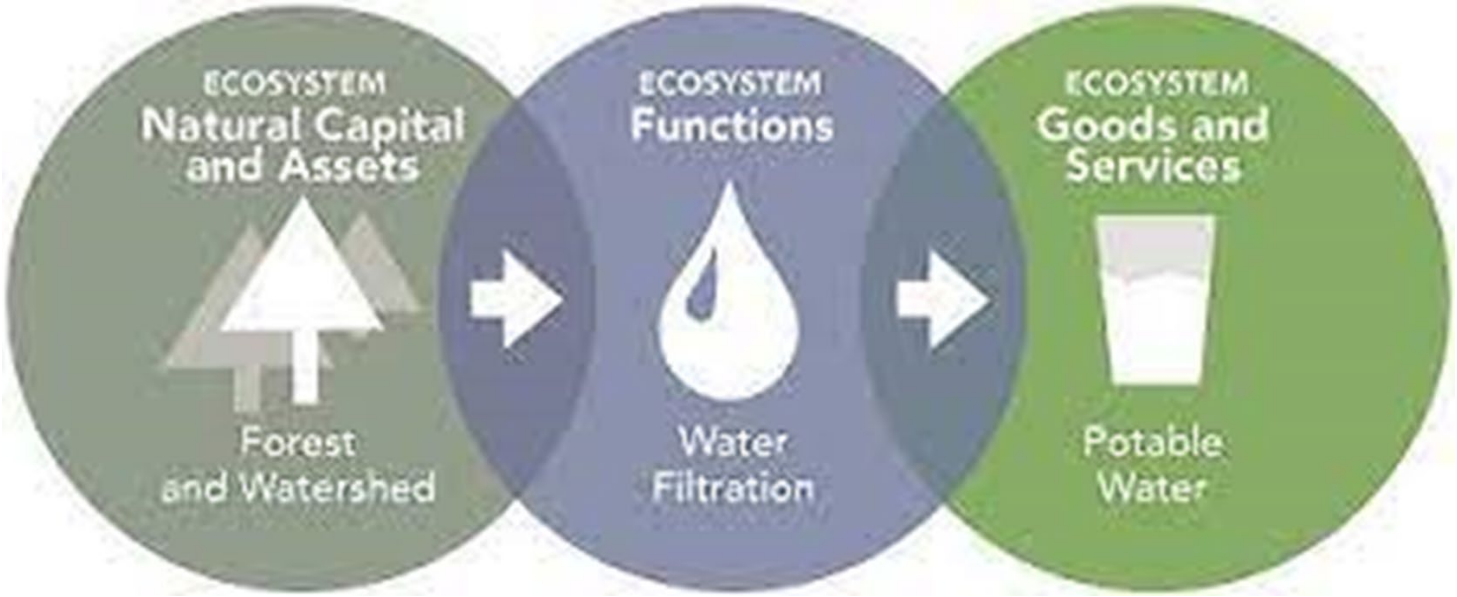


Enabling Community Climate Resiliency via Asset Management:

Natural Assets and Service Delivery

Christine Callihoo, MSc, RPP, Sr. Community Resilience Planner

‘Agenda’: Today’s Journey

1) Introduction
2) Laying the Foundation:
   - i) Climate change projections
   - ii) Shared language (definitions)
3) Natural Assets - Basically
4) Community Resilience

Introduction: The Challenge

The changing climate is, by far, the biggest existential challenge that the human race has had to face. And we need to look at ALL potential options in our collective efforts to begin to address the challenge, including bravely examining and boldly revising the human concept of value and how we protect / manage these values.

Where we are….currently

Where We Are Currently

Natural assets (ecosystem services) are not generally recognized as valued assets – they are largely undervalued and negatively impacted by the very specie that relies upon the services provided.

The **changing climate** has introduced significant challenges to humans – requiring that we, as humans, step back, rethink BAU, and collectively reconfigure in order to enable our continued existence.

#2 Laying the Foundation

i) Climate change projections

ii) Shared language (definitions)

Metro Vancouver Climate Change Projections: 2020s, 2050s and 2080s

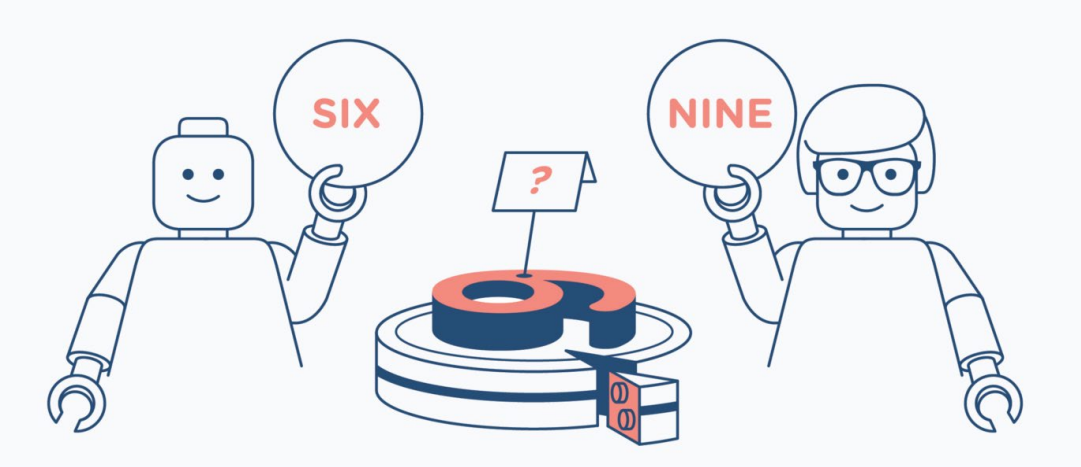
The **2020s** projections indicate that there will be the following:	The **2050s** projections indicate that there will be the following:	The **2080s** projections indicate that there will be the following:
➢ **increase in annual temperature** (+1°C)	➢ **increase in annual temperature** (+1.7°C)	➢ **increase in annual temperature** (+2.7°C)
➢ overall **annual increase in level of precipitation** (+4%)	➢ overall **annual increase in level of precipitation** (+7%)	➢ overall **annual increase in level of precipitation** (+8%)
➢ **fluctuations** in the seasonal precipitation **norms**	➢ **fluctuations** in the seasonal precipitation **norms**	➢ **fluctuations** in the seasonal precipitation **norms**
➢ **substantial decrease in annual snowfall**	➢ **significant decrease in annual snowfall**	➢ **significant decrease in annual snowfall**
➢ **substantial increase in number of frost-free days** (+13 days)	➢ **significant increase in number of frost-free days** (+22 days)	➢ **significant increase in number of frost-free days** (+33 days)

The Metro Vancouver Region can expect changes …. generally as follows:

- warmer temperatures
- decrease in snowpack
- longer dry spells in summer months
- more precipitation in fall, winter, and spring
- more intense extreme events

What climate change looks like in the coming years?

