the asset management framework, described in detail in Chapter 2 and revisited in Figure 12. Produce a broad picture of the current state of asset management across the local government sector. Be sure to discuss the following:

- Infrastructure funding
- The distribution of central and local government asset management responsibilities
- How the distribution impacts the quality of local services

During discussions, gather specific feedback pertaining to your local government sector. You may need many working sessions spread over multiple days for the committee to agree on their assessment of the current state of local asset management in the jurisdiction.

Preliminary findings from the working sessions can be shared with high-level central government officials as a way to keep them informed and invested in the process, but it should be made clear that the findings remain to be validated through sector-wide consultation.

8.3.2.2 Consulting local governments

Consult with the local government sector

Consultations with the local government sector will serve to validate the committee’s assessment and, more importantly, to get broader and deeper

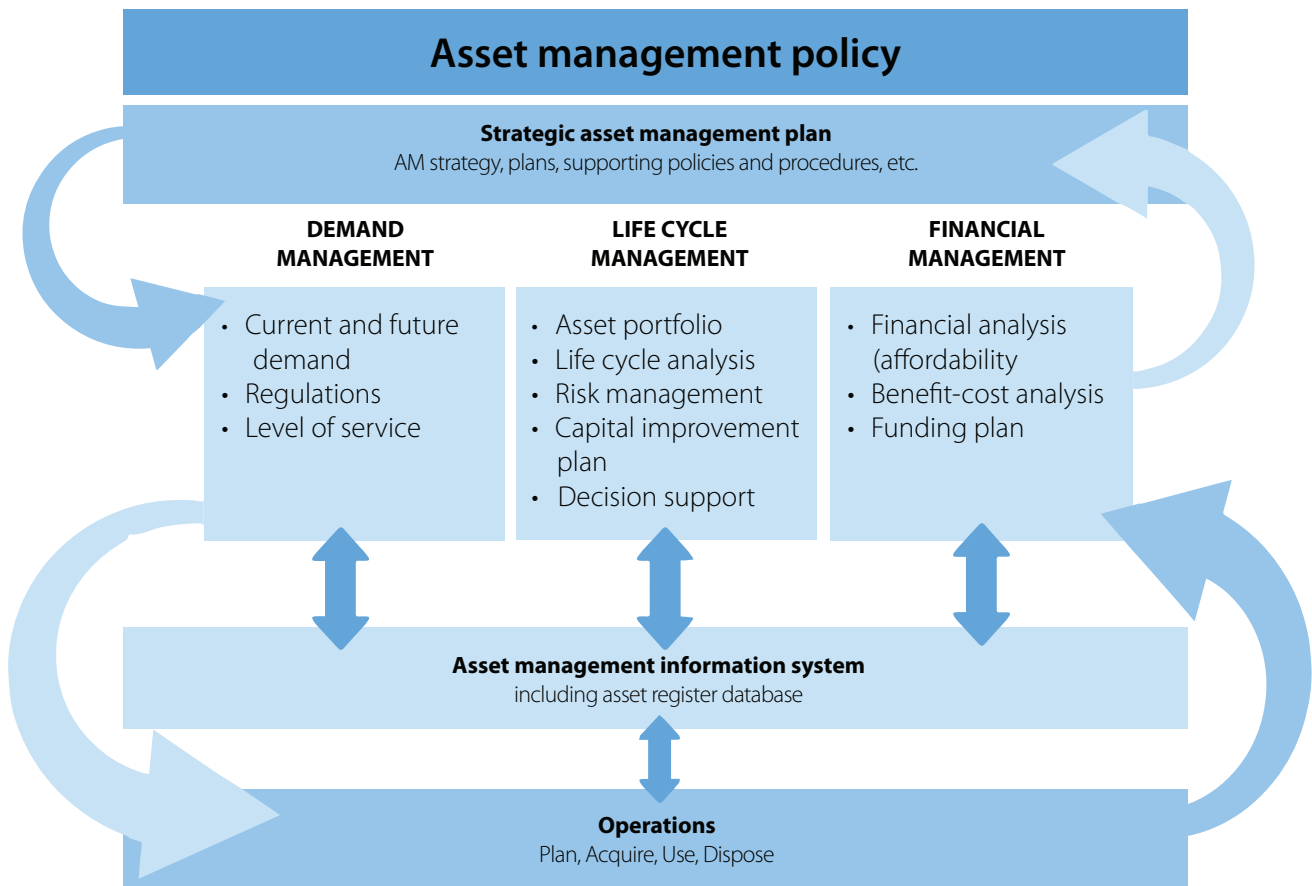
insight into local asset management challenges and gaps.

One way to get these valuable inputs is to host a series of consultations with various regional groups across your jurisdiction to get a broad view of the issues and give local asset management more visibility. This also is a valuable opportunity for you to meet local elected officials, administrators and staff, and to get their perspectives directly. These exchanges can take the form of consultations with local governments and agencies from a given region and talks with networks of local associations and industry groups.

Most of your exchange with these stakeholders should focus on the challenges they experience in managing local assets and delivering services. Present the committee’s conclusions to help focus the conversation.

Figure 12

Asset management framework revisited



Your goal is to receive direct feedback on the validity of the conclusions and to identify any missing gaps. It is not yet time to define the solution because we are not yet certain of the problem.

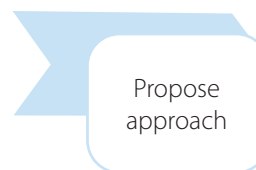
Expect that local stakeholders will want to address the relationship between their jurisdictions and the central government. This is something that a representative of the central government should be explicitly prepared to speak about based on the committee’s work in the previous step.

At least two committee members should attend each consultation. They can help the central government communicate the benefits of asset management and their own preliminary assessment. Through this involvement,

they should also monitor the process and review subsequent reports and documentation to ensure their accuracy.

Document your findings from the sector-wide engagement and report these to the relevant higher-level central government officials before using them to outline the enabling environment approach and mechanisms.

8.3.2.3 Proposing an approach



The technical advisory committee should remain involved through the next step: outline an enabling environment and propose an approach to attaining it. After all, the committee helped to assess the state of

local asset management, and its members are drawn from key stakeholder groups.

Your exploration of possible solutions with the committee should start with a review of the central government's goals for the enabling environment and a recap of the five means through which central government can support local asset management. This is an opportunity for you to gather insight and first impressions on how the approaches described in Section 8.2 can now be applied (see Figure 13).

Figure 13

Five approaches to advance local asset management, revisited



Here is what you need to do: document committee members' observations about what specific jurisdictions are doing; their experiences can provide a sense of what may or may not be achievable locally and why. Use the findings from this first working session to start outlining what an enabling environment might look like. You will likely need to

hold subsequent working sessions to reach an agreement on the scope of a proposed enabling environment that you can present to the wider local government sector.

In completing this step, try to minimize redundancies between the enabling environment under development and other government initiatives already under way. Make sure that local governments do not have to do the same work twice—for example, submitting infrastructure investment data to two separate central government bodies.

The enabling environment you draft with the committee should include success factors such as those presented in Figure 14.

As in previous steps, you should share the documented results of the working sessions across the central level to refine strategic guidance before presenting proposals to local governments for their more detailed comment and amendment.

8.3.2.4 Consulting again

Consult again with the local government sector

Once you have worked with the committee to devise a proposed solution, you should plan for a second round of consultations. This critical

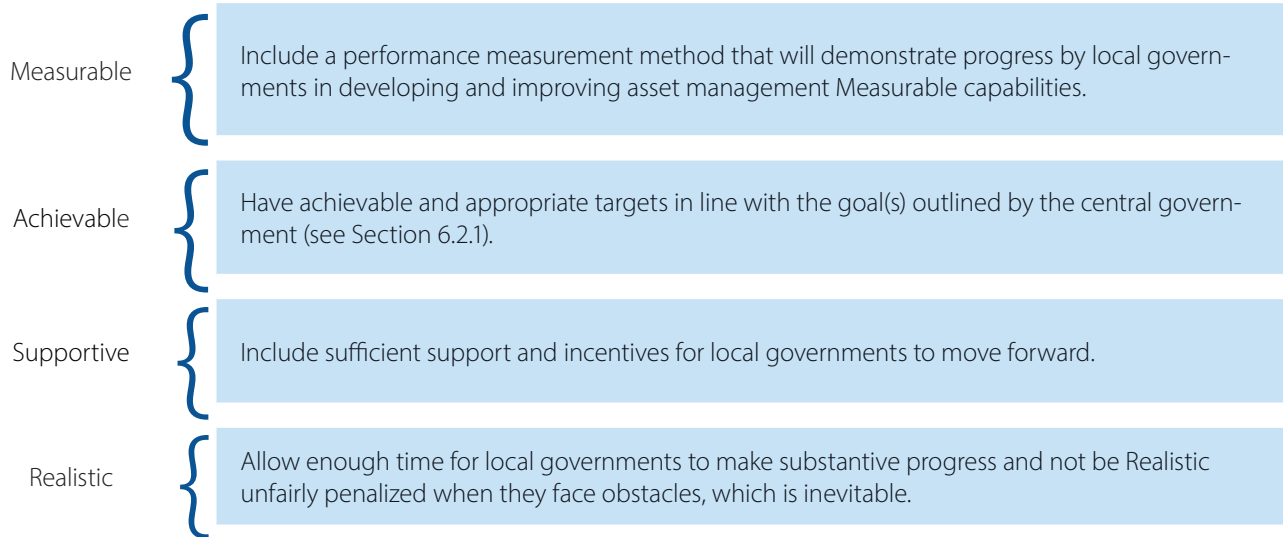
step can help uncover unforeseen negative impacts of the proposed enabling environment that you should correct or mitigate before proceeding to implementation. As with the previous rounds, and for the same reasons, at least two committee members should attend the consultations.

This new round of consultations might also involve several rounds of meetings and should focus, primarily, on verifying:

- Whether the proposed programme is likely to help local governments face the challenges of managing local assets and delivering services.
- Whether it can be achieved.

Figure 14

Enabling environment characteristics for success

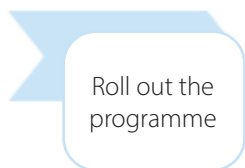


- What timeline and support structures will enable long-term success.

