Implementing risk-based asset management strategies

2018 . 04 . 17

The Challenge for Local Governments

DISTRICT OF NORTH VANCOUVER

Wind Storms
Extreme Weather

Landslides

Debris Flows

Wildfire

Earthquakes

Flooding

Delta Subsidence

Tsunamis

Find resources to:

- Identify and characterize hazards
- Assess risks
- Communicate results
- Develop safely
- Maintain infrastructure
- Plan for emergency response & recovery

natural hazards management program

- Understand hazards & risks using proactive approach
- Reduce risks to life, infrastructure & environment
- Ensure development policies limit future risk
- Educate community
- Maintain a hazard database
- Liaise with scientific, academic & government organizations to create and follow best practices

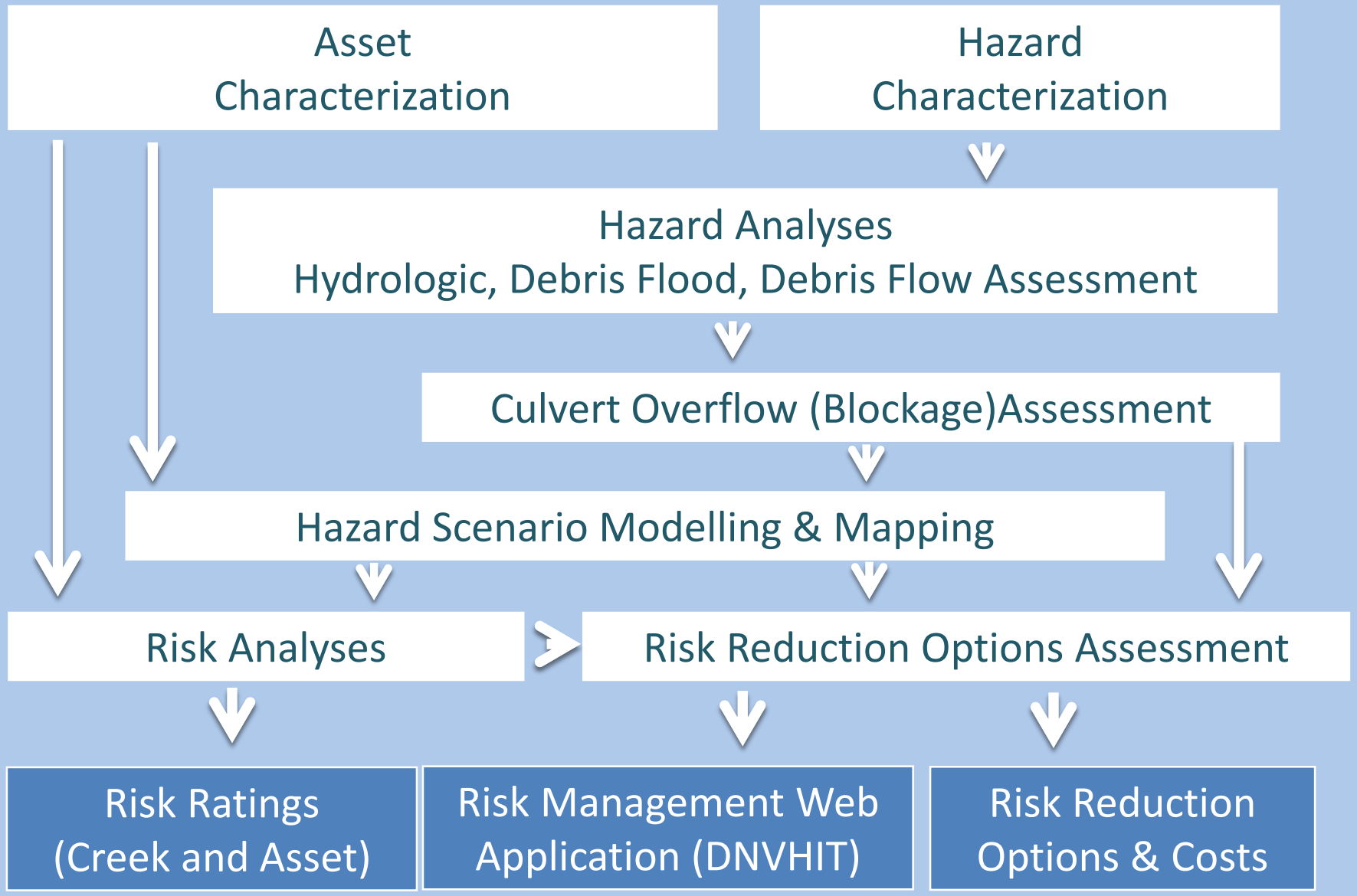
resilience planning

- Risk assessments for natural hazards
- Natural hazard management plans and implementation strategies
- Hazard and environment development permit areas
- Development standards for buildings, infrastructure, and utilities
- Long-term asset management planning
- Increased community awareness

