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How to Avoid Green Elephants: Governance as a Driver for Resilient Green Infrastructure

Welcome

Overview

- Introduction
- About Green Infrastructure (GI)
- GI Asset Management
- City of Vancouver
- Conclusions / Key Takeaways





Green Infrastructure Overview

→ Definitions and co-benefits



Universal Challenges

In the current global climate, the pace of rapid urbanization and population growth have led to significant changes to physical and biological environments.

Climate pressures and extremes has significant impact on built assets, impacts to liveability, and mental and physical health.



Green Infrastructure

The implementation of green infrastructure (GI) approaches is used to address the universal challenges and support healthier, greener communities while having positive environmental outcomes.

The approach includes the use of assets on a continuum from engineered solutions, through hybrid assets, to nature-based solutions that provide multi-benefit outcomes.





Green Infrastructure (GI)

Nature-based Solutions (NbS) / Nature-based Climate Solutions

Natural Infrastructure (NI)

Low Impact Development (LID) / Green Stormwater Infrastructure (GSI) / Best Management Practices (BMPs)

Natural assets*

- Wetlands
- Forests
- Parks
- Meadows
- Lawns and gardens
- Soil

Enhanced assets*

- Rain gardens
- Green roofs and walls
- Bioswales
- Urban trees and tree trenches
- Naturalized stormwater ponds

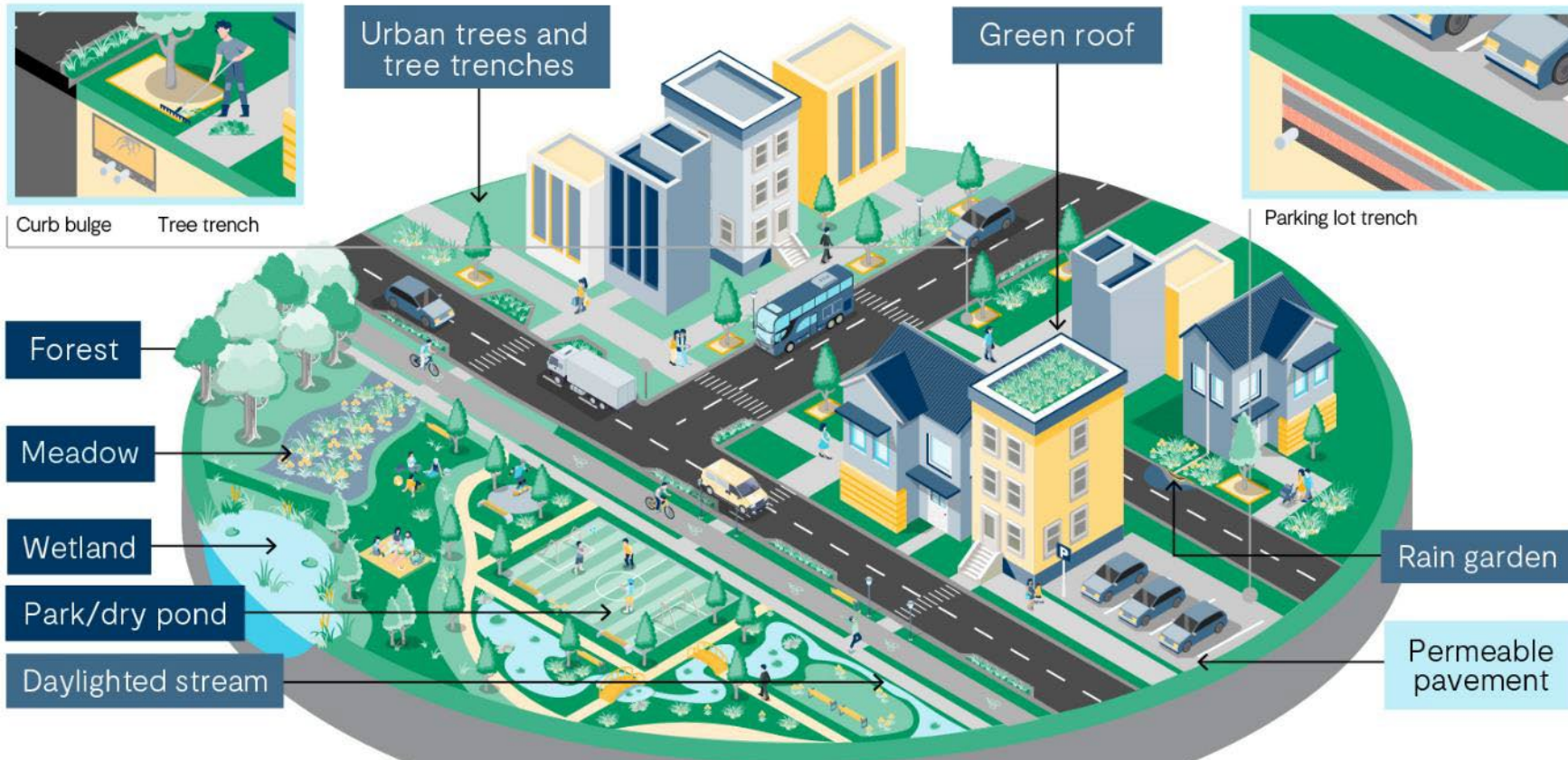
Engineered assets*

- Permeable pavement
- Cisterns
- Perforated pipes
- Infiltration / Detention trenches
- Rain barrels