- Reduced winter snow pack + earlier snowmelt = reduced summer water supply
- Reduced summer soil moisture = increased forest fire risk + decrease in crop yields
- Increased flood risks in spring = increased flooding associated with storm events
- Increased stress on animal and plant species, and shifts in geographical range of vegetation
- Increased river temperatures = stress on fish and other aquatic animals
- Increase in frequency and/or intensity weather events (i.e. heavy precipitation, drought, flooding, landslides)



Shared Language

Shared Language: Specific Terms

- ✓ Resilience (community)
- ✓ Natural Assets
- ✓ Hazards
- ✓ Impact
- ✓ Risk
- ✓ Vulnerability
- ✓ Sustainability

Resilience: IPCC 2014 Summary Report

"The capacity of social, economic, and environmental systems to **cope with** a hazardous event or trend or disturbance, **responding or reorganizing** in ways that maintain their essential function, identity, and structure, while also **maintaining** the capacity for adaptation, learning, and transformation" …

The 'definition **links resilience with the capacity to adapt**, where adaptive capacity refers to the resilience that reflects **learning, flexibility to experiment and adopt novel solutions**, and **the development of a generalized response to broad classes of challenges**' **OKAY ….so for community resilience …..**

What is Community Resilience?

Community resilience is the **sustained ability** of a community to utilize available resources to **respond to, withstand, and recover from** adverse situations **while continuing to deliver** important community services.

Shared Language

Community assets are the people, structures, facilities, and systems (including natural) that have value to the community.

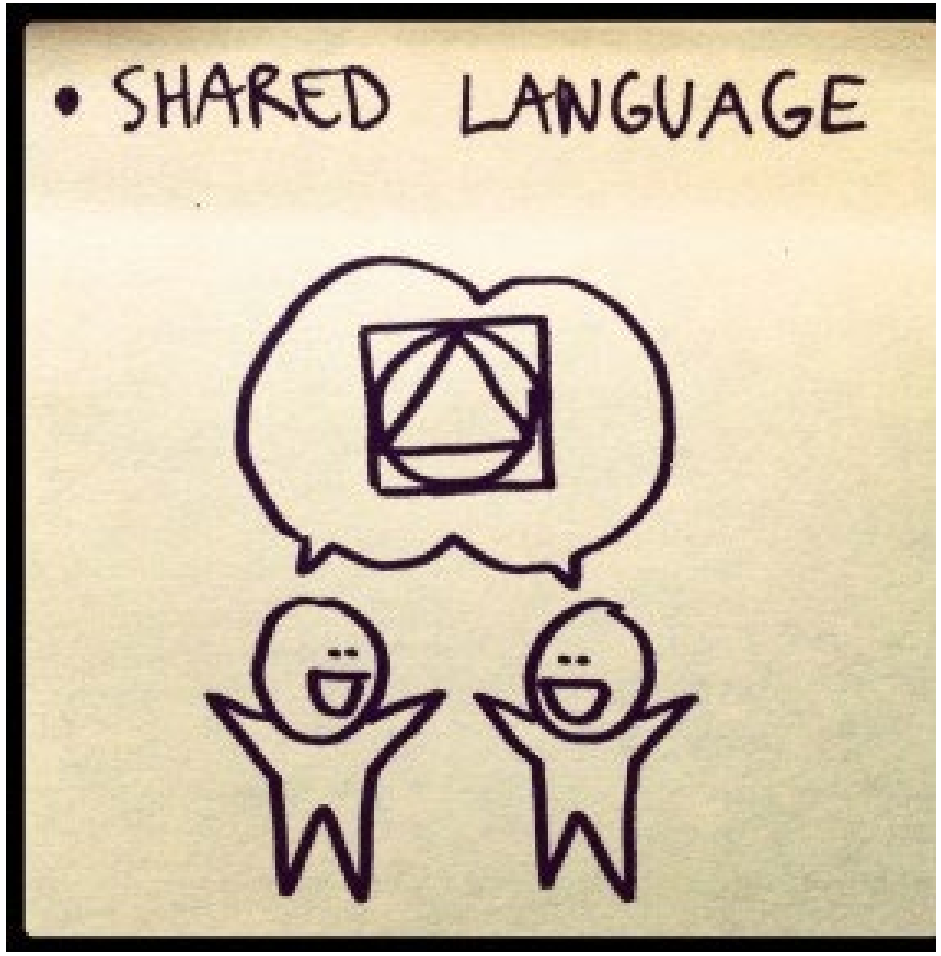
Hazards are natural processes, such as hurricanes, floods and earthquakes. They are a source of harm or difficulty - created by a meteorological, environmental, or geological event.