creek hazards

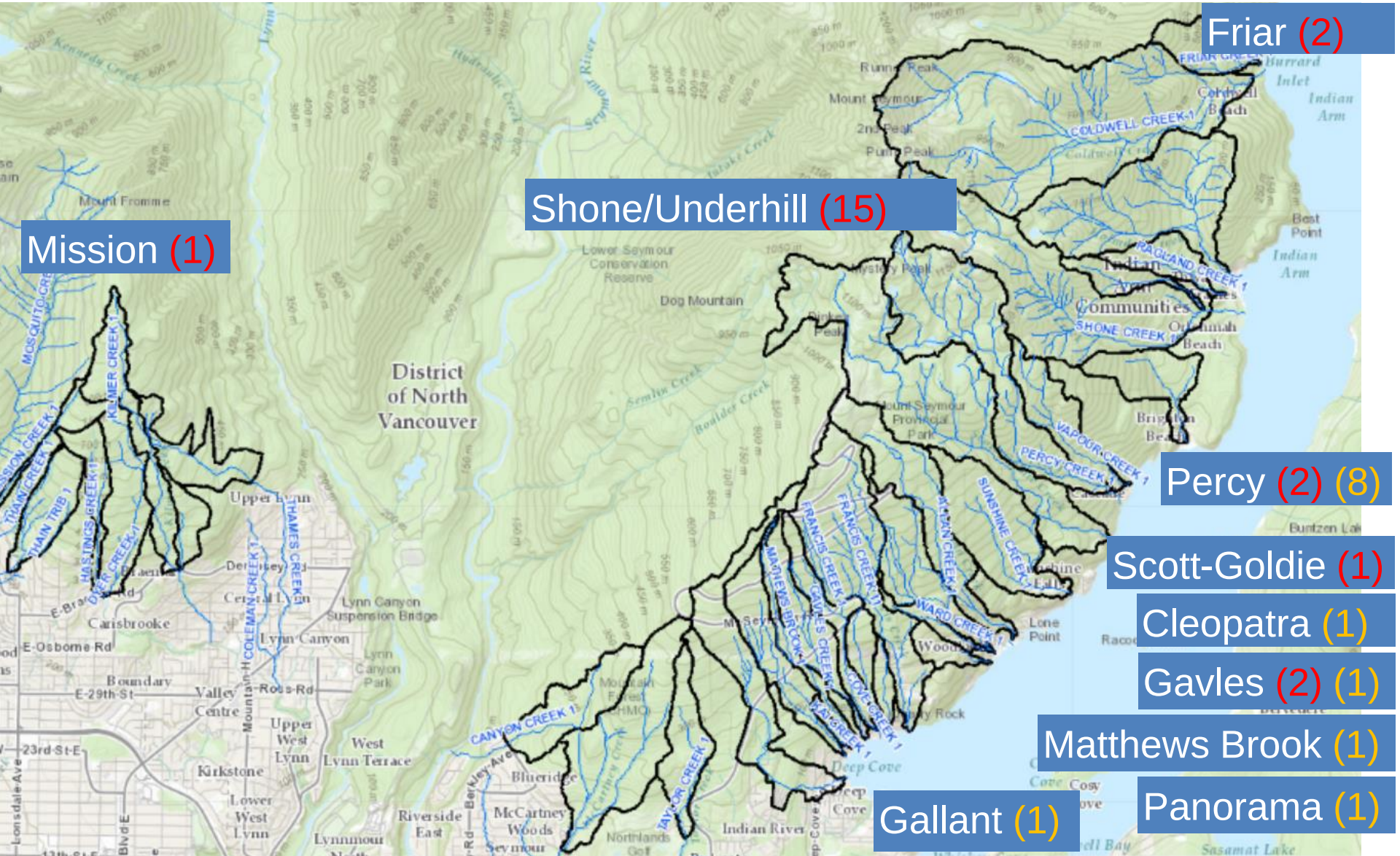
- Extensive creek network that poses a risk to public safety, municipal assets and private property
- Climate change projections indicate increasing intensity and duration of rainfall events
- Aging storm drainage infrastructure is vulnerable
- Creeks work as a system – upstream and downstream impacts
- Current development policies limit risk exposure; this proposed mitigation program is to manage existing risk