Grey infrastructure

- Bridges
- Roads
- Parking lots
- Culverts
- Conveyance pipes

* These are examples of assets, but this is not a comprehensive list



Co-Benefits / Services



Environmental

- Climate resilience
- **Stormwater management**
- Greenhouse Gas (GHG) sequestration
- Urban heat island mitigation
- Improved air quality
- **Improved water quality**
- Reduced air temperatures
- Habitat improvement and connectivity
- Erosion control



Economic

- **Cost-savings compared to grey (lower capital costs)**
- Increased property values
- Reduced energy costs
- Extended life and lower maintenance costs of traditional infrastructure
- Green job creation



Health (Physical & Mental)

- **Space for recreation and physical activity**
- Reduced incidence of asthma
- Improved mood and focus
- Reduced stress and anxiety
- Reduced symptoms of ADHD



Social

- Space to interact and build community
- People living near GI are **better connected to their neighbours and express a stronger sense of belonging** in their communities than those who do not
- Builds community cohesion
- The presence of GI assets leads to greater use of common spaces in social housing projects

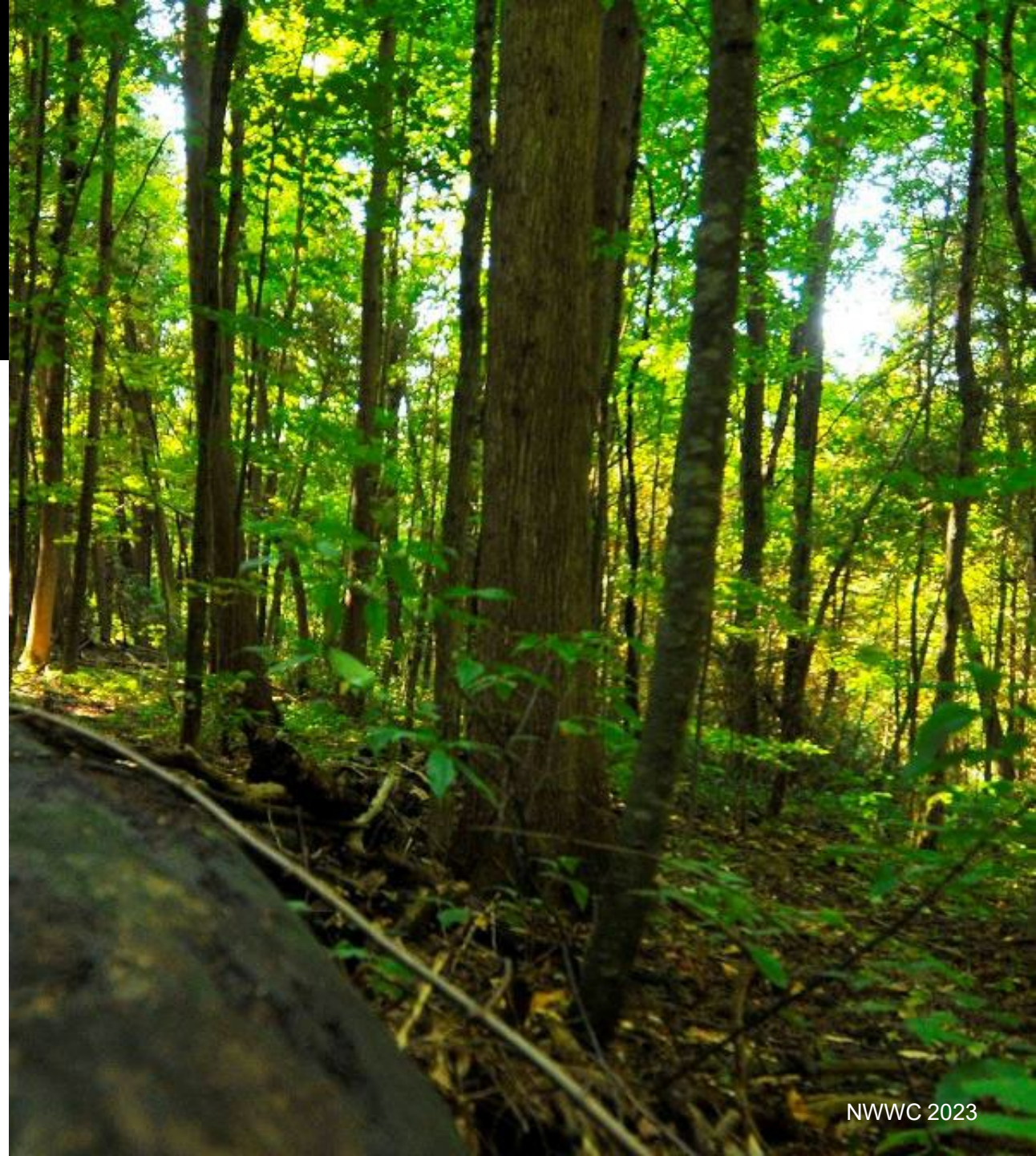
Key Barriers & Challenges



- ➔ Funding life-cycle: capital vs O&M
- ➔ O&M expertise/capacity