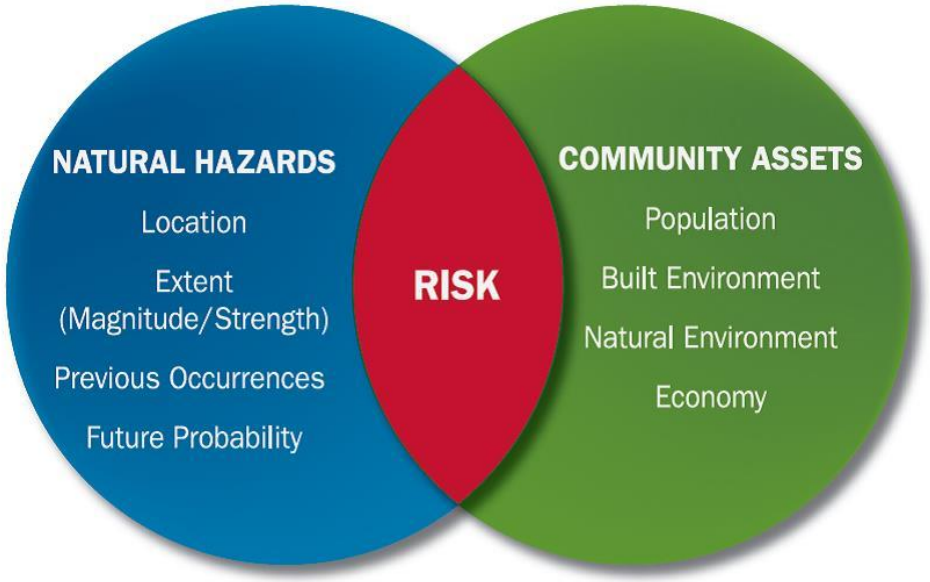
Shared Language

Impact is the consequences or effects of a hazard on the community and its assets.

Risk is the potential for damage, loss, or other impacts created by the interaction of natural hazards with community assets.

Vulnerability are the characteristics of community assets that make them susceptible to damage from a given hazard.





Shared Language

With the changing climate, **natural hazards may increase in frequency, duration and level of impact**. **The exposure** of people, property and other community assets (systems) to natural hazards can result in disasters, depending on the impacts.

The **type and severity of impacts are based on the extent of the hazard and the vulnerability of the community's assets**, as well as the community's ability to **mitigate, prepare for, respond to, and recover from events**; **a community's level of resiliency**.

Shared Language

Sustainability - In 1987, the United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

Further to the above is the Indigenous concept of sustainability by way of the 7 generations principle - every decision should result in sustainable relationships for seven generations.


1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS


Why Invest in Asset Management?
WIND TURBINES
MORE BIKE LANES
COMPOSTING + RECYCLING FACILITY
ARENA
H2O
SOLAR ROOFS
LIBRARY
1950
BUS
STORMWATER MANAGEMENT
water
sewage
BIKE PATH

Asset Management Planning Process

Step 1: Initiate the process / project

Step 2: Articulate and assess the baseline (incl. trends and projections)

Step 3: Identify and prioritize hazards, risks, vulnerabilities and opportunities

Step 4: Develop and prioritize resilience strategies

Step 5: Finalize and share the plan

Step 6: Implement the plan

Step 7: Monitor, evaluate and adjust (ongoing/ living plan)

Asset Mgmt and Community Resilience [Sustainability]

Building resilient communities, with <u>sustainable services</u>, is the **ultimate goal of asset management**; at the centre of any asset management action, decision, policy or program.

The Community Resiliency [Sustainability] is a Significant Challenge

Aging Infrastructure

Urban Growth

Changing Climate

Insurance Bureau of Canada – Sustainable?