Stormwater Asset Risk Assessment

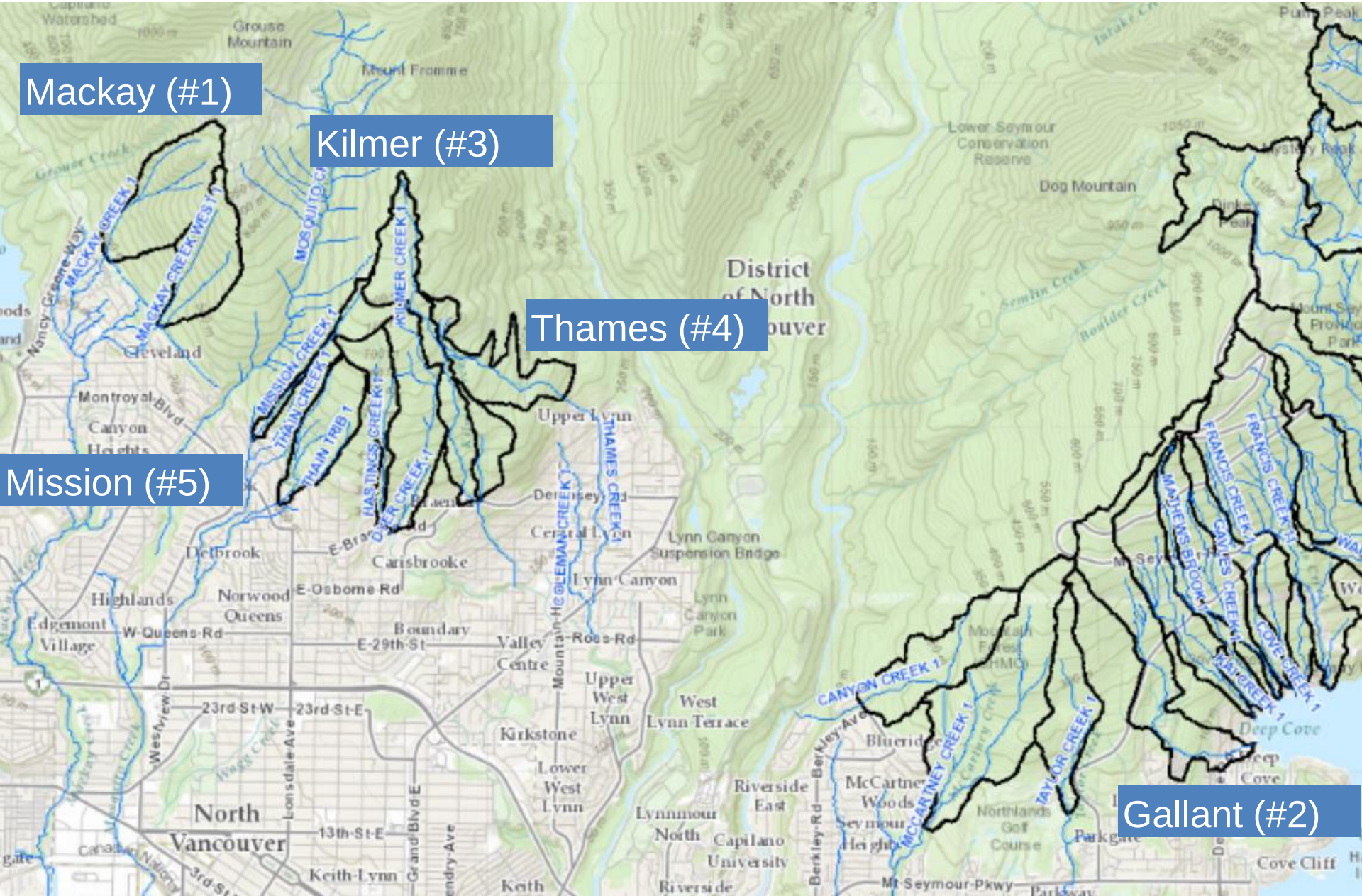


safety risk

Annual individual risk of fatality >1:10,000 >1:100,000



economic risk – top 5 creeks



Debris Geohazard Risk Assessment & Mitigation Options

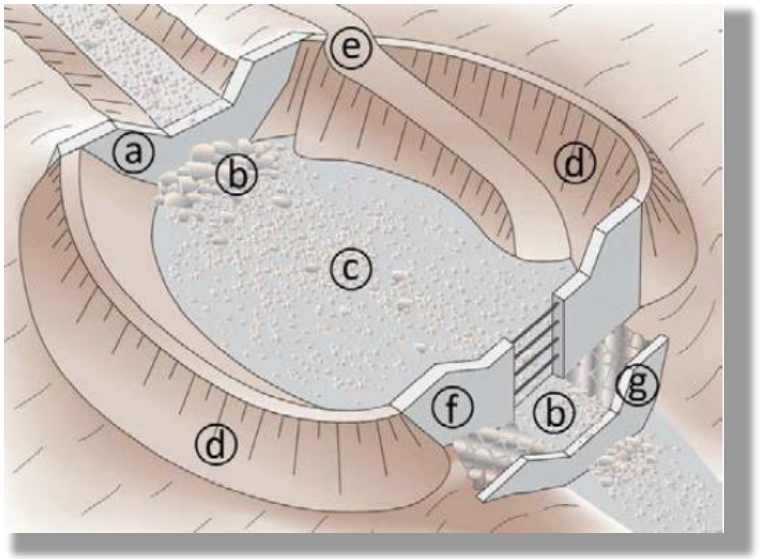
Priority Matrix

	Risk Magnitude			Ownership						Feasibility			Score Totals			Final Priority			
	# of Properties Affected Single=1, More than 10=5	Risk to Life and/or Property		Existing Infrastructure at Risk		Natural Hazard Origin Urban=5 Natural=0		Upstream Watershed Ownership DNV=5 NOT DNV=0		Cost >$3M=1 >$1M=2 $0.5-1M=3 $100-500K=4 <$100K=5	Practicality Technically Feasible 5 = Easy 1 = Very Challenging		Risk	Ownership	Feasibility	Total Score	Rank	Remediation Description / Comment	First Pass Funding Comment
		Economic	Life																
Weight	2.5	2.5	5	2		2		2		2	2		50	30	20	100			
Mission Creek	5	4	5	5	Multiple DNV culverts	3	Urbanized stream	1.5	30%	3	3	On BCH lands	48	19	12	78.5	1	Debris Basin on Powerline Trail above Rondoval Cres.	100% DNV
Thames Creek	5	5	0	3	DNV culverts	3	Urbanized stream	4	80%	3	3	moderate access and challenges	25	20	12	57	2	Debris Basin at Tourney, construction 2017	100% DNV with Grant Funding
Kilmer Creek	5	5	0	3	DNV culverts	3	Urbanized stream	3.5	70%	3	3	moderate access and challenges	25	19	12	56	3	Debri Basin at E Braemar, construction 2016	100% DNV with Grant Funding
Gallant Creek	5	5	1	2	DNV culverts w/ debris barrier	3	Runoff from Indian River Dr. development	1.5	30%	3	3	moderate access and challenges	30	13	12	55	4	Debris Basin @ Cliffwood, construction 2017	100% DNV with Grant Funding
Gavles Creek	4	2	5	3	DNV Culvert	1	No development, 2 road crossings	0.25	<5%	2	1	Limited access	40	8.5	6	54.5	5	Debris basin and check dams pstream of properties, culvert replacement or swales	$1.65M
Friar Creek	1	1	5	0	Private	0	natural	1.5	30%	5	5	remote boat access only	30	3	20	53	6	Encourage seasonal use; restrict development	$0
Percy Creek	5	2	5	0	Private	0	Only 1 private road crossing	1	20%	1	3	Limited access, challenging	43	2	8	52.5	7	Channelization and Large Berm Construction	$2M
Holmden Creek	1	1	5	0	Private, no BP	0	natural	1	10%	5	5	remote boat access only	30	2	20	52	8	Encourage seasonal use; restrict development	$0
Taylor Creek	4	1	0	3	DNV Culvert	3	Several Developments discharge	3.5	70%	5	5	Build Access off MSP	13	19	20	51.5	9	Debris Barrier at STMCUL00259	$60K
Unnamed Creek 2	3	2	0	5	Multiple DNV culverts (3)	2	No development, 5 rural road crossings	5	100%	5	2	Narrow steep road, maint. access poor	13	24	14	50.5	10	Remove Trash Rack and Install Debris Barrier at CTMCUL00661	$60K
Shone / Underhill Creeks	3	1	5	0	Private	0	natural	1.5	30%	3	3	remote boat access only	35	3	12	50	11	Maintain business license restriction for seasonal use; further analysis re bank erosion	$50K
Panorama Creek	3	1	3	3	DNV Culvert	1	No development, 1 road crossing	3	60%	3	2	Limited access	25	14	10	49	12	Channel Upgrades at 2525 Panorama Drive	$500K
Mackay Creek - West	5	5	0	5	Multiple DNV culverts	3	Urbanized stream	0.5	10%	1	2	Impacted By MV mitigation works	25	17	6	48	13	Multiple Culvert Replacements. To review risks following MV design completion.	$1.1M
Mackay Creek - East	5	5	0	5	Multiple DNV culverts	3	Urbanized stream	0.5	10%	1	2	Impacted By MV mitigation works	25	17	6	48	14	Multiple Culvert Replacements. To review risks following MV design completion.	$1.1M
Scott-Goldie Creek	1	1	5	0	Private	0	natural	2	40%	4	3	narrow steep road	30	4	14	48	15	Deflection berm, foundation hardening	$400K
Ward Creek	4	1	0	3	DNV Culverts	1	No development, 2 road crossings	5	100%	5	2	Narrow steep road, maint. access poor	13	18	14	44.5	16	Debris Barrier at STMCUL00662	$60K
Cleopatra Creek	4	2	1	4	DNV culverts	1	2 homes above Panorama Dr	2.5	50%	2	2	Limited access	20	15	8	43	17	Check Dams, surface water diversion or culvert replacements	$1.1M