The things you want to verify will largely correlate with stakeholders' questions, depicted in Figure 15, about how the enabling environment is likely to affect *them*. After all, the enabling environment represents change. You can manage attitudes towards this change by encouraging open dialogue throughout the consultation sessions.

Document the recommendations collected during the sector-wide engagement as they will help you finalize the local asset management enabling environment. Report these recommendations at the central government level before proceeding to the final step, that of implementing the programme.

8.3.2.5 Implementing the programme

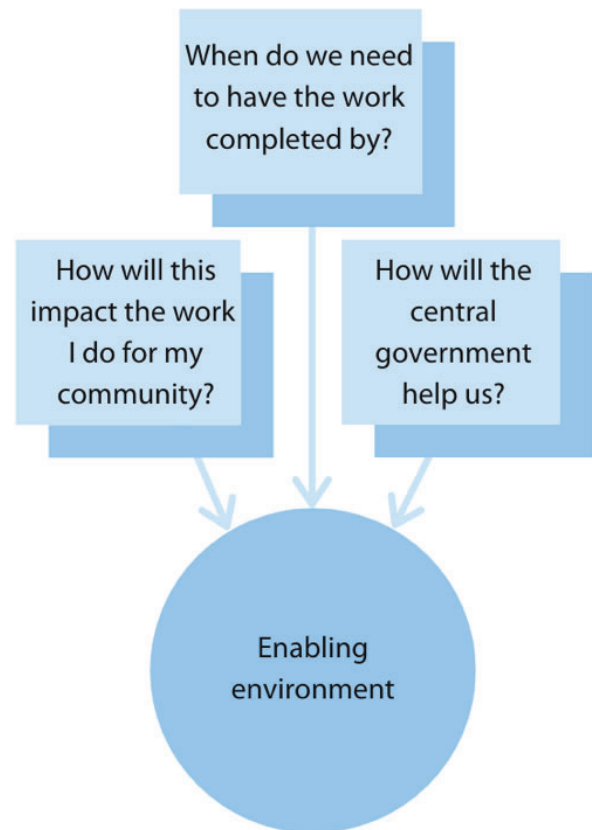


Once you have completed the previous steps to determine the goal, approach, inputs and mechanisms needed for

the enabling environment, you are ready to implement the programme that will result in the establishment of that environment.

Figure 15

Stakeholder questions about the enabling environment



Be sure to follow the administrative processes of your central government regarding how to secure programme funding, establish a programme directorate, work with external stakeholders and report on programme outcomes.

There are a few key points to remember.

The programme roll-out could include the allocation of public funds to local governments and to external stakeholders to advance asset management capacity building projects. Any allocation of public funds should follow local procurement rules and fairness guidelines. The perception that the enabling environment unfairly favors certain groups could reduce support for asset management.

If you find that after a few years the enabling environment is not leading to the desired outcomes, you may need to review its structure. Other countries have experienced this. You can prepare for the possibility from the very start by building a certain amount of flexibility into the programme structure and processes. This will help you change course as and when needed.

8.3.3 Sustain the enabling environment



It will take many years for local governments to adopt advanced asset management practices. The primary threat

Exercise 3

- a. Select a sequence for developing your enabling environment based on the five steps introduced at the beginning of section 8.3.2. Feel free to refer to the examples in Figure 11.



- b. List three main challenges you foresee in developing an enabling environment and how you would address them.

Challenge	How to address it
<ul style="list-style-type: none"> • • • 	<ul style="list-style-type: none"> • • •

to this process is a change in central government. A secondary threat is a gradual decline in interest for it on the part of the local sector broadly and the professional community specifically. Here are ways to mitigate these risks.

8.3.3.1 *Sustaining political support*

You should expect that the people involved in developing or implementing the enabling environment might change roles while the local government sector is still adopting local asset management. This change can negatively impact the enabling environment. Changing central government priorities can also lead to a loss of funding and reductions in programme staff. This is why it is important to maintain buy-in for asset management across the political spectrum and among all political parties without letting politics influence the work of asset management.

“It is often difficult for municipalities to secure funding for infrastructure improvements or replacement, or to maintain existing funding levels. Asset management planning is a proven tool for maintaining and elevating levels of service for [infrastructure] systems and planning system renewal and upgrades.

United States Environmental Protection Agency¹⁴

All parties should be inclined or persuaded to make the implementation of asset management a priority, because all can derive the benefits—from improved governance to fiscal conservation and improvements in service delivery that win the population’s approval.

Therefore, representatives of the local government sector who engage with central government should frame local asset management as a solution. They should ensure that political players see that local asset management benefits them as well.

8.3.3.2 *Sustaining momentum*

The negative impacts of infrastructure investment programmes that misalign with AMAPs can be severe and difficult to overturn. Therefore, you should monitor and address, on an ongoing basis, the risk of such programmes being implemented by the central government and donors. Recall from Section 8.2.2 the preferred forms of direct and indirect support from the central government. The underlying objectives for these programmes should always be to maximize the value and ensure the sustainability of investments in public assets.

Using infrastructure grant subsidy programmes as an example, Figure 16 considers some ways to ensure they align with the work of asset management.

The risks will have been mitigated when you consult with communities of practice about risks to asset management progress in the development of new infrastructure grant subsidy programmes, and when these programmes demonstrate strong support for and use of asset management initiatives and AMAPs.

8.3.3.3 *Sustaining individual and group interest*

After a few years, you may find that local governments have improved their methods as they adopt asset management. Even so, interest in asset management can diminish as other urgent matters take hold. Feedback loops, such as the one shown in Figure 17, can minimize this risk by enabling communities of practice and central governments to be responsive to the needs of local government.

- *Monitor and Ask*

Survey the local government sector and participants of asset management programmes and initiatives about the progress achieved. (e.g. How many local government representatives attended training events? Have they developed an AMAP? Is the AMAP being implemented, and if not, why?)

Figure 16

Align investment programmes with local asset management plans




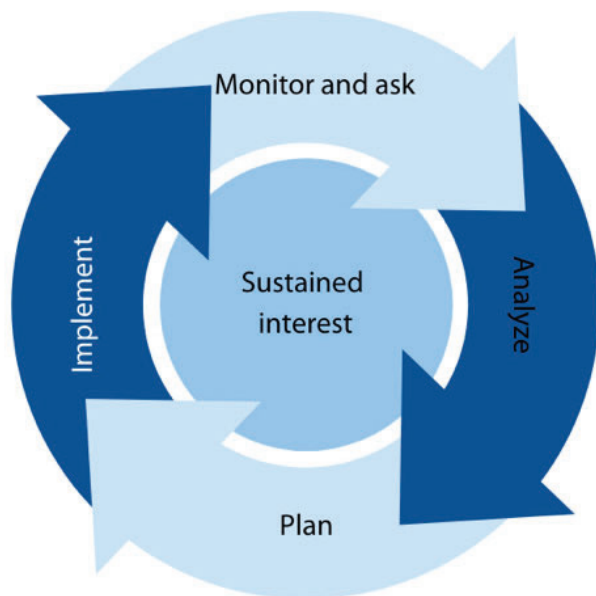
 <p>Assess impacts</p>	<p>To mitigate the risk of undoing local government sector progress in asset management, ensure that the positive and negative asset management impacts of a programme are assessed before it is implemented. Negative impacts include local governments using grants to build new infrastructure for which they cannot afford to pay life cycle costs, such as operations and maintenance. (See Section 6.2.3.1 Assess impacts for guidance)</p>
 <p>Address impacts</p>	<p>Programme developers should ensure that positive impacts on local asset management are maintained and communicated at programme roll-out to bolster ongoing asset management capacity building efforts. The central government and donors should remove potential negative impacts of grant subsidy programmes on local government asset management before Address impacts finalizing the programme requirements</p>
 <p>Consult on impacts</p>	<p>The programme and policy team responsible for developing the programme should complete an asset management impact assessment based in part on consultation with practitioners and the local government sector. The consultation can touch on subjects other than local asset management, such as administration and reporting requirements, but impacts on local asset management must be among the subjects discussed. The consultation can help verify whether the programme processes and outcomes are consistent with the promotion of asset management and inform any necessary adjustments.</p>

Figure 17

Feedback loop



- *Analyze*

Compare results from the monitoring against expected outcomes of the enabling environment. Verify if outcomes are being achieved and identify possible gaps or misalignments to correct. (e.g. Why might local governments not be using asset data to support capital investment planning? What are some barriers to AMAP implementation?)

- *Plan*

Review the results of the analysis with the technical advisory committee and identify opportunities to improve the enabling environment. Always consult the local government sector to validate the assessment and the efficacy of proposed solutions.

- *Implement*

As you update the enabling environment, keep key stakeholders in the loop to ensure that desired outcomes are well understood.

To keep asset management relevant to the

local government sector's needs, the central government and its partners must first know how needs have evolved over the years. New demand for specific knowledge areas of asset management may have emerged that require new programmes and initiatives.

The community of practice and other partners can assess this through different means. For instance, they can assess the quality and completeness of AMAPs that are submitted by local governments to determine knowledge gaps across the local government sector. Alternatively, the compilation of information on local government readiness can also help determine the training needs of the local government sector.

The community of practice can also send special purpose surveys to local governments or to members of different professional communities. The surveys can be about the

asset management challenges they face in their organization or their asset management training needs.

Indications that positive feedback loops are succeeding include:

- The community of practice uses information on the status and needs of local government as the basis for the development of new asset management tools and training.
- Local organizations and professionals continue to see value in communities of practice because of the ideas, tools and lessons they derive from them.
- To central levels of government, the macro-level indicators show central levels of government that asset management capacity is growing across the local government sector and should continue to be supported.