2011: $1.7B

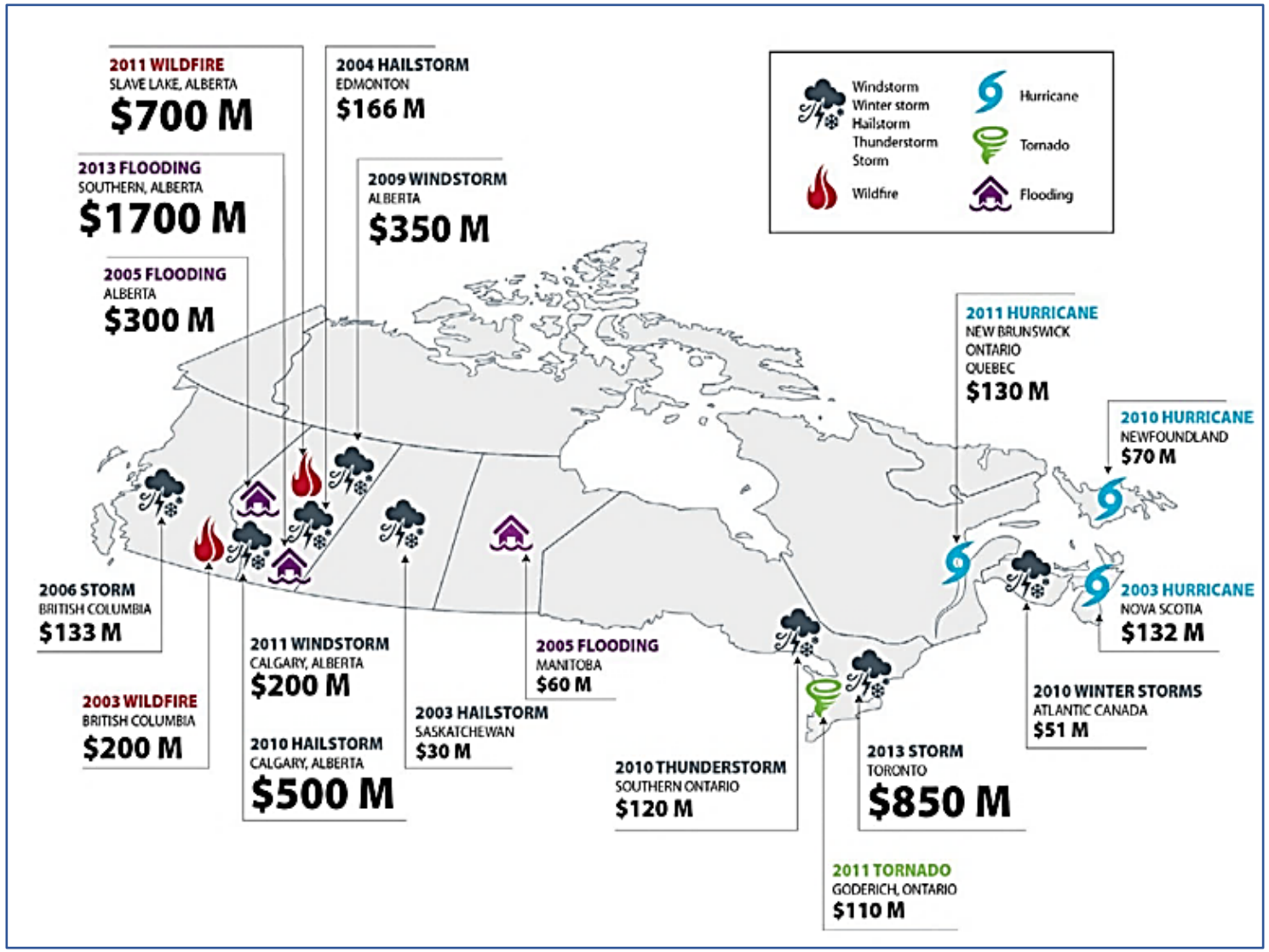
2013: $3.2B

2016: $4.9B

2017: $7.3B

2018: $1.9B

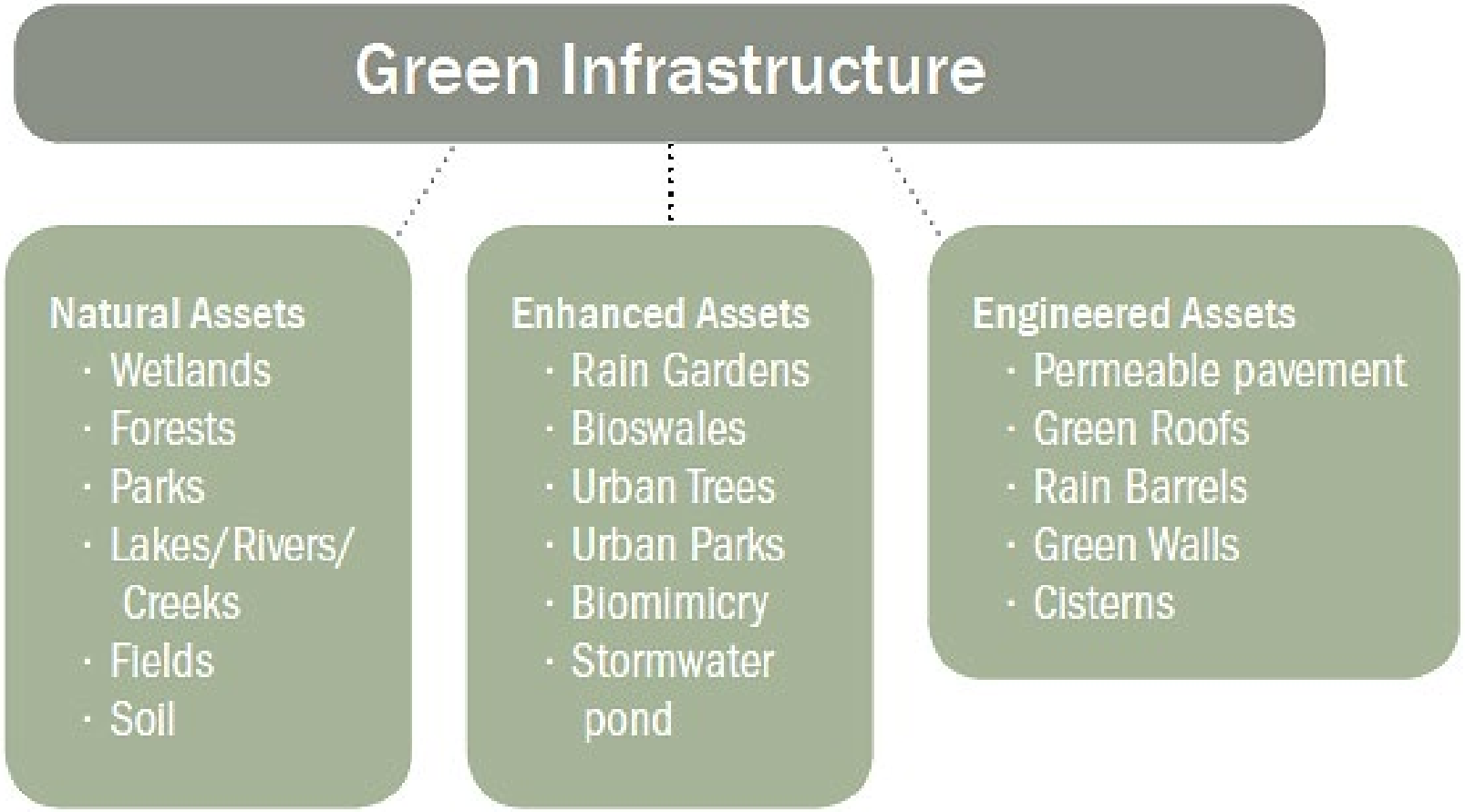
2019: $1.9B



#3 Natural Asset Management - Basically

'Natural assets refer to the stock of natural resources or ecosystems that is relied upon, managed, or could be managed by a municipality, regional district, or other form of … government for the sustainable provision of one or more municipal services.'