- Assessed risk to public safety, property and assets (roads and storm sewer)
- Decision matrix prioritized creeks based on risk, ownership and feasibility

risk control

Debris Control Structures



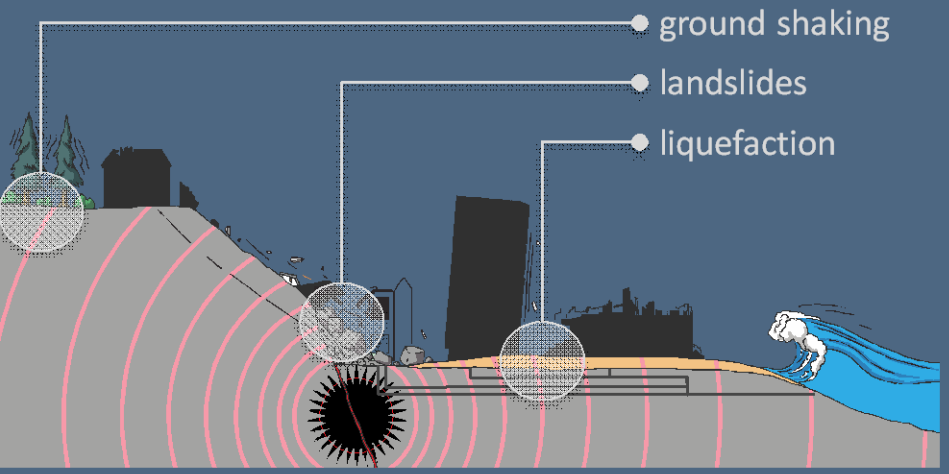
Debris Basins

Channel Upgrades

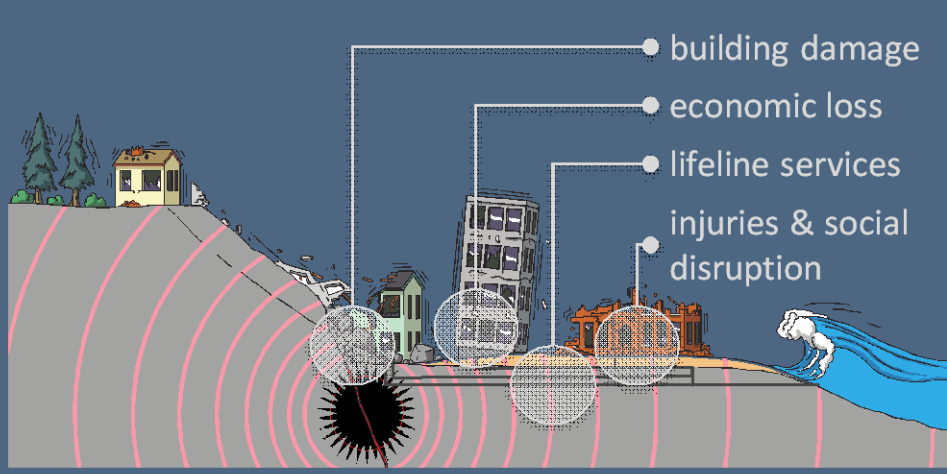
Culvert Replacements

A Profile of Earthquake Risk

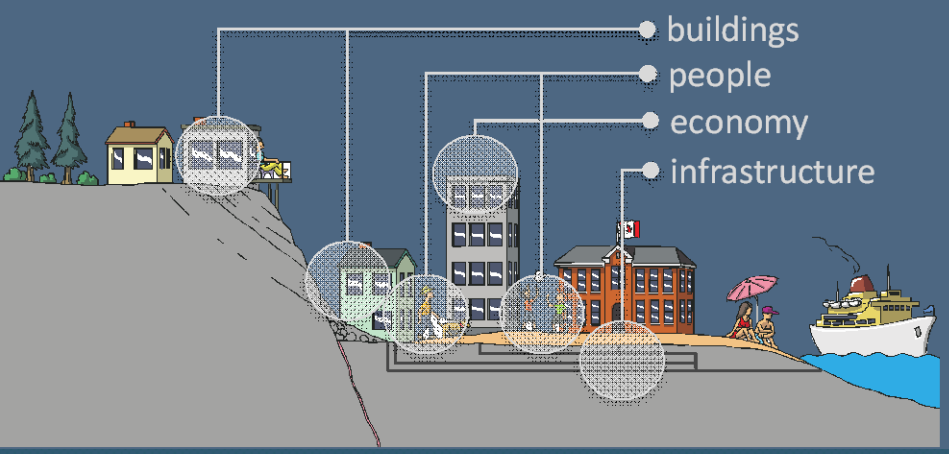