- ➔ Inconsistent ownership of and responsibility for assets
- ➔ Space constraints (availability, conflicts in the ROW, etc.)
- ➔ Perceived barriers to incorporating infrastructure mixes
- ➔ Lack of regulatory drivers in Canada
- ➔ Opportunistic implementation hinders strategic growth

Why Use Infrastructure Language?

- Ensure natural features and processes are viewed as equals to road, bridges, and pipes
- Improve eligibility for federal and provincial infrastructure funding
- Embed nature into infrastructure policy to try to avoid being targeted by changes in government.
- Improve the management of natural features
- Key concepts:
 - Recognize GI assets AS assets
 - Secondary services/co-benefits
 - Cost savings



Green Infrastructure in Asset Management Planning

Benefits of incorporating green infrastructure into asset management planning include improved:



Ability to explain and defend budgets



Oversight of critical infrastructure



Greater inclusion of GI at the beginning of the development and planning process for all types of infrastructure



Development of robust business cases through improved reporting practices and diverse assessment methods



Risk management



Ability to balance capital and operating expenses and reduce costs

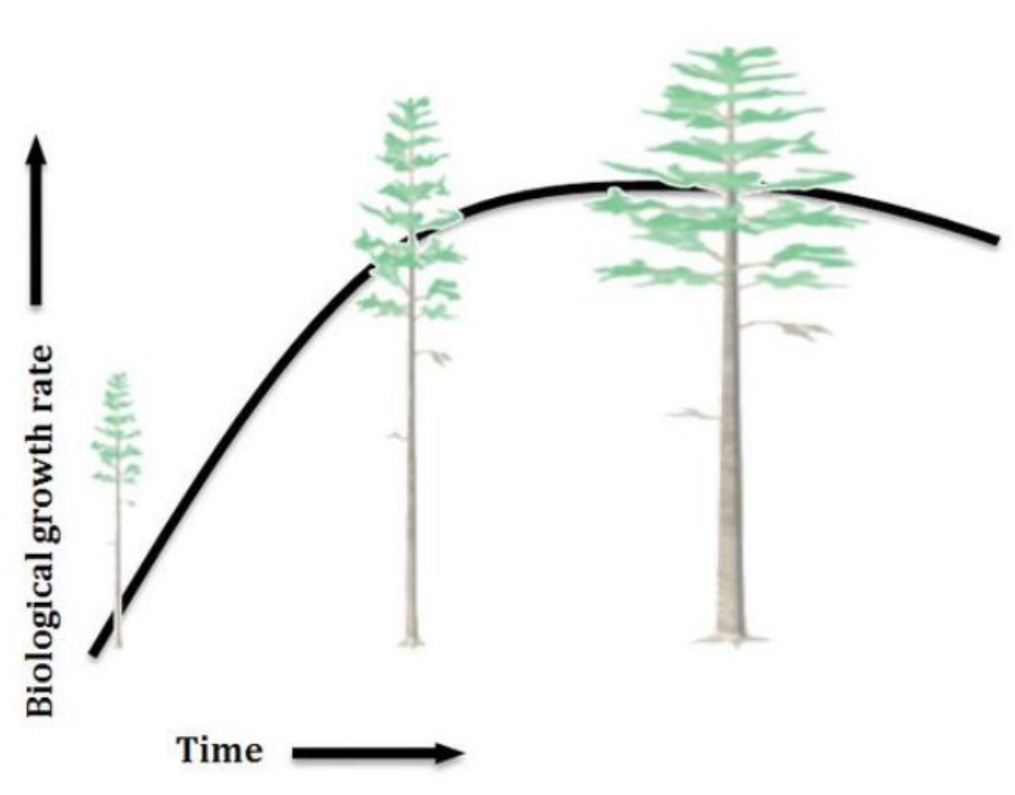
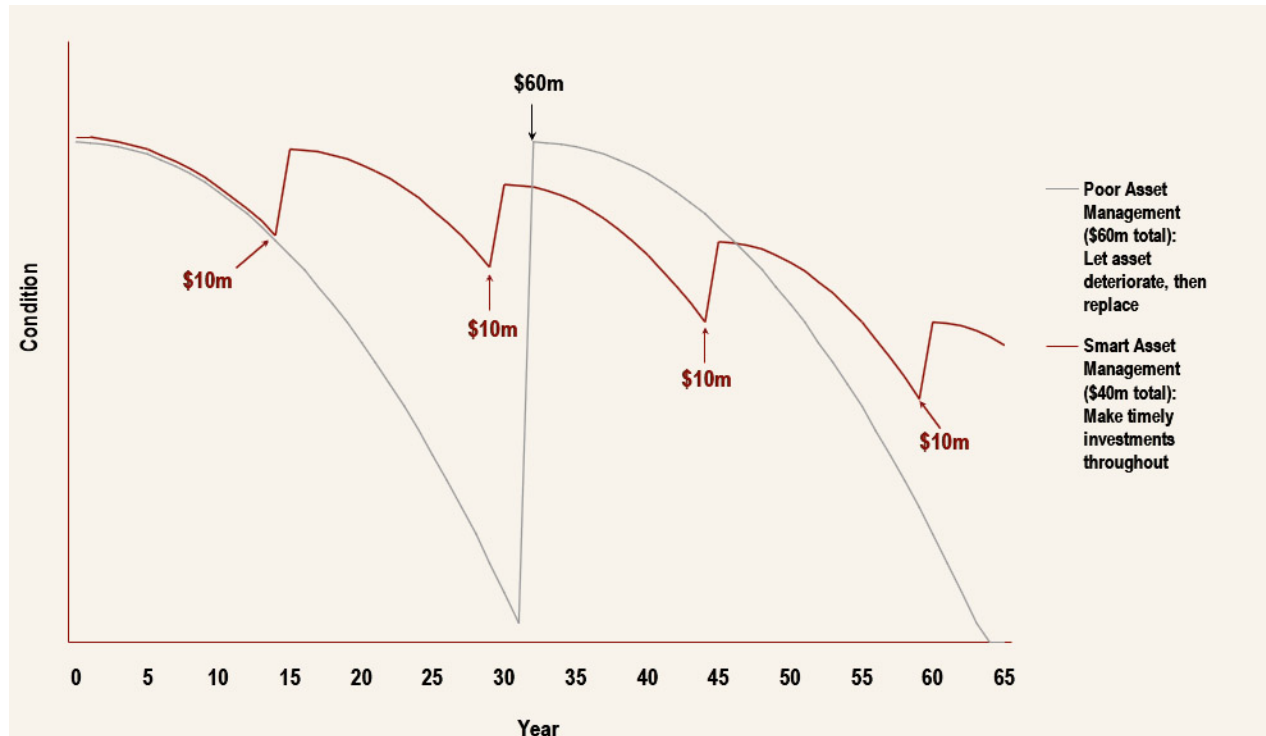