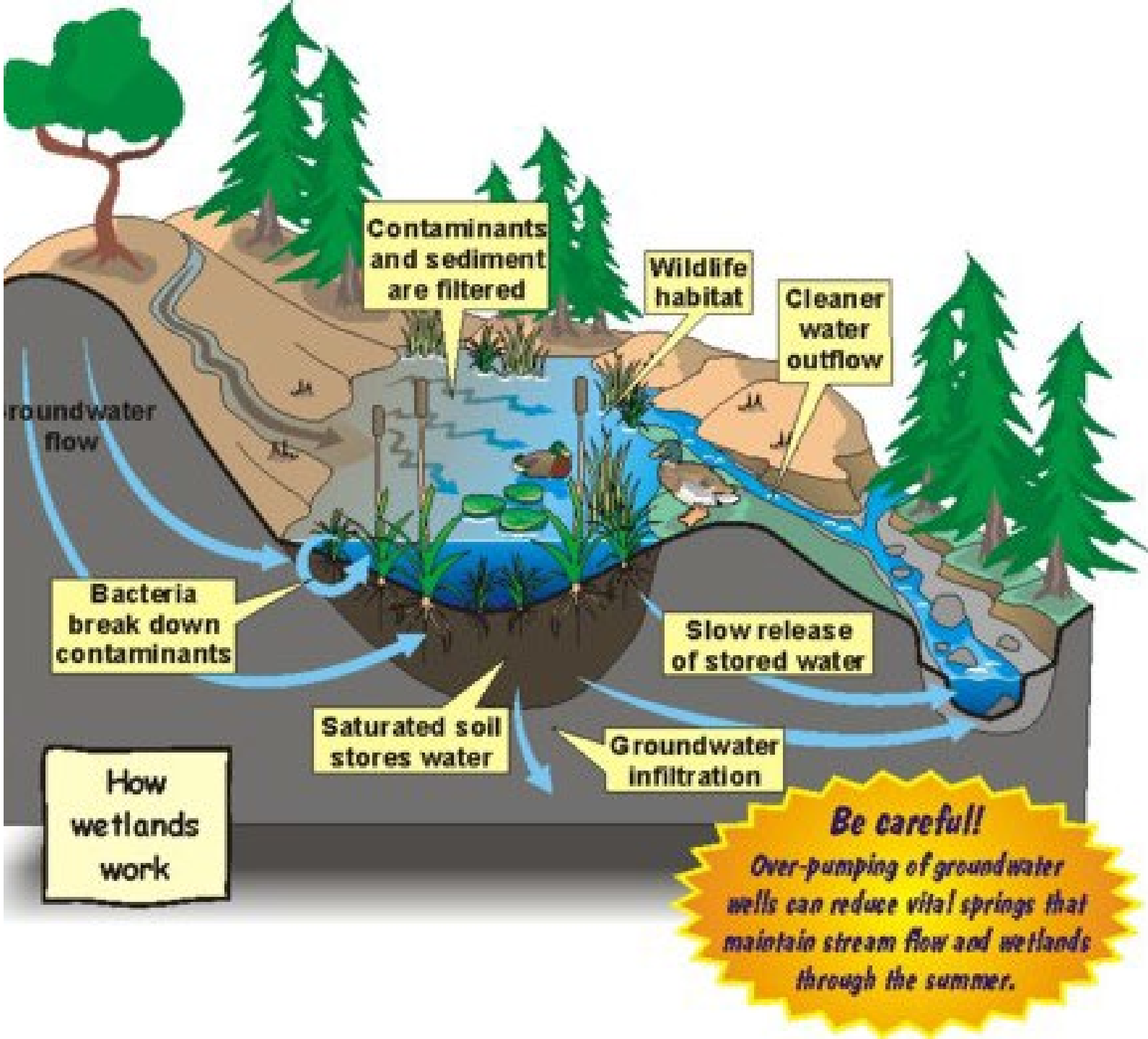
O'Neill, Sara Jane. *Results from the First National Cohort: Decision-Maker Summary*. Municipal Natural Asset Initiative, July 26, 2018; the Municipal Natural Assets Initiative (MNAI), www.mnai.ca.



"Green infrastructure" is a broad category that includes natural assets and designed and engineered elements that have been created to mimic natural functions and processes in the service of human interests, as depicted in the diagram.

Natural Assets

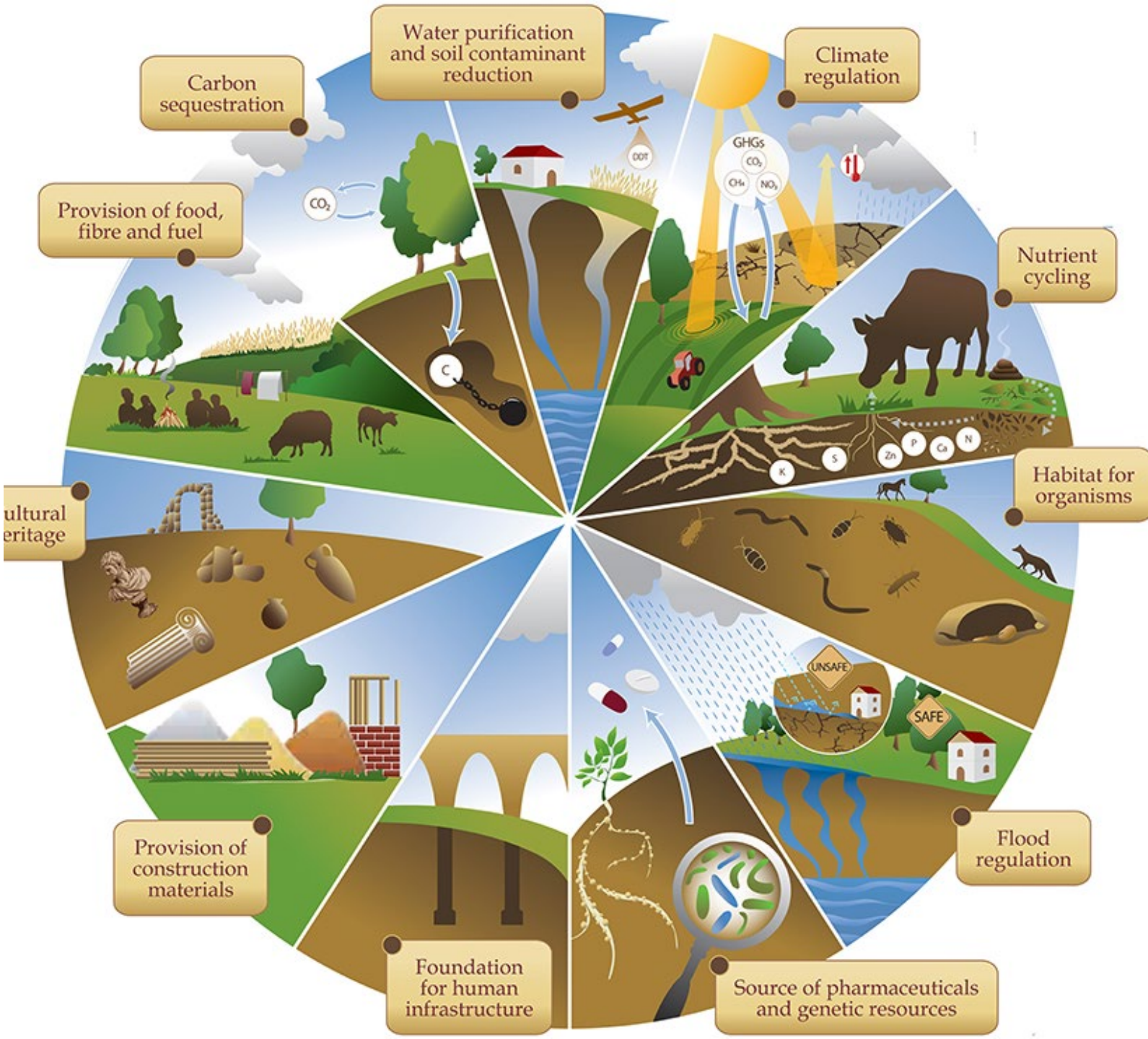
Natural assets provide value, support community resilience and require effective and efficient management in line with other assets for which the community is responsible. There is growing evidence that natural assets provide, or could be restored to provide, services just like engineered assets, **often at lower costs**.