Exercise 4

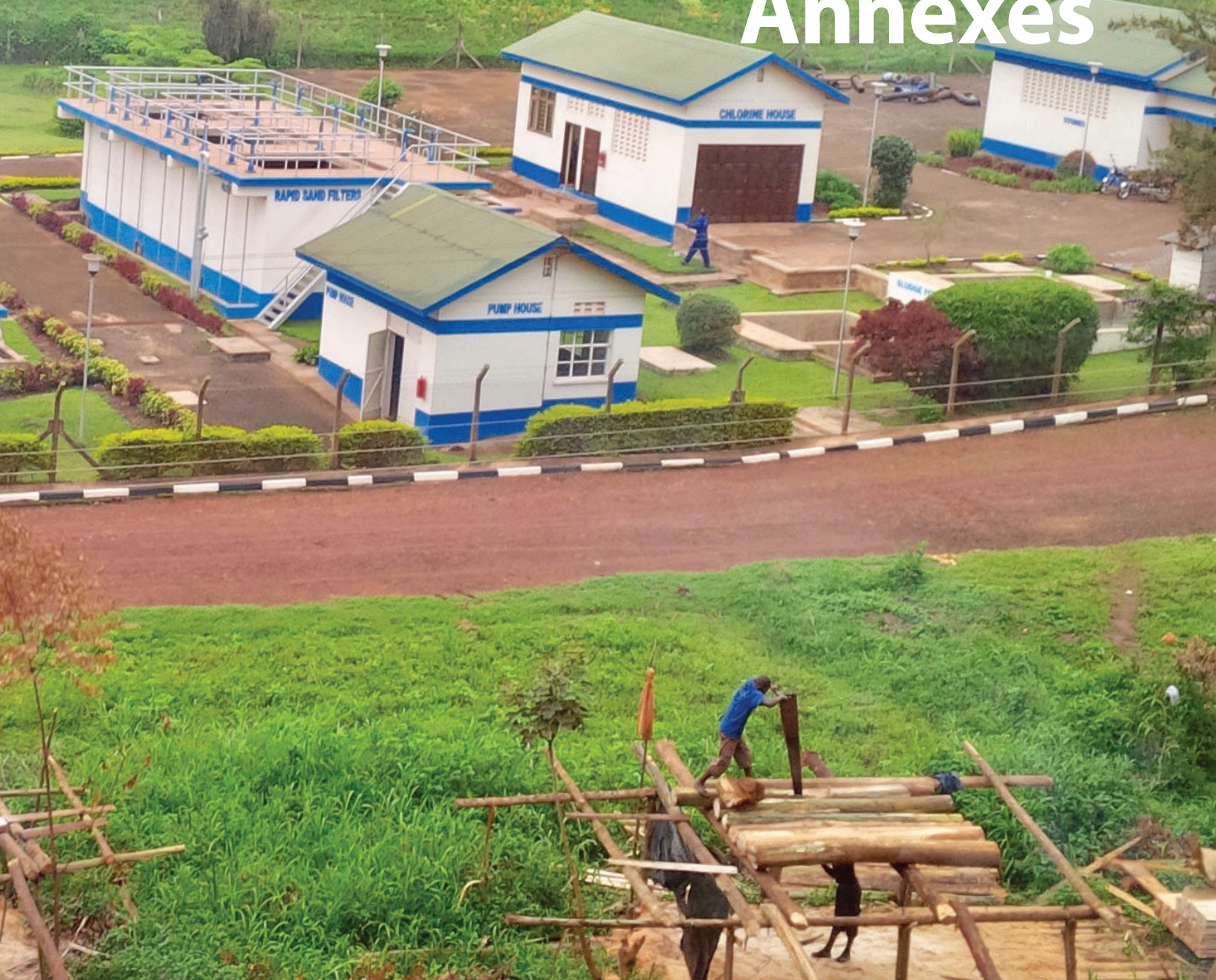
This section presented three facets of sustaining the enabling environment. List specific ways that your government can sustain (1) political support, (2) momentum and (3) individual and group interest.

How to sustain ...		
Political support	Momentum	Individual and group interest

Endnotes

- 1 ISO/TC 251 Asset management, *ISO 55000:2014 Asset management— Overview, principles and terminology* (Geneva, ISO, 2014), last reviewed 2016.
- 2 Cities Alliance, *Connecting Systems of Secondary Cities* (Brussels, Cities Alliance/UNOPS, 2019).
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- 4 Philipp Misselwitz and Jesús Salcedo Villanueva, “The Urban Dimension of the SDGs: Implications for the New Urban Agenda”, in *Sustainable Development Goals and Habitat III: Opportunities for a successful New Urban Agenda* (Cities Alliance Discussion Paper No.3), (Brussels, Cities Alliance, November 2015).
- 5 *New Urban Agenda*, adopted at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador, on 20 October 2016 (United Nations publication, 2017), p. 23.
- 6 Burgess & Niple, *Key Data to Inform Government Asset Management Policies* (Denver, Colorado, American Water Works Association, 2019).
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- 8 Government of Quebec, Ministry of Municipal Affairs and Housing [Gouvernement du Québec, Ministère des Affaires municipales et Habitation], Intervention Plan [“Plan d’intervention”] (accessed 12 April 2020).
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- 12 Eric Champagne and Olivier Choinière, “Financing municipal infrastructure and the challenges of Canadian fiscal federalism”, *Gestion et Management Public*, vol. 4, No. 3 (2016), pp. 25–36.
- 13 Infrastructure Canada, *Investing in Canada— Canada’s Long-term Infrastructure Plan* (Ottawa, Ontario, Minister of the Office of Infrastructure of Canada, April 2018), p. 13.
- 14 United States Environmental Protection Agency, “Asset Management for Water and Wastewater Utilities”, last updated July 2020.

Part 4 Annexes



Annex A

Asset Management Action Plan (AMAP) template

Asset Management Action Plan (AMAP)

for

[Insert name of Local Government]

Prepared by:

Date:

Prior to finalizing this document, please delete all red italic text used as guidance.

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Introduction

As the custodian of local government assets for *[Insert local government title]*, it is important that we conduct our asset management activities in the most efficient and effective manner. We have analyzed our current asset management practices and determined that there are target areas where improvement is desirable. In order to realize these improvements, we must do further analysis to identify shortfalls against current asset management best practices.

The output of this process is a series of prioritized actions, together with context and sound reasoning for taking these actions. This is known as an asset management action plan (AMAP).

Purpose of an AMAP

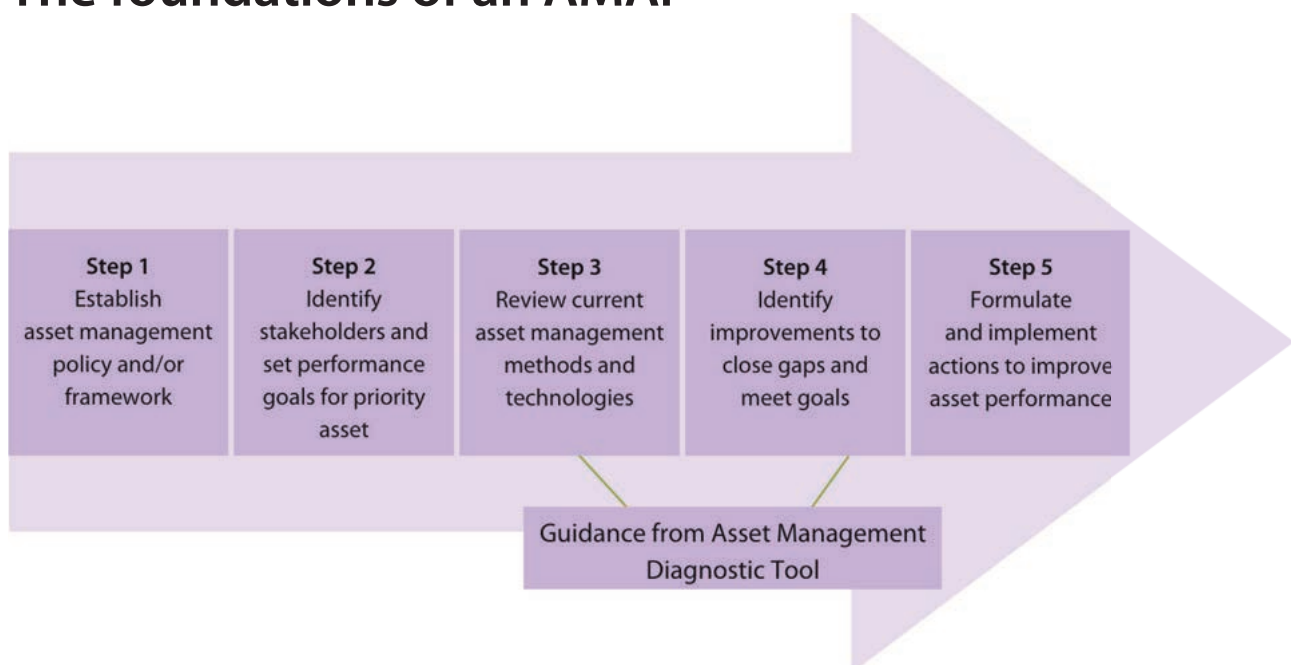
An AMAP is a means of comparing our present asset management knowledge, practice and documentation against good asset management practices and identifying gaps. The AMAP prioritizes these actions and sets timely goals and clear ownership and responsibility for delivery (Figure 1).

An AMAP can relate to one or more assets and is based on a number of pillars:

1. The local government asset management framework, i.e. the overall vision for the management of local government assets, including objectives, targets and links to the broader city vision and capital investment plan, if it exists.
2. An assessment of stakeholders involved in managing the asset(s), a review of their specific functions and setting a performance goal for one or more priority assets in line with the local government asset management framework and national policies and regulations on asset management that govern the management of the selected asset.
3. A review of the types of methods, technologies and tools used in managing the asset (asset

Figure 1

The foundations of an AMAP



inventory database, asset management software, valuation techniques, life cycle management, strategic portfolio reviews, integration of asset management needs in annual budgets, reporting and auditing of the asset).

4. A performance assessment of these asset management practices against the stated objectives and a clear identification of gaps and areas for improvement.
5. The formulation of concrete actions by all relevant stakeholders that addresses the identified gaps and links proposed actions to improve the management of the asset to the current and medium-term local government budget.

This AMAP works through these five pillars (steps) and intentionally concentrates on the improvement of one of our assets:

[Insert asset name or asset group name].

[Insert brief explanation on why this asset has been selected and its criticality to your local government and community].

It is our intention to develop future AMAPs for other assets and asset groups.

Assumptions and constraints

Assumptions

This AMAP has been developed with a number of assumptions. It is important that it is understood how they relate to the action plan. Should any of the major assumptions change, the plan should be re-visited and, if necessary, revised to ensure that it is still relevant and achievable.