Hazard Potential



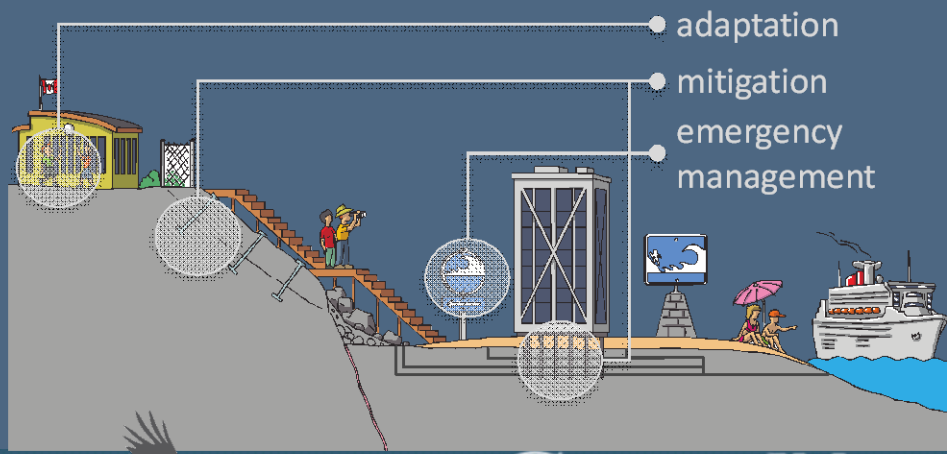
Impacts & Consequences



Vulnerability



Disaster Resilience



Seismic Hazards

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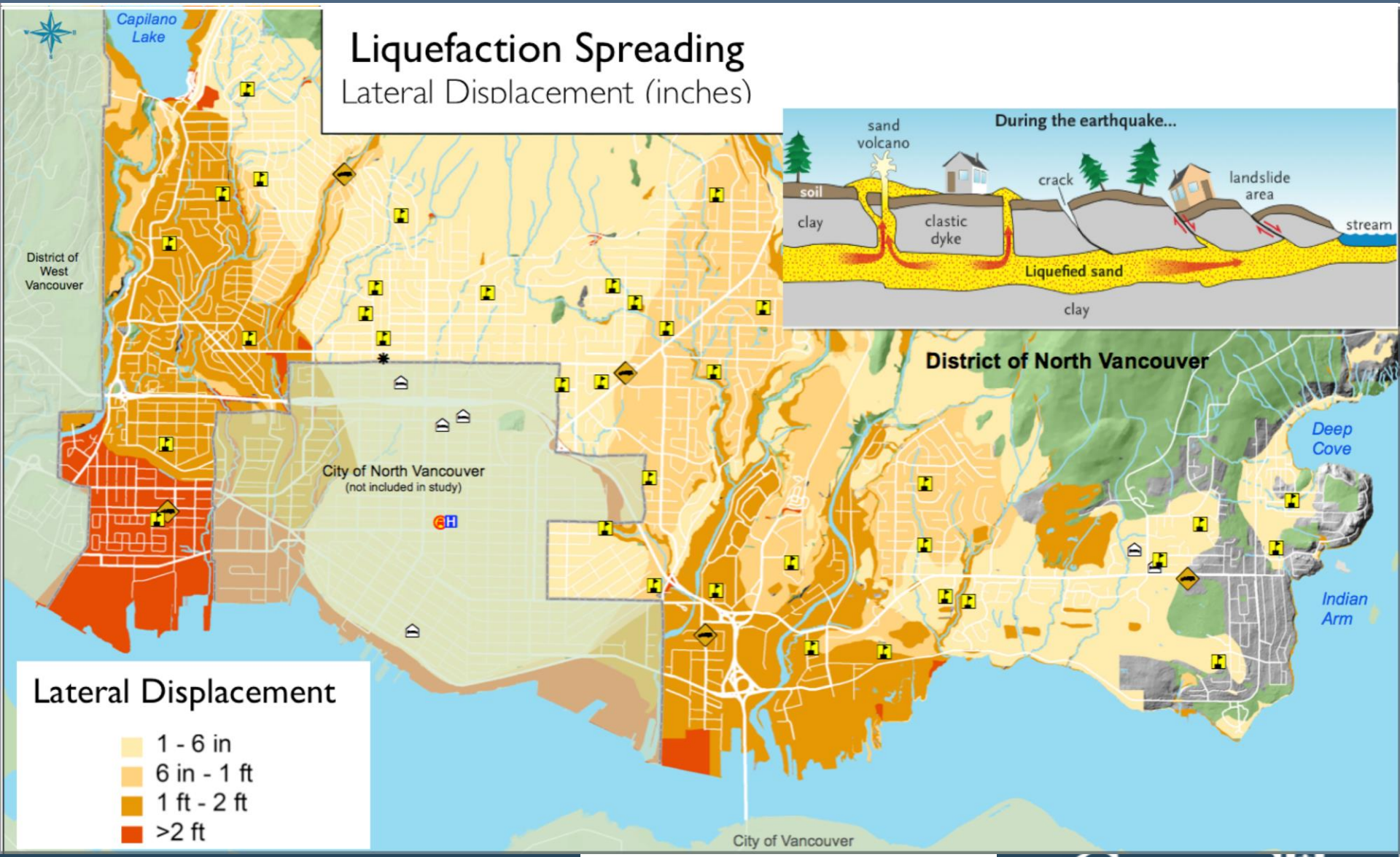

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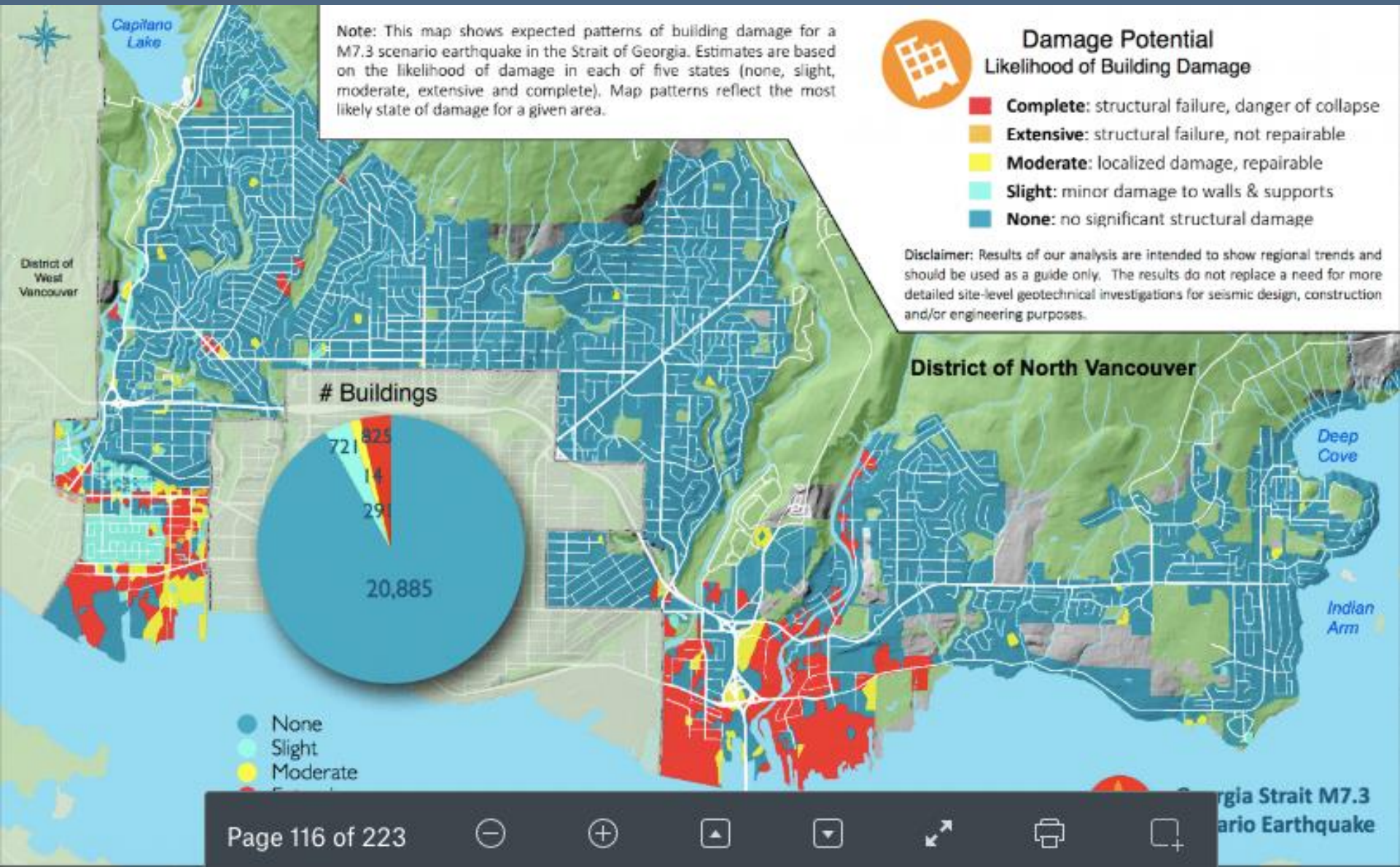
Building Performance – M7.3 Georgia Strait