Ecosystem Services (Natural Assets)

Forests and vegetation store carbon we release into the atmosphere, acting as a buffer against the effects of climate change.

Wetlands slowly absorb water and buffer the effects of flooding from severe weather events. They store water and their trees and vegetation act as barriers for storms and slow the rush of water.



Natural Assets

There are many varying definitions of natural capital [assets], but all revolve around the main theme of the stock of renewable and non-renewable natural resources that includes land, water, atmosphere, minerals, plant and animal species, and all living things. For example,

"Natural Capital can be defined as the world's stocks of natural assets which include geology, soil, air, water and all living things."

~World Forum on Natural Capital

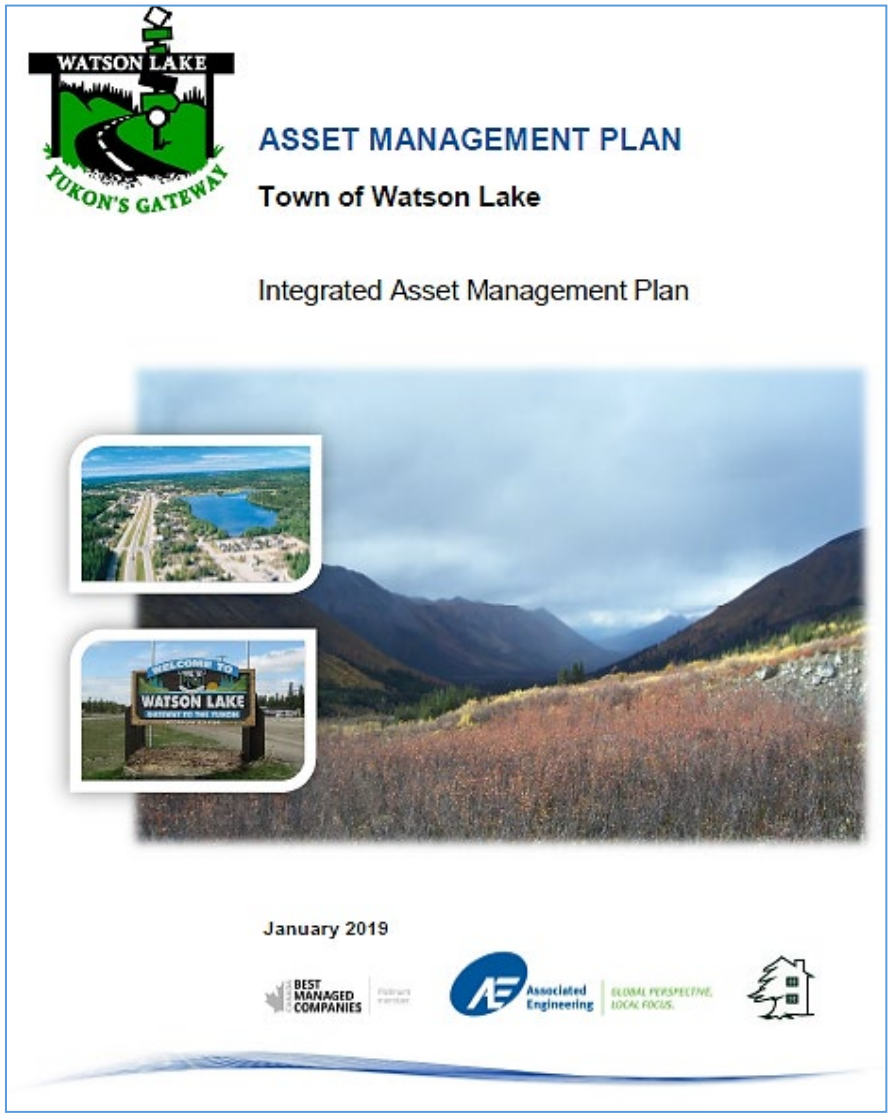
Natural Assets

Key benefits to using natural assets is that often they serve several functions such as both flood and drought reduction and have a variety of additional ecological and societal benefits, whereas traditional grey infrastructure is generally designed to meet a limited set of purposes or one purpose.