- *[Insert bullet-form assumptions with brief explanation on why the assumption has been made and how it relates to the AMAP.]*
-
-

Constraints

In addition, the development of this AMAP was limited by some internal and external constraints. These are set out below along with a brief explanation of how they relate to the AMAP. If any of these constraints are removed in the future, the AMAP will be reviewed to see if the change impacts goals, timing or outputs. If required, the AMAP may be revised to reflect the removal of the constraint.

Internal

- *[Insert bullet-form internal constraints with brief explanation of how they relate to the AMAP.]*
-
-

External

- *[Insert bullet-form external constraints with brief explanation of how they relate to the AMAP.]*
-
-

Section 1—Local government asset management policy framework

The local government of *[Insert title]* has developed an asset management policy framework based on the following:

- General principals of good asset management practice
- The *[Insert local government title]* strategic plan
- National, regional and local legislation and regulations as they relate to assets and asset management

The asset management policy framework has been developed in alignment with our local government's strategic development goals.

The *[Insert local government title]* asset management policy framework's main principles and objectives are set out below and are used to guide the AMAP analysis, priorities and actions (*You can select 5-8 principles from the list below or include your own*):

- We will strive to meet or exceed all national regulations, benchmarks and requirements related to the management of our assets.
- Open and effective management and reporting of public assets is our civic duty.
- We will fight all forms of misuse, abuse or corruption related to the management of public property.
- We commit to fair and equitable access and use of our assets regardless of race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status.
- We recognize the benefits of asset management, which include:
 - Economic sustainability is strongly enhanced by reduced cost to deliver services.
 - Social equity and benefits are realized because the community has more resources to provide services and amenities.
 - Environmental sustainability and reliance are stronger because resources are conserved and more attention is given to long-term solutions rather than short-term affordability or convenience; moreover, proper valuation of environmental assets, such as lakes, rivers and groundwater, allows land and other assets to retain value.
 - Citizens enjoy more dependable service levels without unexpected failures and indefinite interruptions.
 - The financial viability of the local government is enhanced because future costs are anticipated and reserves set aside.
 - The transparency of government is enhanced which leads to better communication with the public and grows citizen trust and confidence.
 - Communication is more effective with rate payers, elected officials, financial rating organizations and regulatory agencies because plans and results are documented and shared.
- We will designate a focal point for asset management who will prepare and convene regular meetings to discuss how our asset management practices can be further improved to the benefit of our citizens.
- We recognize that asset management is a multifaceted and multi-stakeholder process that

involves demand, life cycle and financial management, and we commit to include all relevant parties in our efforts to enhance our asset management practices.

- We will commit to providing the resources to deliver on our asset management objectives.
- We will ensure we have the appropriate organization, policies and procedures in place to support asset management and achieve our objectives.
- We will report regularly on our assets and our asset performance.
- We will involve and inform the public on important decisions related to the acquisition, repair or sale of our assets.
- We will include financial asset management needs in our annual budget and medium-term fiscal expenditure plans.
- We will implement a user-friendly and functional asset management module that complements or is integrated into our current IFMS and other public financial management systems. We will train all relevant staff in its implementation.
- We will continue to improve our asset management practices and systems.

The *[Insert position title]* has been designated as the focal point for asset management in our local government and is responsible for holding regular asset management meetings with all relevant stakeholders.

[Note: If a policy framework and strategy do not exist, this section can be a separate activity and an AMAP can be developed just for it. Refer to the writing guide for examples and assistance on writing an asset management strategy. You can find the guide at: <https://www.un.org/development/desa/financing/capacity-development/home>]

Section 2—Priority assets, stakeholders and performance goals

Section 2a—Identifying priority assets

The asset selected for the development of this AMAP was determined to be one of the local government’s priority assets. The reasoning behind this selection is based on the importance of the asset to the local government and stakeholders and the impact on those stakeholders should the asset fail and fall out of service. The reasons for choosing the stated priority asset are shown in Table 2a below. *[Select one asset from your Diagnostic Tool assessment, choose a different priority asset or refer to the writing guide for processes and tools to help you determine priority assets.]*

Section 2b—Stakeholders

Table 2a below lists and categorizes key stakeholders as they relate to the priority asset we have identified. Their interest and influence are important and form a significant part of how we will shape our asset management practices. The stakeholder information will be used to help identify service needs, gaps and actions later in the AMAP.

[Where applied you can use your UN DESA Asset Management Profile and Assessment of Needs as well as your Local Government Performance Assessment, if applicable, to help complete this section.]

Name of priority asset: _____

Table 2a

Internal stakeholders

Stakeholders and role <i>Which stakeholders are involved or should be involved in the management of your asset? What is their role?</i> <i>E.g. asset manager, director of operations, maintenance supervisor, service provider, councillor, community representative</i>	Influence <i>E.g. 'H' for high, 'L' for low</i>	Interest	Information needed by stakeholder to manage the priority asset <i>E.g. asset inventory data, asset condition data, level of service, costs of repairs, replacement value, remaining service life</i>	Do you have the information? <i>If yes: How do you capture this information? Who is responsible?</i> <i>If no: Write 'NO'.</i>
Internal stakeholders who <u>are</u> involved:				
Internal stakeholders who <u>should be</u> involved: <i>[Insert any positions not involved but should be.]</i>				

Section 2c—Setting performance goals

The performance goals for the *[Insert priority asset title]* have been determined with reference to service levels that were informed by applicable regulations or legislation and technical or stakeholder requirements. Each of the goals has a clear performance measure that can be used to track progress and determine the level of success more accurately. Table 2c below states the goals and performance measures for the priority asset.

Table 2c

Performance goals

Priority asset	Performance goal(s)	Level of service and attribute	Performance targets
<i>E.g. Water supply and distribution system</i>	<i>What you wish to achieve E.g. To provide safe and reliable basic water supply to 95% of population by 2025</i>	<i>Level of Service: the scale of service provided by an asset or group of assets to meet our goals Attribute: (of LOS) can be technical or customer-based, e.g. reliability, accessibility, responsiveness, availability, compliance, return on investment (ROI) E.g. LOS is 'To pipe water directly to buildings in central business district'; attributes include accessibility and reliability</i>	<i>How you will measure if you are meeting your goal; the more concrete the target, the better and easier it will be to measure progress E.g. ≤10 breaks per 10km of pipe per year</i>
			<ul style="list-style-type: none"> • • • •
			<ul style="list-style-type: none"> • • • •

Section 2d—Active stakeholders for priority assets

Stakeholders who actively manage an asset make decisions that directly affect the asset and the service it delivers.

We have reviewed the stakeholders we listed in Tables 2a and 2b and **highlighted** those who actively manage our priority asset(s). These active stakeholders provide information that is needed to make decisions about our priority assets. They are listed in Table 3 below.

Section 3—Current asset management methods

Having clearly established the key internal and external stakeholders and the performance goals for the priority assets, we must now consider the processes, methodologies and tools that stakeholders use in the management of the priority assets. This will help us identify where current processes fall short of the requirements set out in our performance goals.

Table 3 below, identifies the current methods and tools used by the key stakeholders listed in Tables 2a and 2b. These methods and tools were reviewed to see if they met the needs of the local government in trying to achieve the performance goals that were set for *[Insert name of the identified priority asset]*. *[You can use your UN DESA Asset Management Profile and Assessment of Needs or other assessment, where available, to help complete this section.]*

Table 3

Asset management methods

Active stakeholders <i>Include the stakeholders identified in the previous template who actively manage the asset at a strategic or operational level.</i> <i>E.g. Finance Chief, Municipal Engineer, Operators or those who maintain priority assets</i>	Which methods and tools do your stakeholders currently use to manage the priority asset? <i>If nothing, write 'NOTHING'.</i> <i>E.g. asset ledgers, accounting ledgers, asset management software, valuation techniques, life cycle management, strategic portfolio reviews, integration of asset management needs in annual budgets, reporting and auditing of the asset, physical assessment tool or procedure</i>

Section 4—Gap analysis

In previous sections we:

- Outlined our local government asset management framework
- Identified our priority asset
- Identified key internal and external stakeholders
- Set goals for the future of the priority asset performance
- Listed current tools and methods used by stakeholders in the management of the priority asset.

As a result of this review, we have identified the following gaps, stakeholders affected and actions required to remove the gaps.

[You can use your UN DESA Asset Management Profile and Assessment of Needs or other assessment, where available, to help complete this section.]

Table 4

Gap analysis

Priority asset	Performance goal	Identified gap	Gap description	Stakeholders affected	Stakeholders actively managing	Actions required
E.g. Community borehole	List your goal(s) from Section 2 above, e.g. 'to provide clean water supply'	E.g. Water quality of borehole'	E.g. Current water quality fails on a regular basis due to lack of treatment; poor borehole maintenance	E.g. All community members using borehole; schools; neighboring communities; health centers	E.g. Senior Engineer, Inventory Manager, Maintenance Manager, Plumbing technicians	Brief description of all actions to be taken to address ga, e.g. Monthly treatment of borehole with disinfecting chemicals

Section 5—Action plan (addressing the gaps)

From the list of gaps identified in Section 4 (Table 4), we have further described our actions and identified the resources required, including funding, to implement them for our identified priority asset: *[Insert asset name]*. These actions and resources are presented in Table 5a.

Table 5a

Actions and resources required

Actions required <i>List all actions previously identified as needed to address your gap</i>	Owner	Resources required <i>Include new and existing</i>			Funding and source
		People	Training/mentoring	Tools	

From the list of gaps identified in Section 4 (last column of Table 4) and detailed in Table 5a, we have prioritized the actions using the following methodology:

[Insert a brief rationale (i.e. the criteria) used to prioritize the actions and relate them back to your goals, the Local Government Asset Management Framework and any relevant policy or regulatory requirements. Ensure that top priority actions are there on merit and logical reasoning.]

Priority action	Rationale

Our resulting AMAP priorities are presented in Table 5b. We include descriptions of each action, specific stakeholder responsibilities and timelines as well as main resource requirements.