Decision-making in areas of appropriate investment and management and maintenance



Public reporting

Grey vs Green Infrastructure Comparison





City of Vancouver

→ Rain City Strategy



Rain City Strategy

- Formally adopted in 2019
- Articulates the aspiration to become a Water Sensitive City
- 3 key goals:
 - improve and protect Vancouver’s water quality,
 - increase Vancouver’s resilience through sustainable water management, and
 - enhance Vancouver’s livability by improving natural and urban ecosystems

RAIN CITY STRATEGY

Rain City Strategy

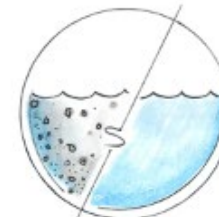
- Commitment to capture and clean a minimum of **90% of Vancouver's average annual rainfall volume** and to manage urban rainwater runoff from **40% of impervious areas** in the city by 2050
- **Targeting 10% of all impervious surfaces** to be retrofitted to manage stormwater with GI

Green Infrastructure Implementation (GII) Branch

- Established in 2017
- Consolidating ownership of and responsibility for GI assets from 9 other Branches



Vision: Vancouver's rainwater is embraced as a valued resource for our communities and natural ecosystems



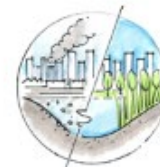
Goals: Improve and protect Vancouver's water quality



Increase Vancouver's resilience through sustainable water management



Enhance Vancouver's livability by improving natural and urban ecosystems



Objectives: Remove pollutants from water and air



Reduce volume of rainwater entering pipe system



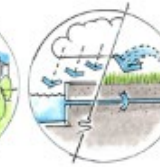
Increase managed impervious area that treats urban rainwater runoff