Lifeline Resilience

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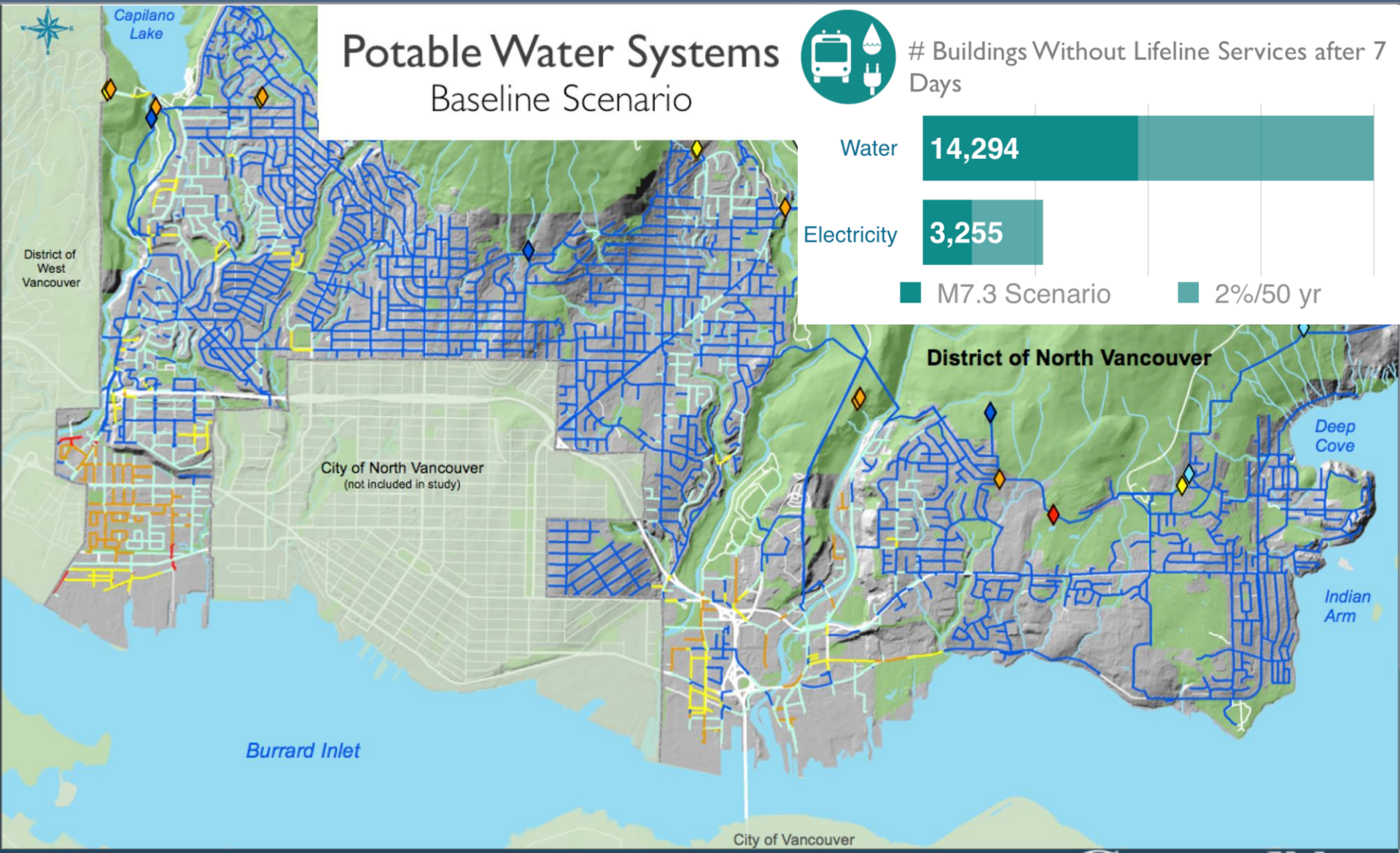

Natural Resources Canada | Ressources naturelles Canada

Canada

Economic Security

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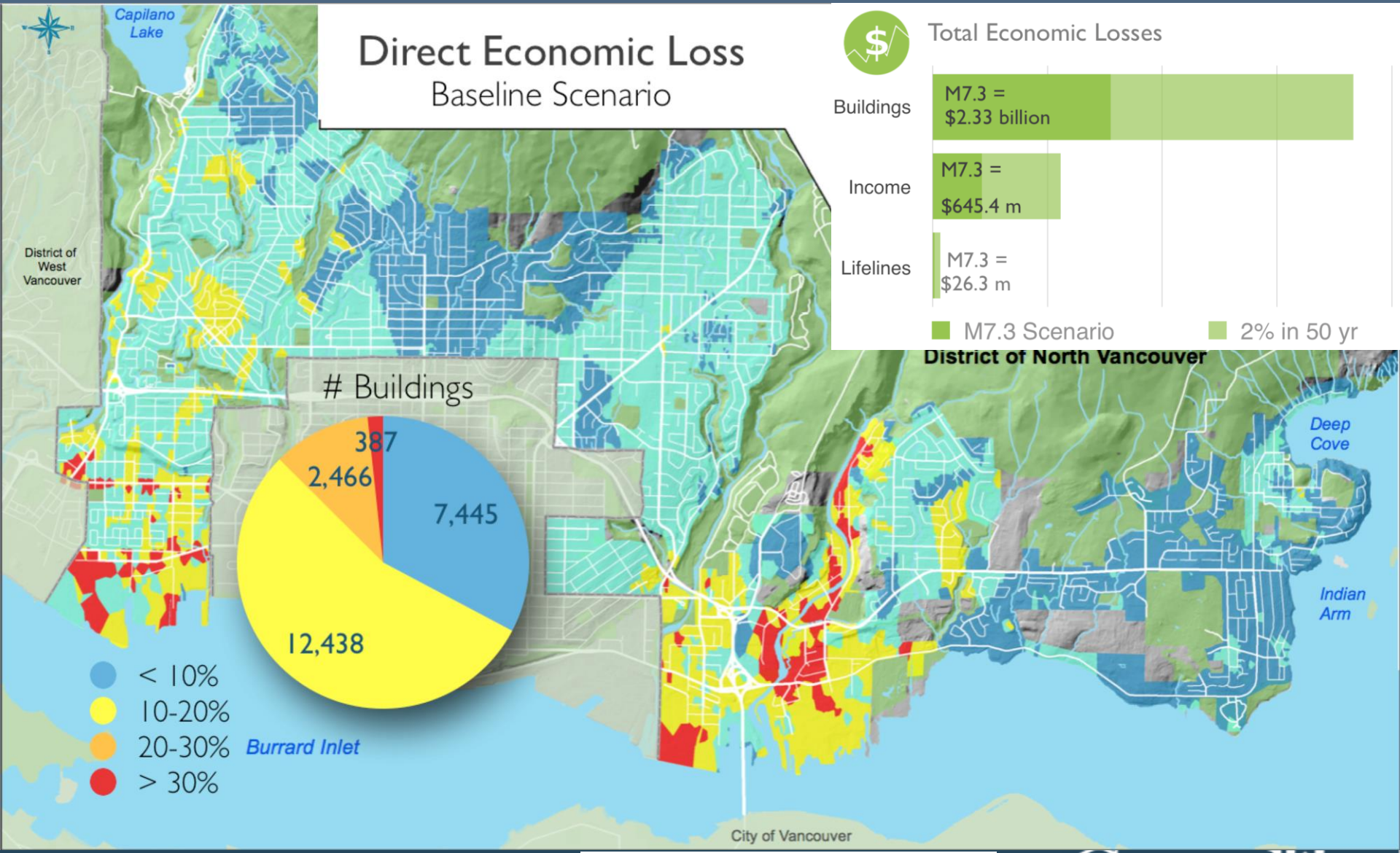