Table 5b

Our AMAP priorities

Priority action	Related actions	Summary of resources needed <i>State any new resources needed; if none, state, 'can undertake with current resources'</i>	Target date for completion	Funding and source

Follow up and review

This AMAP is a living document. Responsibility for review and update lies with the asset management focal point and the following stakeholders:

[Insert list of people with review and update responsibilities. The list should be in priority order and should be brief to avoid confusion.]

Key stakeholders responsible for review and update	Responsibility

The AMAP will be reviewed every six (6) months or upon significant change in any assumptions or constraints, stakeholders, legislation or regulation. Reviews may result in drafting and distributing a new AMAP to all affected stakeholders.

This AMAP and subsequent updates or progress reports will be communicated to all stakeholders listed below:

[Insert list of main stakeholders to whom this AMAP and progress updates will be sent.]

Name	Title	Contact information

Annex B

Local government experiences

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Moving from policy design to implementation is never easy. Over the course of four years, UN DESA and UNCDF piloted the Asset Management Diagnostic Tool and Asset Management Action Plans (AMAPs) with more than 40 local governments in four Least Developed Countries – Bangladesh, Nepal, Tanzania and Uganda. Our experiences have informed the development of these asset management tools as well as this handbook.

Local circumstances were already challenging, and the onset of a pandemic caused by the coronavirus disease (COVID-19) has only exacerbated, albeit to varying degrees, the difficulty of implementing the tools across the municipalities. Adding to the wave of lockdown measures seen worldwide, countries are seeing a drastic shift in local policy priorities as they scramble to respond to the health and economic fallout of COVID-19 and the crises emerging from it.

Thankfully, as countries shift from response to recovery mode, asset management has gained renewed importance on the policy agenda. National and local governments are seeing how well-managed assets can contribute to robust response and recovery.

This annex presents a distillation of local experiences with the Diagnostic Tool and AMAPs in Bangladesh, Nepal, Tanzania and Uganda. Despite — and because of — the challenging contexts in which these tools were developed, progress has been encouraging. This has been especially so where the central government has provided sustained political support.

On the following pages, references to municipalities, local governments and countries apply only to the ones that were assessed. Such references should not be generalized to all local governments in those countries, nor to other countries. Moreover, the information that follows reflects only the circumstances that existed at the time of applying the tools and preparing this publication.

Insights from the application of the Diagnostic Tool

As presented in Chapter 3, the Asset Management Diagnostic Tool includes an on-site assessment in which the current asset management practices of the local government are assessed through a series of questions. A total of fourteen questions are split among three areas of inquiry: *Understanding and defining requirements*; *Life cycle decision-making*; and *Asset management enablers*. This section compiles the responses from municipalities in the four pilot countries that applied the tool.

Understanding and defining requirements

1. *Asset inventory data*

- Local governments distinguish between movable and immovable assets, and between expendable and non-expendable assets. Record-keeping for immovable and non-expendable assets, including buildings, land, parks, roads and bridges, tends to be insufficient or non-existent. This is problematic as these assets are often the most critical to a community.
- Where data on critical assets is available, it frequently lacks vital details, such as initial and current book values, depreciation costs and dates of purchase — all necessary components of life cycle asset management.
- Data collection methods often do not support reliable, accurate and complete asset inventories. In Uganda, some local governments have to rent asset storage sites several kilometres from the headquarters, making it inconvenient to maintain supervision and conduct regular on-site inspections. In Bangladesh, officials said that inspections were not verified by reports,

making it difficult to track who conducted the inspection, when and what the findings were. In Tanzania, governments had begun to consolidate data electronically but were still overcoming the learning curve that comes with adopting a new technology. Improper training had led to duplicated entries of the same asset as well as old data being overwritten by new data.

- In Uganda, several local initiatives had started to collect data for different sectors, like health and education. However, the information was submitted to national ministries and often was not used at the local level, where it was generated.
- Obtaining information on land has proven particularly challenging. The lack of land titles in some districts of Uganda renders it difficult to ascertain location and size, and leads to misuse, encroachment and disputes with neighbouring communities. In some instances, several schools and health centres were constructed and continued to be built on land that was owned by other constituencies, including churches, without proper agreements (see Figure 1).

2. Asset performance

- Instead of anticipating the operations and maintenance requirements of their assets, local governments often carry out inspections and repairs only when an asset's performance has already been disrupted and may continue to deteriorate until someone is sent to patch up the issue.
- Delayed action results from not following a pre-planned maintenance schedule, but it is difficult to plan ahead and take preventive steps when resource availability is unknown and inconsistent. In many local governments, staff are assigned to assess the condition of assets only when there are enough funds.
- Many local governments possess obsolete assets that have not been disposed of in a timely manner but have been left to sit for as many as ten years. In Uganda, condemned buildings and other assets are left undemolished due to a lack of funds to advertise their sale, or to a failure to follow disposal procedures outlined by the government. Moreover, on-site surveys reveal misuses of municipal assets, like employing an ambulance for personal use to transport bricks. In Nepal, annual maintenance of

Figure 1

Land registration status in six Ugandan local governments

Name of district	Pieces of land	Number titled	Per cent of land titled
Moroto MC	54	54	100
Napak	74	23	31
Mbale MC	47	38	80.8
Yumbe	87	15	17.2
Adjumani	149	58	37.5
Gulu MC	54	4	7.4

Source: UN/DESA-UNCDF Asset Management Report for Uganda, June 2020.

roads remains a burden to local governments due to limited own-source revenue.

3. Levels of service

- Local governments in Nepal, Tanzania and Uganda generally follow national guidelines on service delivery. These outline minimum standards in a variety of service areas, from health care and water supply to education and waste management.
- However, local budgets can be small compared to what is needed to meet the performance benchmarks set by the central government, and local officials often lack enough information to identify residents' needs and analyze whether these are being met. Some local governments in Uganda and Bangladesh have put in place Geographic Information Systems (GIS) to collect better information. Nepal is considering a similar approach, specifically to map physical infrastructure.
- In Bangladesh, officials follow guidance from the detailed Citizen Charters jointly crafted by constituents and government officials. Town Level Council Committees (TLCCs) and Ward Level Council Committees (WLCCs) ensure community participation in defining the required services and levels of service delivery.



Municipal market in Kushtia, Bangladesh
(Photo © of Bidhan Krishna Das)

- All four countries are pursuing efforts to expand and sustain participatory, inclusive governance. In Bangladesh, community members pressed successfully for a project to increase piped water delivery in a municipality where previously, pipes delivered only five per cent of the local water supply. In Uganda, community members have opportunities to enter into dialogue with their local government through the budget conferences process from the village to the district level.
- National guidelines also help local governments to project future levels of services, but future needs are being underestimated because they are failing to keep up with population trends. Local governments in Bangladesh, Nepal and Tanzania cited the influx of refugees and increasing rural-urban migration as contributing to population growth and the expansion of informal settlements.

4. Demand forecast

- Record-keeping at the local level often remains insufficient, with local governments relying on national data sources to project local population and forecast demand. In Uganda, local governments are required to use official figures from the Bureau of Standards and in Bangladesh, they refer to the Bureau of Statistics.
- The lack of comprehensive local asset registers means that governments do not have a wealth of historical data or prior demand analysis. This diminishes their ability to benchmark forecasts with actual local data, not just estimated data from national bureaux. In Tanzania, local governments have looked at broader trends to help with forecasting but lacked records of past expenses with which to predict future maintenance costs.
- Even when asset inventories are put in place, local governments stress the need for formal training to build expertise in

demand forecasting and for more funding to act on future projections. In Nepal, officials called for tighter links between budget allocations and demand estimates to ensure minimum levels of service.

- In Bangladesh, solid waste management has become an increasing concern with population growth. Some municipalities have limited trucks for waste collection and thus the daily waste collection is conducted in fewer areas than what is designated. The Diagnostic Tool recommended using a structured analysis to capture inputs such as the number of workers, vehicles, and equipment relative to a given population number. A forecasting methodology would improve the management of increased solid waste in municipalities as they become more densely populated.

Life cycle decision-making

5. *Decision-making*

- Planning and decision-making processes are more inclusive in some countries' local government sectors than in others. In all cases, the mayor or head of the municipality has the final say on what is approved or not.
- In Uganda, planning is done in a bottom-up fashion. Whether in a rural or urban setting, local governments host annual budget conferences from the village level up to the district level and from cell to municipal level. Local governments in Tanzania strive to incorporate community planning and strategic priorities into their asset management decision-making process.
- Municipalities in Bangladesh rely on the recommendation of the Local Government Engineering Department (LGED) to make decisions about asset refurbishment, replacement or acquisition. They first prepare a report for approval by the finance department and then present it to the mayor for approval. The municipal council makes the final decision on investment in new assets.



Uganda (Photo © of Linda Newton)

- In Nepal, the maintenance of assets is primarily determined by the mayor in concert with ward chairpersons and municipal staff. Presenting issues and projects at council or town hall meetings could increase opportunities for community engagement.
- In many cases, resources are insufficient to apply rigorous analytical and decision-making techniques, like benefit-cost analysis.

6. *Operational planning*

- As noted above, local governments do not have comprehensive inspection schedules in place to regularly assess the condition of their assets. Where such schedules exist, they are frequently only for some assets and do not support preventive maintenance. Interventions are reactionary and take place when there is a complaint or report of failure. This precludes effective operations and maintenance planning.
- Often, operational planning is done only to the extent necessary to clear budgets or obtain funding. In Uganda, local governments assess roads regularly as a requirement for funds to be released, but other assets are not put up for routine checks. Only where funding is earmarked are staff assigned to generate a condition assessment report. In Bangladesh, basic operations and maintenance plans provide only estimates of asset costs and their budget allocations. Municipalities in Nepal

allocate lump sums to operations and maintenance without detailed plans that prioritize at-risk assets.

- Local governments in all countries recognize the need for a standardized approach to maintaining assets. They need to assign specific individuals the responsibility of carrying out inspections regularly, *before* any complaints are filed, and documenting any findings in a report. Following clear guidelines and criteria for asset upkeep, not simply a ‘when the money comes’ approach, will ensure assets do not go obsolete prematurely but rather, continue to perform at minimally reasonable levels of service throughout their life cycle.