Increase total green area that treats urban rainwater runoff



Mitigate urban heat island effect



Harvest and reuse water



Green Infrastructure Asset Management

**→ Overview and City of Vancouver
Program Development**

Asset Management vs. Managing Assets

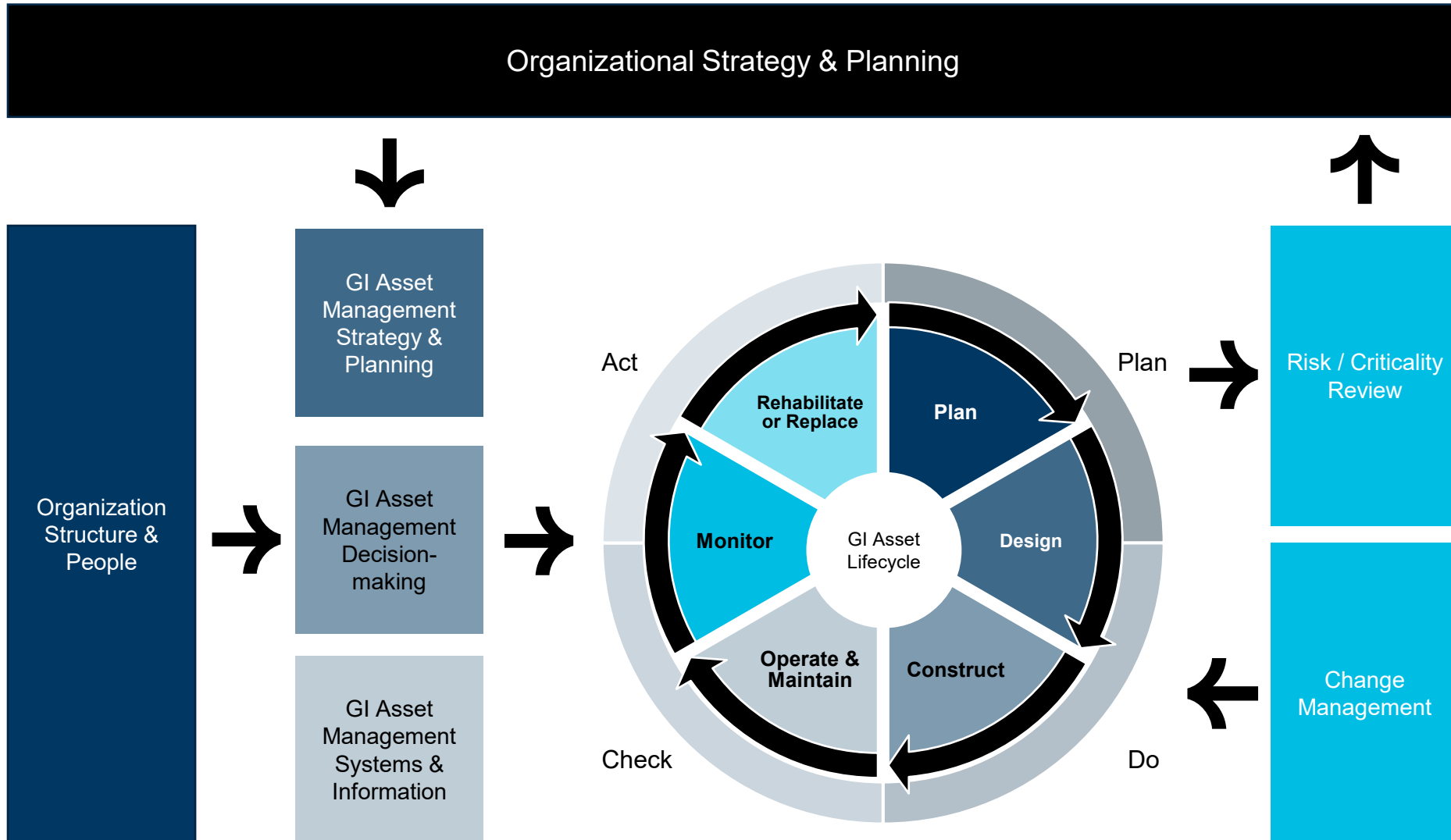
Asset Management

Making decisions about the collective set of assets

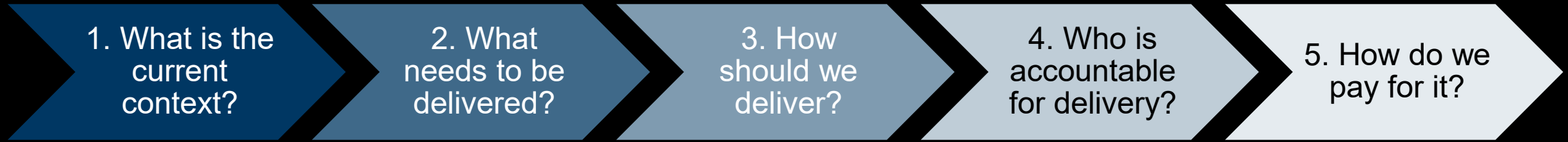
Managing Assets

Making individual decisions about assets

Goal: Living GI AM Framework



GI Asset Management Program Development



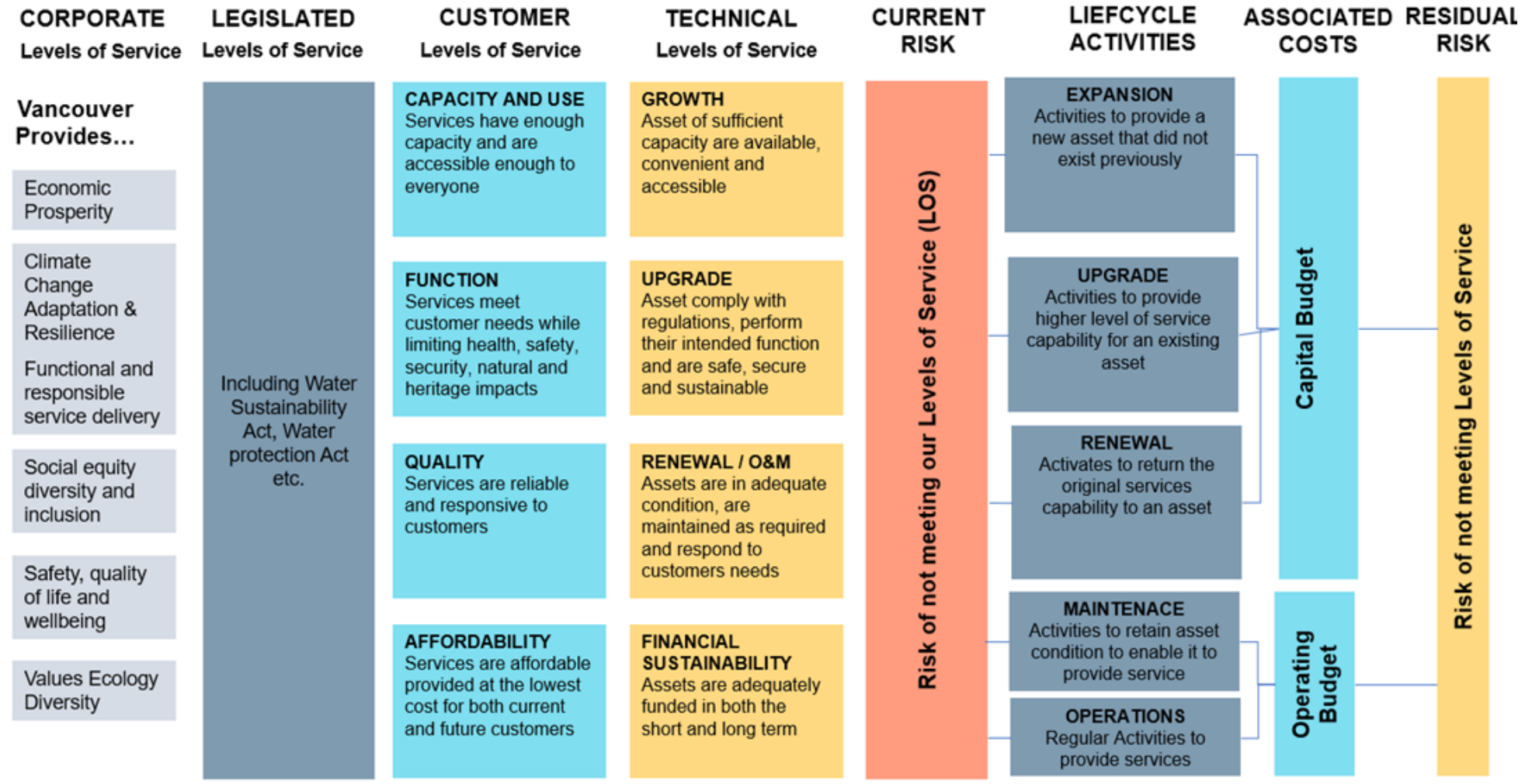
1. What is the Current Context?

- Conducted internal system and data maturity assessment of GI programs
- Complemented by external analysis of drivers and peer city benchmarking
- Interviewed comparable cities with mature GI programs
- Learned about GI deployment, management, best practices, and challenges
- Identified data and lifecycle management activities required
- Recommended Data Management System integrated with City's asset management systems

2. What services are delivered?

2. What needs to be delivered?

And what to track to ensure service performance?



3. How are Services Delivered?

3. How should we deliver services?

Service delivery: process of providing a service to meet demands from customers and/or internal clients within an organization.