Economic Security

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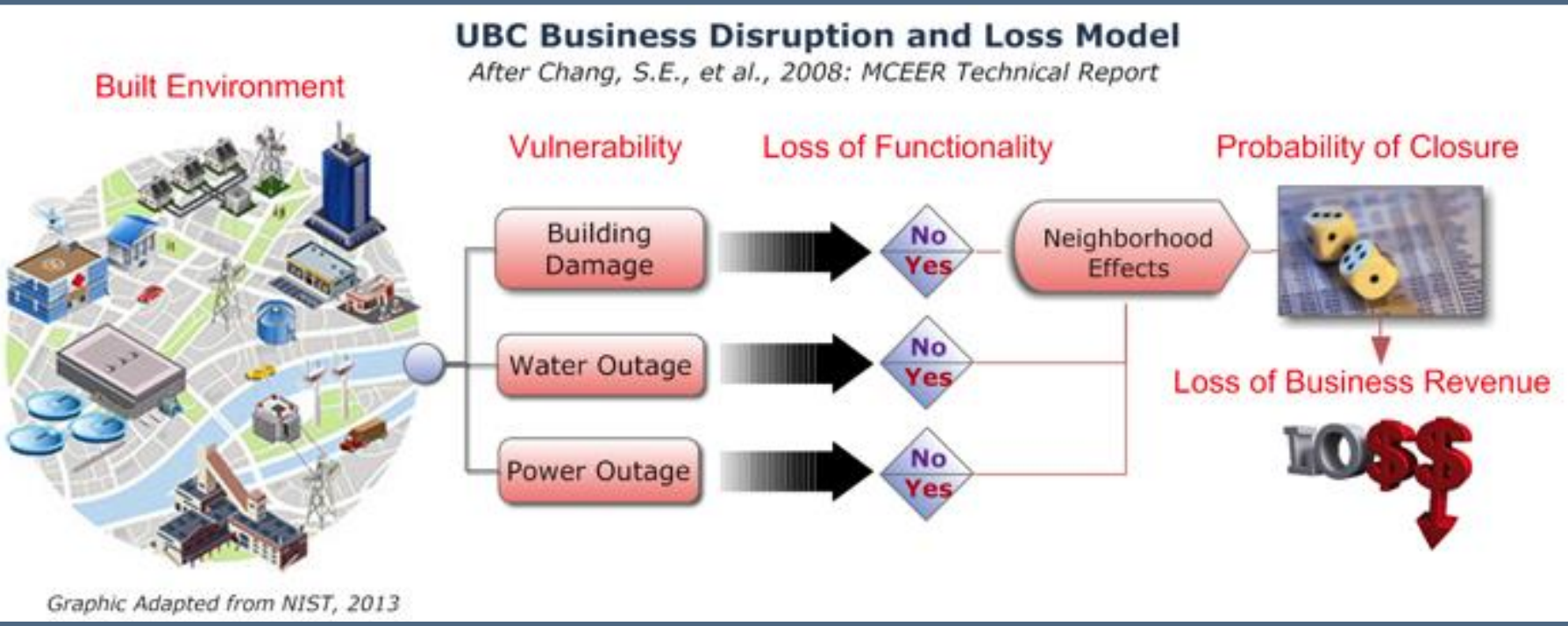


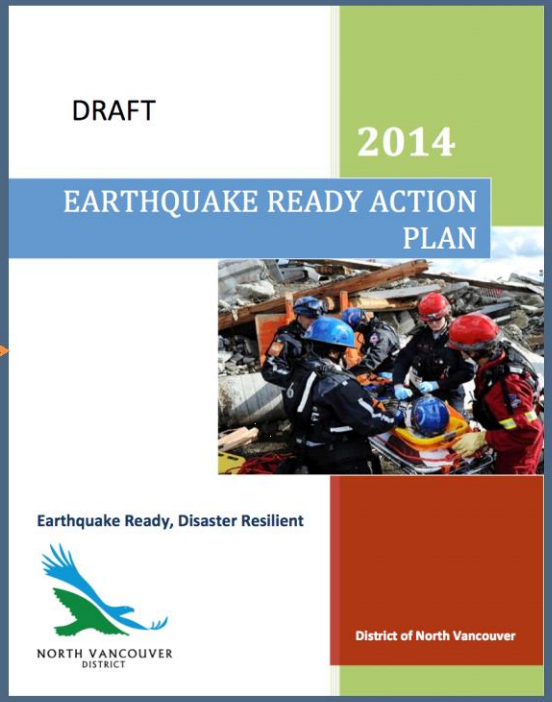
DNV Gross Daily Revenue
~$5M per day

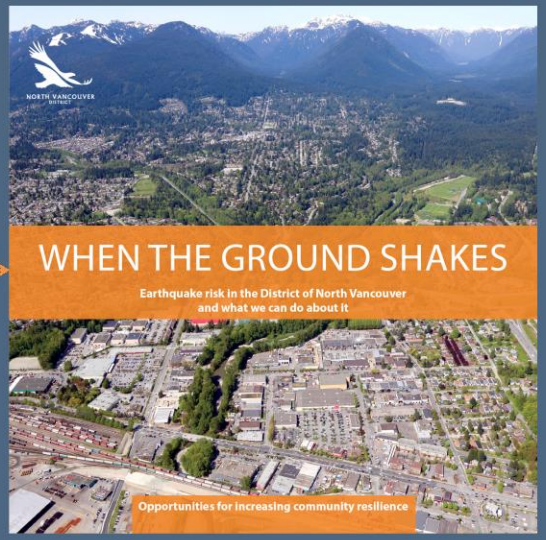
~ $4.4 M per day of business-related losses