7. Capital planning

- Local governments typically follow a three- to five-year development plan that identifies all activities and requisite investments to be completed in that time period. However, implementing the plan involves many obstacles.
- Most plans outline what investments are to be made but not how they will be made. In Uganda, officials cited the lack of demand data to predict the financial and human resources needed for implementation, so the plans lack a realistic costing of capital projects. Some at the city and municipal level have sought assistance from district governments to estimate capital expenditures.
- The question of who will provide funding has made it difficult to fully follow through on capital investments. In Bangladesh, municipalities rely largely on central government or outside donor funding for project expenses. One particular municipality had sufficient funding for only 12 out of 50 projects in its five-year Capital Investment Plan (CIP). Eight projects were funded by the central government, with the remainder expected to be funded by donors. Officials highlighted a need to update the CIP for existing assets and to conduct an annual

audit of the plan to ensure it remained in line with broader asset management goals for municipalities.

- CIPs do not always prioritize activities. Municipalities in Nepal had pinpointed projects to undertake, but these were not ranked according to strategic importance (for example, on the basis of costs and benefits).

8. Financial planning

- Typically, local governments establish annual budgets based on historical revenue data. Sources of local revenue include water tariffs, trade licenses, land taxes, conservancy taxes, certificate fees and lease payments. In Bangladesh, an accountant from Chandpur Municipality reported that revenues raised through such means cover only 70 per cent of staff salaries. As a result, underfunded asset management leads to insufficient service delivery.
- Heavy reliance on central government or external funding limits the flexibility of local governments to address emerging priorities, especially those requiring more extensive financial and capital planning. In Tanzania, total own-source municipal revenues finance, on average, about 11 per cent of recurrent expenditures.¹
- Local governments in Tanzania stressed the difficulty of projecting their finances and acknowledged that community contributions and even own-source revenues are not completely reliable, in terms of timing and volume, for both capital and recurrent expenditures. Funds pledged by the central government and development partners sometimes are not disbursed on time—or at all.² In some instances, funds are disbursed on time but are then re-allocated to other activities deemed more important or urgent.
- In one local government in Tanzania, the central government gained ownership of local road management, so the municipality lost the opportunity to generate advertising revenues from billboards.

- In Uganda, most of the local governments use an established financial management and reporting system software as a platform for payments and financial reporting, although the asset management module has not yet been activated to link with the rest of the system. Elsewhere, local governments lack an adequate framework for financial reporting altogether. In some Nepalese municipalities, tax brackets are not clearly defined to determine the amount of taxes owed.
- Given that most of the funding is conditional in nature and varies in size depending on national financial resources, there is a push for central governments to entertain methods of long-term financial planning with their respective local government sectors. This would allow for more meaningful financial planning that is integrated with operational and capital planning.

The box “Comparing local government

revenues around the world” uses global data on local government revenues to highlight disparities between and within countries.

9. Sustainability

- Most local governments grasp the importance of sustainability — including respect for environmental standards and community concerns — so that assets can continue to serve current and future generations. In Uganda, sustainability is anchored in local investment guidelines, which requires that all projects be screened for economic, social and environmental sustainability. Among some local governments in Nepal, sustainability measures are not yet central to local concerns but are discussed if required as part of a donor-funded infrastructure project.
- It can be difficult to execute plans when sustainability dividends are not soon to be realized. In Uganda, the central government

Comparing local government revenues around the world

According to the data collected by the World Observatory on Subnational Government Finance and Investment, worldwide local government revenues accounted for an average of 25.7 per cent of total public revenues and 8.6 per cent of GDP in 2016.³ However, these averages obscure wide disparities between countries and regions of the world. While local government revenues averaged almost PPP \$6,000 per capita (or about 32 per cent of total public revenues) in OECD countries, they accounted for less than PPP \$300 per capita (or about 15 per cent of total public revenues) in Africa.

Intergovernmental transfers were similarly diverse and accounted for a global average of around 50 per cent of the resources of all local and regional authorities.

In 2016 national government grants and subsidies ranged from 70 per cent or more of local government resources in Indonesia, Sri Lanka and the Philippines to only around 20 per cent in India, Malaysia and Cambodia. These grants and subsidies represented up

to 96 per cent of local government revenues in Uganda, around 90 per cent in Kenya, Tanzania and Rwanda, around 25 per cent in Senegal, Namibia and Eswatini and barely 4 per cent in Zimbabwe. In Peru and Mexico, more than 90 per cent of local government income came from central government grants and subsidies, compared to 15 per cent in Costa Rica and 3 per cent in Argentina.

The World Observatory on Subnational Government Finance and Investment is a joint initiative of UCLG and the OECD with the technical and financial support of UNCDF, AFD, DeLoG and CEB. It provides detailed information on the structure and organization of local governments, their main responsibilities, the nature and weight of their expenditures, revenues and debt in more than 120 countries, including 23 of the 47 least developed countries. See <http://www.sng-wofi.org/>

Contribution provided by Serge Allou and Mathilde Penard from United Cities and Local Governments for the purposes of this handbook. Adapted with the authors' permission.

conducts annual assessments of the local implementation of sustainability initiatives. However, most local governments prefer the acquisition of new assets to investments in long-term asset maintenance.

- Inadequate funding has always proven to be a key challenge. Nevertheless, municipalities in Bangladesh have been removing iron from groundwater and building water treatment plants for increased use of surface water despite facing resource constraints. Likewise, some have begun to assemble sustainability plans to address such pressing concerns as riverbank erosion.
- Assessments in both Bangladesh and Tanzania concluded that sustainability should be better incorporated into decision-making processes. Staff recognized the opportunity to further integrate the economic, social and environmental dimensions of sustainable development into concrete local asset management policies and planning.

Asset management enablers

10. Asset management leadership and teams

- The Diagnostic Tool revealed a similar willingness in all four countries to improve local asset management, to move away from their previous, siloed approaches to local



Tanzania (Photo © of Linda Newton)

asset management and to move towards comprehensive organizational structures capable of optimally managing entire asset portfolios.

- Individuals working on asset management lack substantive training and expertise to perform their responsibilities effectively and efficiently. Officials in Nepal reported that team leaders have not successfully linked asset management strategies to service delivery—and thus have yet to connect policy, planning and provision.
- Local governments also have not established a common asset management strategy nor leadership and teams dedicated to operationalizing such a strategy. In Tanzania, the need to integrate asset management across different agencies represents an additional challenge. One local government sought to address this challenge by proposing, in their CIP, the creation of an interagency team to promote greater collaboration.
- Without an asset management organizational structure in place, there is little opportunity to gain expertise and build scalable capacity, for which many interviewed officials highlighted a need. Municipalities are working to train and hire experienced team leaders and members with the necessary skillsets and a direct mandate to manage assets in a systematic manner.

11. Asset management policy and process

- Feedback from local governments suggests the absence of a comprehensive set of policies and processes, at the local and national levels, to guide asset management.
- There needs to be a sufficient level of awareness and buy-in from national policymakers in order for local governments to consider asset management an integral part of continuous, high-quality service delivery. In Nepal, the transition to federalization calls

for more policy-level sensitization among federal agencies and local governments—for example, tighter coordination between the Ministry of Finance, the Ministry of Urban Development and the Department of Local Infrastructure. In Uganda, asset management is embedded in the Public Finance and Management Act that places it in the hands of the Chief Accounting Officer, but related policy and guidelines at the national level remain in discussion.

- Local governments in Bangladesh and Tanzania cited the need for more dialogue among local stakeholders to design and implement plans that are aligned not only with available resources but also community needs.
- Overall, there is a willingness to develop asset management strategies and processes, accompanied by the training needed to effectively deliver on plans and promises. Some local governments in Uganda have formulated their own guidelines for specific assets like computers and vehicles, but these are limited in scope.

12. Asset management information systems

- Local governments in some countries have transitioned from manual to digital information systems for asset management. Many of those surveyed in Uganda have automated their asset registers, making it easier to generate reports and adjust data, though this is mostly for movable assets like vehicles.
- Even with more automated processes in place, there remain technical challenges that prevent the full and proper usage of new software. In Tanzania, local governments use software to meet the information needs of asset managers, customers and community. However, not all parties involved in asset management are properly trained to use the software, so duplicate entries and inconsistent datasets have resulted. Assessments in Tanzania and Uganda

underscore the importance of having an organizational structure, described earlier, for harmonizing asset management practices among all involved individuals.

- In Bangladesh, a digital information system does not exist in the municipalities assessed, and the paper-based system is not well maintained. Local governments there identified the main focus to be on improving the quality of data collected. Public dissemination of information through the TLCCs and WLCCs remains a priority.

13. Service procurement

- Decisions on local service procurement are governed by national guidelines, usually in the form of a procurement act or financial administration act. In Uganda, local governments follow guidelines set out in the Public Procurement and Disposal of Assets Act. Usually, the Chief Accounting Officer oversees the procurement process and wields approval authority over user departments' plans to procure or dispose of assets.
- Tender bids are typically open to the public through a competitive bidding process either at the national or international level. In Tanzania, a list of awarded contracts is announced in local newspapers. In Bangladesh, the use of e-tenders and spot quotation processes defined at the national level is relatively systematic and working well for the municipalities.
- In Uganda, there are challenges in



Nepal (Photo © Linda Newton)

accountability and competitiveness at the local level. Sometimes, the procurement process is not well understood by the public and where contracts are advertised, this is usually in national newspapers beyond the reach of most locals. Better community engagement could help, perhaps through radio broadcasts.

- Local governments in Nepal have to prepare an annual procurement plan based on the approved budget of the financial year, though cash flow estimates are often missing from these plans. The local governments have full authority to purchase, maintain and even sell assets, with the exception of land which requires federal approval.

14. Transparency

- Most of the diagnostic assessments rate transparency within local governments to be fairly high, although some practices are more transparent than others, as noted above in the sections on service procurement, decision-making and information systems.
- Local officials in Bangladesh reported that transparency is greater for projects involving international donor agencies.
- Community involvement is observed to varying degrees in all four countries. In Uganda, meetings of the Local Government Council, staffed by elected officials, are always open to the public, and representatives on the council have a duty to report to their constituents. Annual budget conferences also are attended by a cross-section of people and 'wish lists' are developed to account for their views and priorities. The TLCCs and WLCCs in Bangladesh conduct regular meetings to update constituents on asset services and operations. In Tanzania, information including procurement decisions, audited financial statements, policies and processes are generally current and accessible to the public.