Services Provided	Natural Asset	Grey Infrastructure
• Stormwater storage	x	x
• Water quality	x	
• Habitat creation / improvement	x	
• Microclimate stabilization (e.g., urban heat island reduction)	x	
• Air filtration	x	
• Recreational amenity and aesthetic services	x	
• Energy savings	x	
• Carbon savings	x	

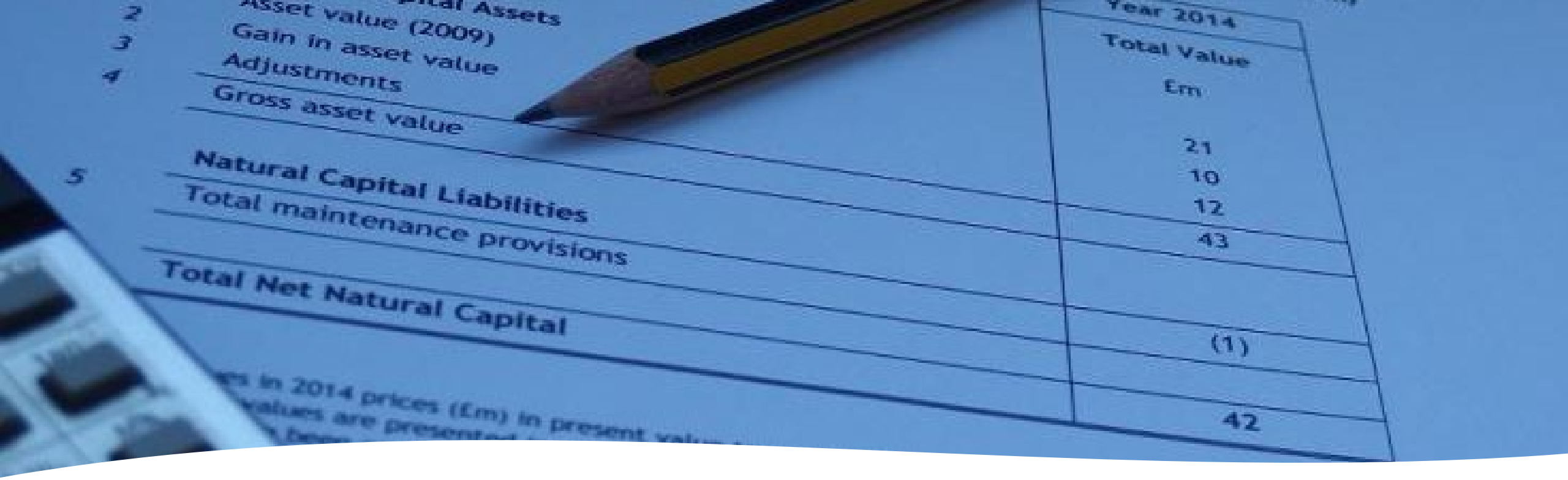
Asset Mgmt Plan

Communities can integrate natural assets with asset management and financial processes using the same systems as for all other assets. To that end, communities can formally account for natural assets in the asset register, thus enabling greater awareness of the services provided by these natural assets, in addition to ensuring the ongoing integrity and wellbeing through proper management of these assets to continue to serve the community.



Highlights: Natural Assets

- ✓ Natural assets can **reduce service delivery costs**: managing areas such as aquifers, forests, and wetlands reduces service delivery costs and improves engineered assets efficiency.
- ✓ Natural assets can have a **perpetual life span**: engineered assets must be replaced after their lifespan ends. Some natural assets, on the other hand, can provide services in perpetuity when properly managed. They can become more valuable over time with effective monitoring, maintenance and restoration.
- ✓ Natural assets are **carbon neutral or carbon positive** (i.e. carbon sequestration).
- ✓ Natural assets **support climate change adaptation**: some natural assets are resilient and can meet increased service delivery requirements under predicted climate change scenarios, meaning that their value can grow over time.



The Challenge: Incorporating Natural Assets

The question is **how**; **how do we identify, valuate, incorporate into business as usual, and manage for natural assets?**

- How do you place a monetary value on an inherent value? Or do you?
- If not a monetary value - that is able to span most knowledge levels and therefore communicate 'value' in most languages ($) - how do we value natural assets?
- And how are these values impacted by the changing climate?

Valuing Natural Assets

Compare the service provided by the natural asset with the cost of providing that service through an engineered structure = ***comparative costing?***

Table 1: Example of water specific municipal services that can be provided by natural assets and ecosystem services

Municipal Water Services	Ecosystem Service	Natural Asset	Engineered Replacement
Drinking Water Supply	Aquifer Recharge	Aquifer & Source Water Area	Pipes for bringing in water supply
	Lake Recharge	Lake Watershed	Water Treatment Plant
	River Headwaters	Headwater lands	Pipes for bringing in water supply
Drinking Water Treatment	Water purification	Wetlands, forests, vegetation	Water Treatment Plant
	Water Filtration	Wetlands, forests, vegetation	Water Treatment Plant
Stormwater Management	Rainwater Absorption	Wetlands, forests, vegetation	Stormwater pipes, culverts, storm drains, stormwater ponds
	Rainwater Filtration	Wetlands, forests, vegetation	Water Treatment Plant
Flood Mitigation	Rainwater Absorption	Wetlands, forests, vegetation	Dams, retaining walls, embankments

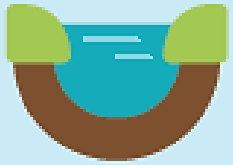
Is natural capital really valuable in financial terms?

Ultimately, nature is priceless but for asset mgmt. we require valuation in financial terms:

- **Street trees** in California provide **$1 billion per year** in ecosystem services, through atmospheric regulation and flood prevention
- Mexico's **mangrove forests** provide an **annual $70 billion** to the economy through storm protection, fisheries support, and ecotourism
- Canadian **boreal forest's** contribution to global ecosystem services, if ecologically intact, has an estimated value of **US$3.7 trillion - US$93.2 billion of annual services** (2.5 greater than the annual value of resource extraction)

The total value of the world's ecosystem services amounted to twice as much as global aggregate GDP – as much as **$124.8 trillion per year**!

NATURAL INFRASTRUCTURE IN ACTION



Naturally occurring ponds in the coastal town of Gibsons, British Columbia, provide **$3.5 million** to **$4 million** of stormwater storage services annually.

A 250-metre naturalized channel in the town of Oakville, Ontario, provides **$1.24 million** to **$1.44 million** of stormwater conveyance and storage annually.