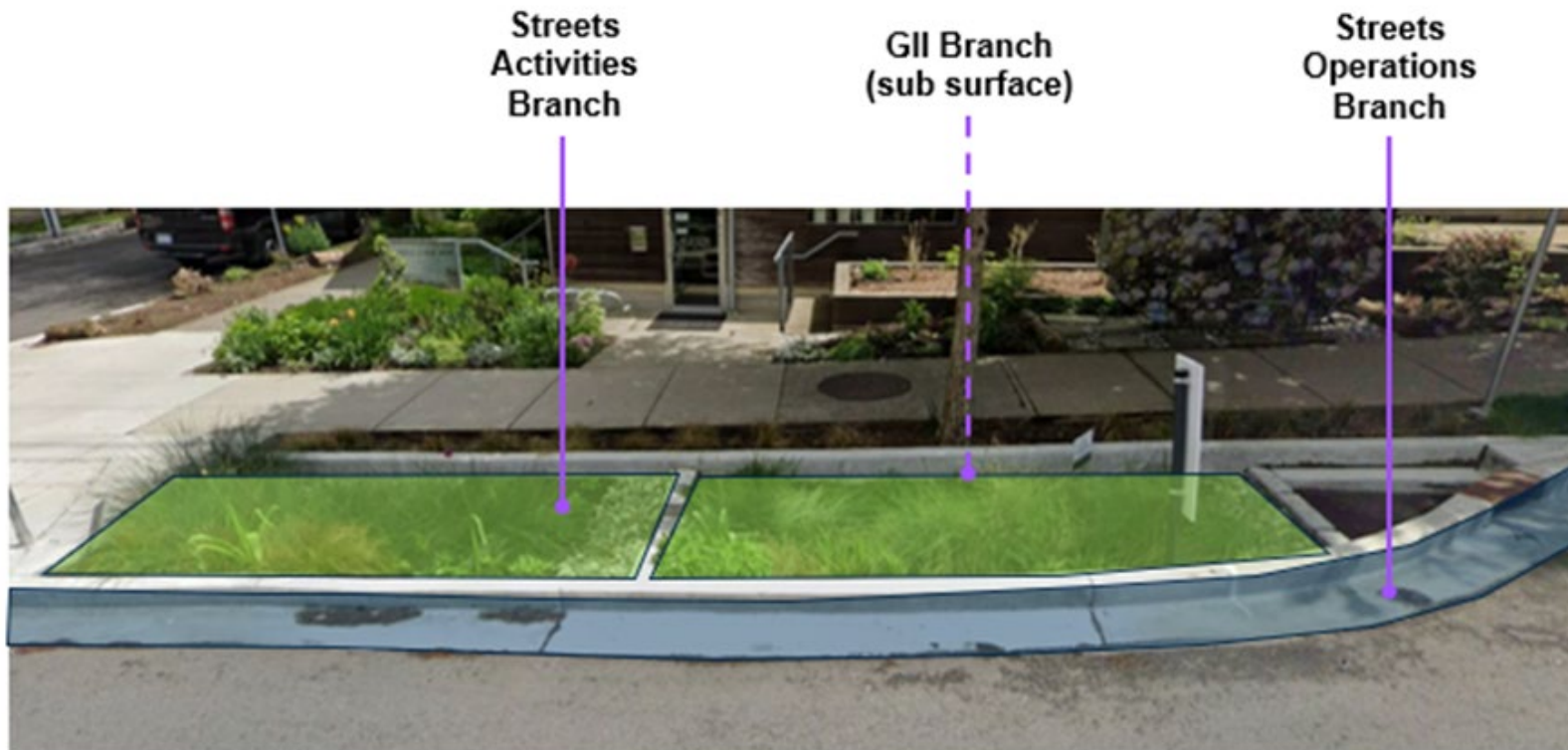
Service delivery model: organizational processes involved in the design, development, deployment and operation of these services



4. Who is Accountable for Delivery

4. Who is accountable for delivery?

Leadership sets the *direction* and makes sure that it happens, whereas **Governance** is the *accountability* for that direction and actions taken.



5. How do we pay for these services?

5. How do we pay for it?





Key Takeaways

→ Summary

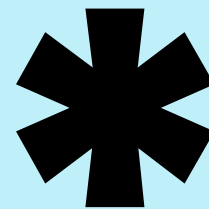
Key Takeaways

- ➔ GI AM is an emerging practice
- ➔ Implementing GI in an ad hoc and opportunistic manner is problematic
 - Does not ensure that GI assets are in optimal locations to maximize benefit & service provision
 - Does not allow for sound financial planning (especially for future O&M costs)
- ➔ GI performance monitoring is important
- ➔ Data is key (quality data, and a data management strategy)





***Aquanomics* reveals droughts, floods and storms could result in a total loss of nearly \$5.6 trillion to GDP across our seven focus countries between 2022 and 2050.**



A problem for this decade

Between 2022 and 2030, water risk could cost these key economies an estimated total of just over **\$1.3 trillion**.

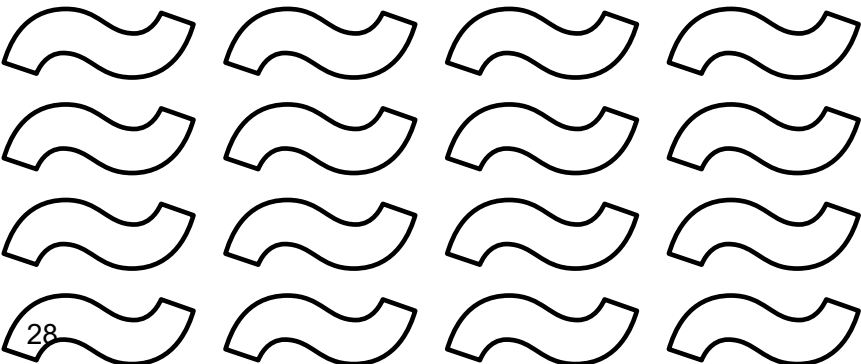
Canada

↳ **\$108 billion**

GDP impact of water risk
between 2022 and 2050
(USD)

0.2%

**Average annual GDP loss
between 2022 and 2050**



Impact of water risk on Canada

Flooding alone is expected to cost the Canadian economy over \$30 billion in the years leading up to 2050

Canada's FMCG and retail sector is projected to make average losses of 0.3% year on year.