- lost wages & business income
- rental & relocation costs

= loss

From Knowledge to Action





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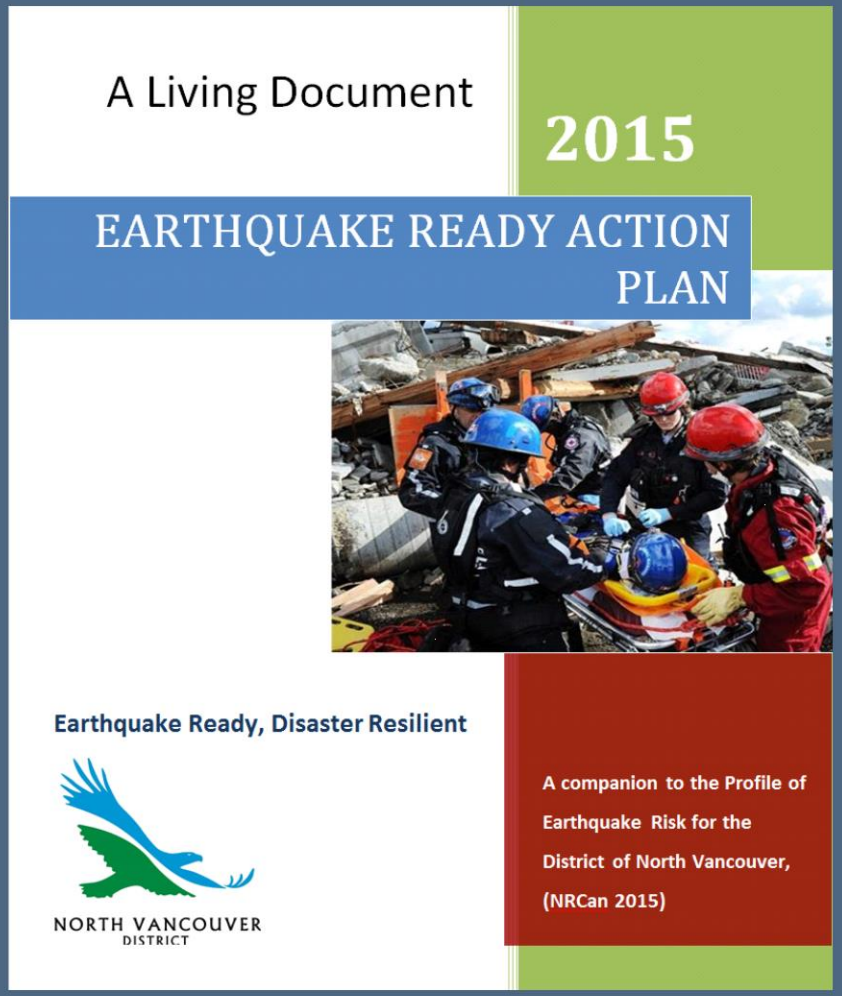
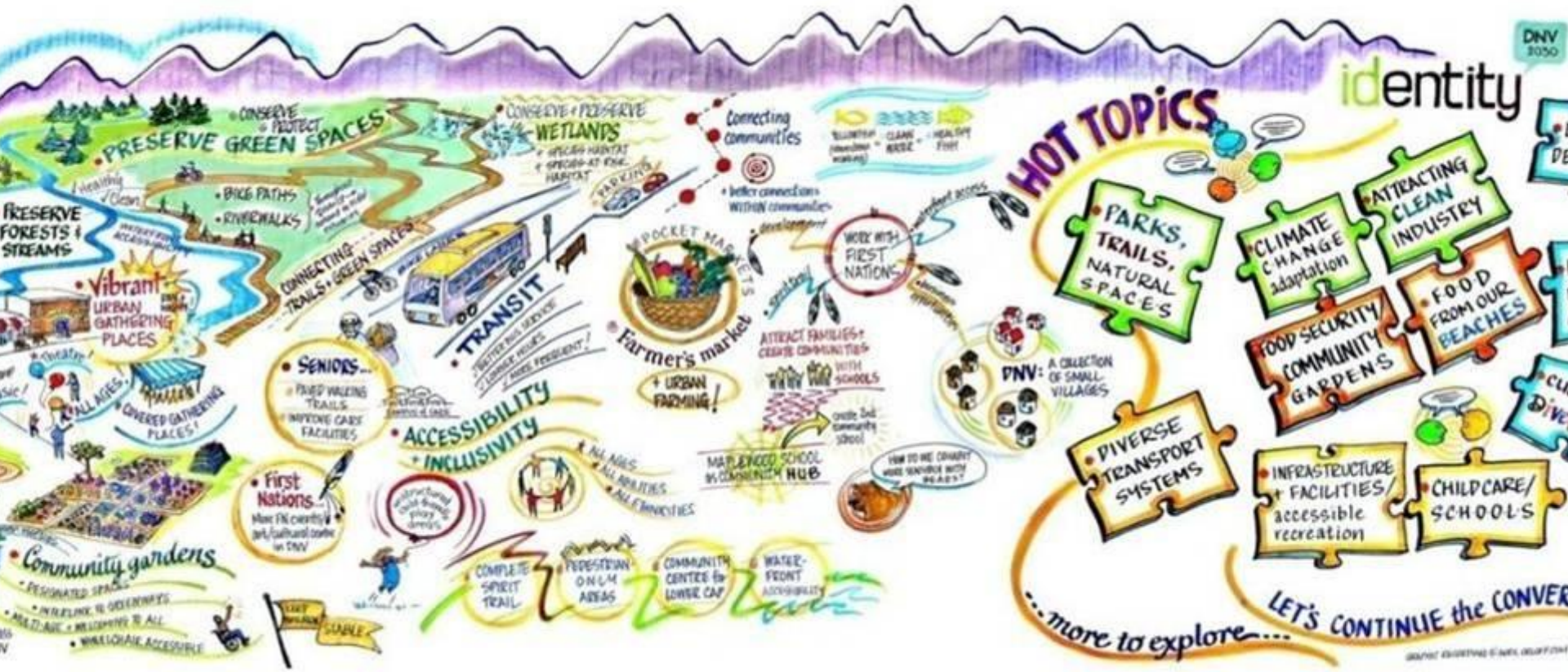
- Manage risk to District assets
- Encourage preparedness
- Promote business continuity
- Prepare for effective response
- Plan for recovery
- Collaborate with stakeholders



Effective risk communication helps to…

- build social community – shared responsibility
- incorporate resilience measures into development process
- improve lifeline/infrastructure functionality
- increase response capacity
- plan for climate change



NORTH SHORE EMERGENCY MANAGEMENT

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