- To advance transparency, local governments receive internal and external audits. In Bangladesh and Uganda, annual external audits are mandatory and internal audits by municipal standing committees are conducted monthly. However, in the case of Uganda, most reports are not accessible to the public. In Nepal, under Financial Procedures Rule 2064, a municipality's officer-in-charge should inspect both expendable and non-expendable assets on an annual basis and prepare a report.

Insights on the design and implementation of AMAPs

This section presents snippets of the resulting AMAP documents from three municipalities (or agencies) per pilot country. The selection of municipalities was random, and they are listed in no particular order.

The information here is meant to provide an informal snapshot of the discussions and decisions that resulted from asset management workshops in selected local governments in all four countries. It is neither a comprehensive nor an official description of plans.

Recommendations

Initial progress assessments yielded a number of insights and policy recommendations that could further advance progress in the implementation of AMAPs and pave the way for more systematic asset management in support of national sustainable development priorities.

The following recommendations are organized by type: policy, organizational factors, data collection and financing. However, many are interlinked in that the ability to follow through with one is interdependent on achieving the others. Although most of the recommendations are applicable at all levels of government,

Figure 2

AMAP examples from Bangladesh

Municipality or agency	Priority asset	Implementation
Chandpur	Water provision <i>Performance goal: supply safe and reliable water to all citizens of the municipality by 2030.</i>	At the workshop, attendees outlined the following actions to be taken in relation to the asset: <ol style="list-style-type: none"> 1. Perform a weekly treatment of piped network with disinfectant chemicals. 2. Manage funds to expand the water-supply coverage by 2030.
Cox's Bazar	Solid waste management <i>Performance goal: provide solid waste management services to the entire municipality by 2025</i>	At the workshop, attendees outlined the following actions to be taken in relation to the asset: <ol style="list-style-type: none"> 1. Set up an awareness-building program. 2. Procure new vehicles. 3. Construct an access road to the dumping station. 4. Construct a new landfill through proper assessment, planning and acquisition.
Kushtia	Multipurpose market <i>Performance goals include creating job opportunities, increasing recreational facilities, ensuring a hassle-free shopping environment for city dwellers and introducing an eco-friendly shopping facility.</i>	At the workshop, attendees outlined the following actions to be taken in relation to the asset: <ol style="list-style-type: none"> 1. Identify the number of shops required in the market. 2. Prepare a financial model of the project with projections of revenue, profit, etc. 3. Develop a detailed plan for the market. 4. Manage all safety measures. 5. Construct a temporary marketplace for existing shops who will then be shifted over to the new one upon its completion. 6. Reconstruct the new market.

Figure 3

AMAP examples from Nepal

Municipality or agency	Priority asset	Implementation
Bheemdatt	Solid waste collection <i>Performance goal: provide solid waste collection services to 100 per cent HH of core city areas (wards no. 3, 4, 6 and 18) by 2021</i>	At the workshop held on 18 September 2019, attendees outlined the following actions to be taken in relation to the asset: <ol style="list-style-type: none"> 1. Charge collection fees on the basis of volume generation or occupancy type. 2. Ensure existing vehicles are working and effective. 3. Keep spare parts. 4. Allocate budget for and procure new garbage vehicles. Reschedule collection times.
Tulsipur	Solid waste collection <i>Performance goal: segregate degradable and non-degradable solid waste at source and convert into revenue generation project by 2022</i>	At the workshop held on 19 September 2019, attendees outlined the following actions to be taken in relation to the asset: <ol style="list-style-type: none"> 1. Provide regular information through radio and local television and have a supervisor monitor garbage collection in the municipality. 2. Add extra vehicles and manpower for collection, including drivers, sweepers, tractors and compactors. 3. Install a biogas plant.
Dharan	Water provision <i>Performance goal: provide safe and reliable water to 98 per cent of the population by 2025</i>	The local government agreed to the following actions to be taken in relation to the asset: <ol style="list-style-type: none"> 1. Immediately transfer ownership from old to new water supply system. 2. Expedite the interconnection system between the old and new. 3. Conduct a baseline survey of coverage under the community-based water supply system, then analyse and publish the baseline data. 4. Expand, upgrade, rehabilitate and maintain the existing system as needed.

Figure 4

AMAP examples from Tanzania

Municipality or agency	Priority asset	Implementation
Tanzania Rural and Urban Roads Agency (TARURA)	District road networks	<p>The local government outlined the following actions to be taken in relation to the asset:</p> <ol style="list-style-type: none"> 1. Communicate to stakeholders about the networks. 2. Undertake a district road management system for prioritization module. 3. Acquire and run a Roads Economic Decisions (RED) Model. 4. Develop a maintenance plan based on road condition and traffic.
Mwanza City	Mwanza Central Market	<p>The local government outlined the following actions to be taken in relation to the asset:</p> <ol style="list-style-type: none"> 1. Prepare a replacement plan for the existing market. 2. Solicit funds for constructing the new market. 3. Ensure effective supervision and preparation of contract documents to obtain value for money. 4. Construct temporary market to ensure continuity of services while new market is under construction. 5. Move traders from the old market to a temporary market. 6. Construct the new market. 7. Hand over the new market, ready for use. 8. Transfer traders from the temporary to the new Mwanza Central Market.
Temeke	Primary and secondary schools	<p>The municipality is collaborating with the Ministry of Education, Science and Technology to construct, operate and maintain local primary and secondary schools.</p> <p>At the workshop, attendees outlined the following actions to be taken in relation to the asset:</p> <ol style="list-style-type: none"> 1. Measure the rate of student registration at the beginning of each term against available classrooms in the schools. 2. Introduce morning and afternoon shifts. 3. Encourage private sector to build more schools. 4. Construct new schools. 5. Increase the number of classrooms to accommodate selected and registered students.

Figure 5

AMAP examples from Uganda

Municipality or agency	Priority asset	Implementation
Kapelebyong	<p>Livestock markets</p> <p><i>Performance goal: to provide a conducive and integrated market environment that attracts business and deters crimes such as theft and tax evasion.</i></p>	<p>The local government outlined the following actions to be taken in relation to the asset:</p> <ol style="list-style-type: none"> 1. Introduce security check points to curb tax evasion, reduce theft and other crimes and better police presence; also, fix tender price per market. 2. Establish demarcation, survey, fencing and titling of land for the market. 3. Build toilets at the market and appoint and train staff to manage hygiene. 4. Set up a sensitization/public awareness campaign on the proper usage of local revenue via taxes.
Adjumani	<p>Water for production (boreholes)</p> <p><i>Performance goal: to provide safe and reliable water for production by 2023.</i></p>	<p>The local government outlined the following actions to be taken in relation to the asset:</p> <ol style="list-style-type: none"> 1. Implement a testing and maintenance program. 2. Allocate more funds for provision in water-stressed areas. 3. Acquire equipment for desalination. 4. Acquire equipment for irrigation. 5. Recruit more technical staff in the Water Department according to local government structures.
Abim	<p>Land management</p> <p><i>Performance goal: to improve on land administration as most institutional land in the district have no titles, no known boundaries and may be open to encroachment</i></p>	<p>The local government outlined the following actions to be taken in relation to the asset:</p> <ol style="list-style-type: none"> 1. Formulate asset registers. 2. Title public land under the local government. 3. Plant trees along land boundaries. 4. Enclose all critical public land. 5. Sensitize the council and public on public land management.

any recommendation whose ownership makes most sense within a particular authority or body is specified as such.

Policy

- Expedite completion of a national legislative framework and policy for asset management that will direct, harmonize and regulate asset use throughout the country. A robust enabling environment for asset management relies on such a framework as the basis for further country-wide capacity-building.
- Undertake a thorough review of existing laws, policies and guidelines around public finances, public procurement, local authorities in urban areas, local authorities in districts and public asset management.
- The use of AMAPs across central and local government agencies should be integrated into local planning frameworks, including budget and evaluation processes. A cascade of training and information-sharing promotes a sound and supportive enabling environment.
 - Within a national framework, the local government sector could set more concrete guidelines for the local implementation of asset management—as has Bangladesh’s Ministry of Local Government, Rural Development and Cooperatives.
 - Federal technical support is needed to facilitate the move away from the traditional approach of standalone reporting and siloed efforts towards integrated asset management. Such was the case in Nepal as it underwent federalization.
- Discuss, design and implement a local asset management framework that follows country-wide guidelines but provides a clear, strategic roadmap that caters to individual communities’ needs and priorities.
- Incorporate into local and national asset management policy any related policies

or acts, such as those regarding the environment, water access and parks and recreation.

- Include in the local and national frameworks all necessary by-laws related to asset management.
- Coordinate asset management policies with any strategic visions or plans laid out by the country or city, such as the *Tanzania Development Vision 2025* and the city-specific *Mwanza City Master Plan 2035*.
- Align AMAPs with community goals and objectives.
- Continue to build awareness among political leaders and major stakeholders whose commitment and involvement you will need.

Organizational factors

- Build a dedicated task force at the central and local levels that will spearhead, champion and support asset management and sustain momentum past the infancy stage.
- Upgrade or create offices within local government to coordinate asset management activities and initiatives.
- Invest in human capital: train more staff in local governments on a wide range of asset management know-how, including but not limited to operational, capital and financial planning, asset condition assessments, data collection and knowledge-building activities, demand forecasting and sustainability initiatives. Allow individuals to gather expertise through training, experience, motivation and incentives to ensure they can perform their assigned responsibilities effectively. Trainings can cover four main areas, each building on the previous ones: (1) awareness of local asset management, (2) asset management basics, (3) the implementation of the UN/DESA-UNCDF Diagnostic Tool and AMAPs and, when and where appropriate, (4) advanced asset management techniques.

- Conduct workshops, trainings and mentoring visits on a regular basis, both for staff and other senior-level or community stakeholders, to stress the importance of good asset management.
- Ensure there is sufficient technical expertise and input in planning and decision-making processes. Local governments may require particular technical assistance support in the case of AMAP development and implementation. This can be difficult when local government officials are appointed from the top down and may use their political

authority in ways that do not align with asset management goals. To mitigate this risk, asset management policy should clearly define the roles of local government officials and mandate regular monitoring.