Aging pipes mean millions of litres of water are being lost per day.

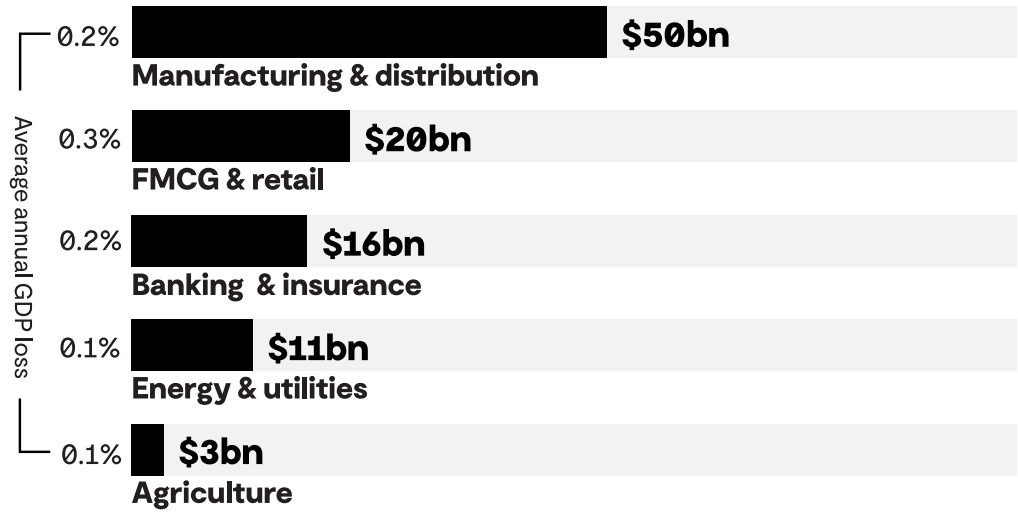
Building resilience

Canada may not be a water-stressed country, but it is a country of extremes, and these extremes are getting more pronounced. It is up to the engineering community to help clients adopt a risk-based management approach to plan for increasing variability.

Canada

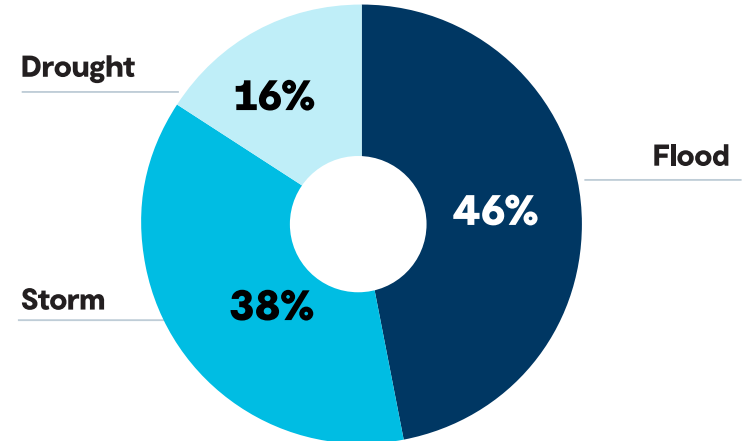


Total output losses by sector



Data showing total sector output losses in \$ (billions) between 2022 – 2050

Direct losses by event type



Data showing total sector output losses in \$ (billions) between 2022 – 2050

An unequivocal call to action...

01



02



03

Adapt

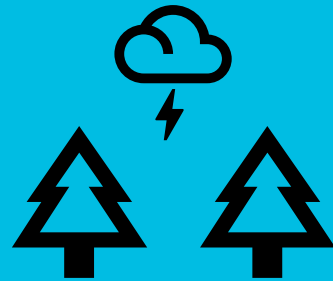
Build future resilience into new projects. The industry needs to rapidly adapt to evolving risk. Adopting an adaptive management model using smaller and even temporary investments – with 10- and 20-year horizons – will allow for more flexibility.

Optimise

Improve performance of existing infrastructure with advanced technologies and data-driven insights. For sectors such as agriculture, irrigation practices based on intelligent asset management can reduce the water needed for production as well as waste. This is crucial in the world's thirstiest industry, as food production accounts for almost 70% of global water withdrawals.

Prioritise

Put regenerative and nature-based solutions first. A circular economy approach to water management is crucial. Focusing on water recycling and resource recovery, working within nature's cycle, will improve long-term sustainability.



Liveable + Resilient + Sustainable + Productive



*** Thank You**

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