Naturally occurring wetlands in southern Ontario reduce flood damage costs to buildings by **$3.5 million** (or 29%) at a rural pilot site and by **$51.1 million** (or 38%) at an urban pilot site.

A restored and engineered wetland in Manitoba is valued at **$3.7 million** for the flood reduction, water quality improvement, carbon sequestration and other benefits it provides.

Community Resilience

In the long run it is nearly always **less challenging and less expensive to build resilience into planning and design prior to development** rather than as a response to a major event.

'The Institute for Building Sciences estimates that **every dollar invested in building resilient infrastructure saves $6 in future costs** including **economic disruptions, property damage, public health crises, and deaths** caused by extreme weather disasters.'

But how do we do this?

Basic Anatomy of an AMP (Asset Mgmt Plan)

1. Introduction
2. What are we trying to achieve? Vision, objectives
3. Where are we now? Current status (assets & practices)
4. What is the gap? Risks and issues
5. How are we going to close the gap? Strategies and actions (including improvement actions to do it better next time)
6. What assumptions have we made in writing the AMP? Assumptions and uncertainties
7. How are we going to implement the AMP? Plan execution and monitoring

Steps Towards Effective Municipal Natural Asset Management

Step 1: Develop an asset management policy, bylaw or financial statement directing the municipality to consider natural assets.

Step 2: Identify key natural assets and the services they provide.

Step 3: Determine the condition of natural assets in your community and do an initial valuation

Step 4: Determine which assets are highest priority through a basic risk identification analysis.

Step 5: Determine what scenarios you want to understand

Step 6: Start managing your natural assets

Asset Management Planning Process + Steps Towards Effective Municipal Natural Asset Management + Climate Projections

Step 1: Initiate the process / project

Step 2: Articulate and assess the baseline (incl. **climate projections + natural assets**)

Step 3: Identify and prioritize hazards, risks, vulnerabilities and opportunities

Incorporate here: Steps Towards Effective Municipal Natural Asset Mgmt

Step 4: Develop and prioritize strategies

Step 5: Finalize and share the plan

Step 6: Implement the plan

Step 7: Monitor, evaluate and adjust (ongoing)

= ⬆ COMMUNITY RESILIENCE!

Questions with Resilience In Mind

- ✓ Have we **incorporated climate projections** into all aspects of our work including implementation?
- ✓ Have we considered **natural assets** and the ecosystem services provided in our projects / actions?
- ✓ Have we ensured **redundancies** for critical services / actions?

Resiliency

- ✓ **Make resilience part of planning, design and development**

Building resilience in typically costs much less than incorporating resilience later, including protecting natural assets to ensure service delivery.

- ✓ **Pay attention to local risks and hazards**

Adopt a resilience scorecard and rating system that includes all assets including natural assets and includes climate projections.

- ✓ **Calculate potential costs**

Incorporate integrated asset management strategies into capital budgets at concept stage including the management of all assets (natural assets).

- ✓ **Identify and protect critical elements**

Identify and incorporate all natural assets into all community related policies and guidelines in order to protect the ecological function in perpetuity.

A Final Note

Community preparedness is very much part of community resilience. Be sure to incorporate home and neighbourhood preparedness into all of your community resiliency efforts.

CASE NAME AND YEAR	DESCRIPTION (damages, cost and settlement amounts included where identified)	DEFENDANTS
Anderson et al. v. Manitoba et al., 2017 (ongoing)	A $950-million class action lawsuit was brought forward by 4,000 residents of four First Nations following severe flooding in spring 2011. The flood resulted in damage to property and the evacuation of many families from their homes. The plaintiffs brought claims of negligence, nuisance and breach of treaty rights, alleging that the Government of Manitoba caused the flooding through its water and flood control measures that affected the water levels around the four First Nations. The class action lawsuit was certified in January 2017 and is moving forward.	Province, Association of Native Fire Fighters Inc.
Muskoka Class Action, 2016 (ongoing)	Muskoka residents as well as cottage and business owners launched a $900-million class action lawsuit against the Province of Ontario after flooding and high water levels caused damage. The plaintiffs allege that the Ministry of Natural Resources and Forestry was negligent for failing to control water levels.	Province
Cerra et al. v. The Corporation of the City of Thunder Bay, 2012 (ongoing)	In May 2012, floods resulted in severe damage in Thunder Bay, Ont. The plaintiffs allege negligence in repairing, inspecting and maintaining the water pollution control plant, as well not diligently operating and supervising at the time of the flood (including an allegation that alarms were ignored). The $300-million claim is ongoing. The court certified action on consent in 2013.	Municipality
Maple Ridge Class Action, 2010[11] (ongoing)	After a 2010 flood, 15 households filed a class action lawsuit against a developer and contractor, two engineering firms and the City of Maple Ridge, BC. The plaintiffs allege that the defendants were negligent, arguing construction failure, faulty workmanship and design, and failure to inspect basements for leaks and repair leaks as requested. The plaintiffs also argue that the houses were not waterproofed to code, despite the municipality's inspection, review and issuance of permits. The trial was scheduled to begin in 2016.	Municipality, developer, contractor, engineering firms
Panza et al. v. The Corporation of the City of Mississauga et al., 2012	Upper- and lower-tier municipalities, the Province of Ontario and the conservation authority were all named as defendants in a negligence claim related to systemic flooding in the Lisgar area of Mississauga over several years. The $200-million class action lawsuit was withdrawn before trial. However, this case shows the potential for systemic flooding giving rise to class action lawsuits.	Province, municipality, conservation authority

Today’s Journey …….

Gain a general understanding regarding climate change, natural assets, tools for incorporating natural assets [asset management planning] and their ecosystem services in order to support and contribute to community resiliency.


Thank
You
Merci
Obrigado
Asante
Spasibo
Maake
Grazie
Kiitos
Kia Ora
Welalin
Juspaxar
Mamana
Matondo
Arigato
Vinaka
Dank Je
Nirringrazzjak
Multumesc
Mochchakkeram
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