- Anticipate the training needs of people who will want to excel in asset management by collaborating with universities who can offer dedicated courses in the growing field.
- The local government sector should coordinate with other government agencies, such as those overseeing roads and highways, power grids or public schooling.

The ‘co-creation’ approach and local asset management systems: an example from Bangladesh

The Government of Bangladesh and UN Office for Project Services (UNOPS) are pursuing a ‘co-creation’ approach to asset management, which seeks to tap outside stakeholders and resources in strengthening sustainable local asset management.

The Local Government Engineering Department (LGED) under the Ministry of Local Government, Rural Development and Cooperatives is responsible for planning, developing, maintaining and managing local transportation infrastructure throughout Bangladesh. It is one of the largest implementing arms of the central government and as such, recognizes that it is essential to manage assets to sustainably deliver appropriate levels of service and meet community demand now and in the future.

UNOPS provides technical support to LGED to develop an asset management system aligned with ISO 55000. At the outset, these efforts included ensuring that the LGED leadership had a strong sense of ownership of the asset management system and that the partners understood that through ‘co-creation’, UNOPS would not be working ‘for’, but rather ‘along with’ LGED.

To avoid consultant-driven delivery, LGED established an institutional arrangement to develop the asset management system through the formation of an asset management committee and a number of working groups. LGED senior officials lead the groups to demonstrate strong leadership support and commitment to the process. The UNOPS technical team, the committee and working groups and consultants are jointly developing all the key

documents through face-to-face workshops as well as online discussions, and are working on the documents simultaneously from different parts of the world using an online file-sharing platform.

“ ***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.*** ”

LGED AM Policy Statement

This co-creation approach helps pin down ownership of the process by the organization in charge of the asset management system.

Crucial to the success of the ‘asset management system mission’ was the realization by LGED’s top management that the system does not introduce new software or processes but helps bring about cultural change within the organization by improving existing practices and procedures.

Contribution provided by Iftekhar Ahmed from the United Nations Office for Project Services for the purposes of this handbook. Adapted with the author’s permission.

Data collection and analysis for improved asset performance

- Invest in constructing a local asset inventory for as many categories of assets as possible, including land, buildings, infrastructure equipment and natural resources. Standardize procedures as much as possible by developing appropriate forms for recording assets and templates for preparing reports. The central government and/or local government sector may play a key role in standardization, which would save resources at the local level and avoid a costly piecemeal approach to asset data management.
- Design and implement a preventive maintenance programme, making adjustments where necessary to ensure effectiveness and follow-through.
- Appoint or assign technical focal points, like engineers or IT officers, to compile regular asset performance assessment reports based on data collected through regular inspections. The relevant local government committees should regularly discuss the reports.
- Particularly in the case of land, establish proof of asset ownership through, for example, land titling, fencing or engraving to ward off encroachers and prevent conflicts over facilities but also to earn much needed revenue.
- Require regular appraisals of inventories by a technical or financial manager with a good handle on the minimum criteria for a well-functioning information system subject to the particular local resource constraints. Such criteria are discussed in Chapter 5.
- Ensure compliance with established standards by requiring that accountability bodies conduct regular reviews, such as monthly internal audits and annual external audits. Be transparent by publicizing the reports as well as clear steps for improvement.
- Explore asset management tools and processes and how you might take advantage

of them for cost savings. There continue to be advancements in how to capture and store data, enable quick retrieval, link inventories with financial services and use satellite-based mapping for greater reliability.

Financing

- A central planning authority on finance and economic development should articulate broad asset management needs and set aside the appropriate funds on a periodic basis.
- Local governments should identify strategies to improve their revenue-generating capacities and reduce their dependency on fiscal transfers from central government. Revenues and transfers should be sufficient to cover ongoing operational expenses.
- Consider alternative means of financing, particularly at the national level. For example, central governments or donor partners can provide asset management grants, including by diverting a percentage of existing grants. Another option is to create a local government development fund with a lending window for asset management from which local governments can borrow and repay on low-interest or otherwise concessional terms.
- As local governments improve their asset management systems, they can also take better advantage of various institutional lending mechanisms available from the central government or outside donors.
- To improve facilities management, build a coalition with the community through vendors or vendor associations and users. For income-generating facilities like markets, a percentage of the income should be ploughed back to support the maintenance of such assets. The feedback cycle sustains service delivery for users and income streams for vendors.
- Consider ways to diversify modes of urban development and financing, such

as through community land trusts, which can be both socially inclusive and protect land values against speculation, economic downturns and other unpredictable market forces.

- Maximize value from the sale of boarded-off items by disposing of assets on an annual basis instead of neglecting them and leaving them to deteriorate. In Uganda, for example, the assessment concluded that in the short term, where assets from multilateral and bilateral donors are concerned, the Ministry of Local Government should coordinate with those bodies to secure approval for boarding them off. It is important to formulate clear guidelines that guarantee the automatic handover of logbooks and other documents once the items are boarded off.
 - Where possible, engage the private sector. You can lease publicly owned
- land, buildings, office space or other assets to private sector investors and turn unused assets (potential liabilities) into revenue-generating assets.
 - Particularly where local government capacities are stretched thin by rural-urban migration and refugee crises, seek central government support on ways to serve a growing number of residents given limited funding. Central government can help by:
 - Setting up economic zones to create employment.
 - Incentivizing village farmers to continue agricultural work.
 - ☒ Increasing budget allocation to areas affected by excessive migration and refugee issues to ensure that existing residents receive the same or upgraded services.

Community land trusts, a tool to remobilize land assets towards affordable housing

Community land trusts (CLTs) are emerging as an innovative—but as yet little-exploited—model for long-term, sustainable land management. CLTs can be defined as non-profit organizations that develop and manage affordable housing for households excluded from traditional housing markets. In this model, land is removed from the market and placed in a collectively owned trust. Whereas land is owned by the CLT, the ownership, or the right of use, of the built environment reverts to the households. There is a division of ownership such that when property is sold and bought, the trust still owns the land and can keep it permanently affordable.⁴ CLTs act as long-term stewards of these assets, ensuring that any additional value generated is retained within the CLT. Among other benefits, CLTs can foster urban renewal processes in less attractive areas by remobilizing small or complicated sites which hold less value for traditional developers.

Through its global network of local and regional governments, the Global Fund for Cities Development (FMDV) is leading an effort to create conducive financial environments for CLTs. With support from the European Commission, FMDV has been involved in the four-year

Sustainable Housing for Inclusive and Cohesive Cities (SHICC) programme since 2018. SHICC aims to foster a favourable financial and legislative environment and build capacity for existing and nascent CLTs.⁵

FMDV will help scale a financial model for CLTs across Europe and coordinate an investment platform that bundles CLTs at the transnational level. The platform will act as a financial intermediary, attracting and combining funding across European countries. In the long term, SHICC will contribute to the creation of 500 CLTs in Europe and the development of 7,000 affordable housing units for 21,000 people.

Read more about SHICC here: <https://www.nweurope.eu/projects/project-search/shicc-sustainable-housing-for-inclusive-and-cohesive-cities/>

Contribution provided by the Global Fund for Cities Development (FMDV) for the purposes of this handbook. Adapted with the author's permission.

FMDV is a global network of local governments dedicated to promoting and developing solutions to finance and invest in urban development. In recent years, it has worked with 1,500 local governments from 100 countries and has contributed to mobilizing USD\$1 billion.

Endnotes

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Annex C

**UN system capacity
development support
for life cycle asset
management**

Within the UN system, UN/DESA, UNCDF and UNOPS work together to provide a range of capacity development support for the different stages of infrastructure asset management for national and local governments. Such support can help governments improve their capacity to plan, acquire, operate, maintain and dispose of infrastructure assets. These services aim to enhance government capacity to improve the quality, performance and value of their infrastructure systems while minimizing lifecycle costs and exposure, to meet both present and future community needs. Please contact IAMH@un.org to share requests for technical assistance.

UN infrastructure asset management tools

- Stage 1: Planning
- Stage 2: Acquiring
- Stage 3: Operating and Maintaining
- Stage 4: Disposing

Stage 1: Planning

Within the planning stage of the IAM lifecycle, the following support can be provided:

- Physical workshops and Online Training of Trainers on assessing local and national government asset management needs with the application of the **UN Asset Management Diagnostic Tool**;
- Physical workshops and ongoing support for the assessment of the national/urban enabling environment for quality infrastructure with the use of the **Capacity Assessment Tool for Infrastructure (CAT-I)**, more at <https://cati.unops.org/>;
- Physical workshops, online courses and self-paced MOOC with certification on designing and implementing frameworks, strategies, plans as part of **Asset Management Action Plans (AMAPs)**;
- Physical workshops and ongoing support on rigorous, systems-based infrastructure asset assessment and modeling using the **National Systems Model (NISMOD)**;
- Training in the design of local capital investment plans.

Stage 2: Acquiring

To support the acquisition phase of the infrastructure asset management lifecycle, the following support can be provided:

- Infrastructure design and construction;
- Review and revision of codes and standards;
- Building the capacity of government and development partners to incorporate climate resilient design and construction techniques in infrastructure development.

Stage 3: Operating and Maintaining

For the operating and maintaining phase of the infrastructure asset management lifecycle, the following support can be provided to improve government's ability to manage assets and the quality of service provision, including in times of crises:

- Physical workshops and online courses on capturing and utilizing data for asset management;
- Physical workshops and online courses with certification on building asset management information systems;
- Critical infrastructure asset identification, vulnerability assessment, resilience and climate adaptation planning;
- Post disaster infrastructure damage assessments, response and recovery planning;
- Existing infrastructure assets rehabilitation;
- Physical workshops and online courses on responding to health emergencies with the design and implementation of **Emergency-Response Asset Management Action Plans (ER-AMAPs)**.

Stage 4: Disposing

The final stage of an asset's lifecycle is disposal. An asset is disposed of when it has reached the extent of its useful life or has been damaged beyond repair. It is important to plan for the disposal of assets as once they have exceeded their usefulness, they can drain resources. Furthermore, they provide an opportunity to generate revenue that can be used to invest in new assets as their materials can be reused and recycled for use in new construction.

- Technical assistance in designing disposal policies and strategies as part of AMAP
- Demolition and debris management.



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