

Global Platform for Sustainable Cities (GPSC)

# **C4B SECOND DEEP-DIVE LEARNING**

## Greening Cities: Urban Nature and Biodiversity

November 28<sup>th</sup>–December 1<sup>st</sup>, 2022



An Overview of Tools to Help Cities Develop, Evaluate, and Monitor Their Progress on Biodiversity Conservation Efforts

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# Session Overview

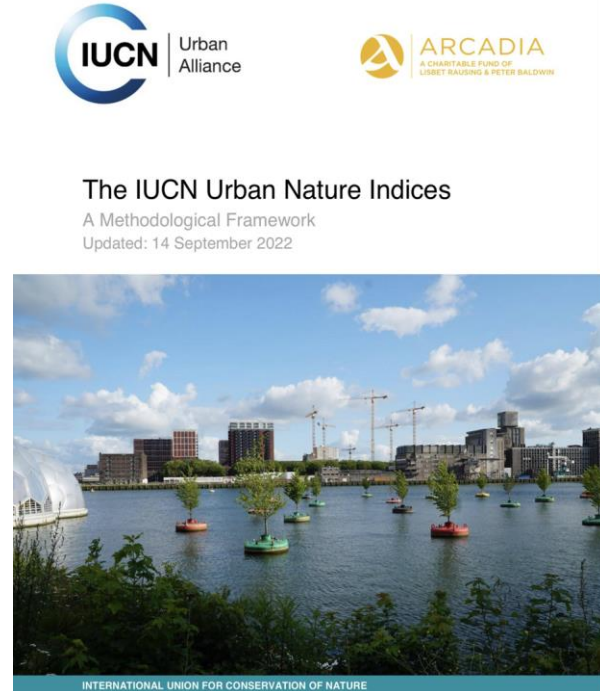
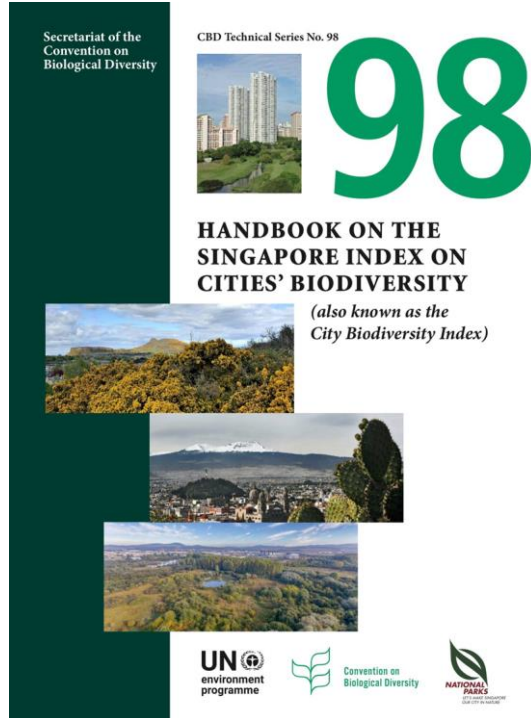
This Second Deep Dive session provides an overview of some of the major tools and guidance documents that can help cities develop, evaluate, and monitor their progress on urban biodiversity and nature efforts.

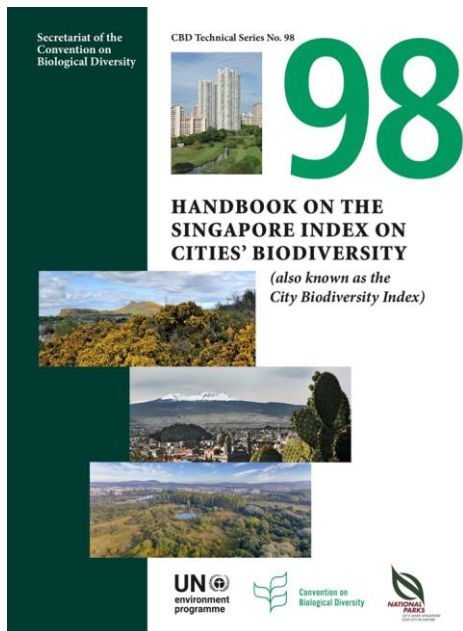
This presentation is organized around three themes that will help you develop your own urban ecological planning and management systems:

1. Measurement and Management Tools
2. Ecological Planning Tools
3. Implementation Tools

# Measurement and Management Tools

# Measuring Biodiversity and Nature: Indices





PART II - Indicators	Core Components	Indicators	Maximum Score
	<b>Native Biodiversity in the City</b>	1. Proportion of Natural Areas in the City	4 points
		2. Connectivity Measures	4 points
		3. Native Biodiversity in Built Up Areas (Bird Species)	4 points
		4. Change in Number of Vascular Plant Species	4 points
		5. Change in Number of Bird Species	4 points
		6. Change in Number of Butterfly Species	4 points
		7. Change in Number of Species (any other taxonomic group selected by the city)	4 points
		8. Change in Number of Species (any other taxonomic group selected by the city)	4 points
		9. Proportion of Protected Natural Areas	4 points
		10. Proportion of Invasive Alien Species	4 points
	<b>Ecosystem Services provided by Biodiversity</b>	11. Regulation of Quantity of Water	4 points
		12. Climate Regulation: Carbon Storage and Cooling Effect of Vegetation	4 points
		13. Recreation and Education: Area of Parks with Natural Areas	4 points
		14. Recreation and Education: Number of Formal Education Visits per Child Below 16 Years to Parks with Natural Areas per Year	4 points
	<b>Governance and Management of Biodiversity</b>	15. Budget Allocated to Biodiversity	4 points
		16. Number of Biodiversity Projects Implemented by the City Annually	4 points
		17. Existence of Local Biodiversity Strategy and Action Plan	4 points
		18. Institutional Capacity: Number of Biodiversity Related Functions	4 points
		19. Institutional Capacity: Number of City or Local Government Agencies Involved in Inter-agency Co-operation Pertaining to Biodiversity Matters	4 points
		20. Participation and Partnership: Existence of Formal or Informal Public Consultation Process	4 points
		21. Participation and Partnership: Number of Agencies/Private Companies/NGOs/Academic Institutions/International Organisations with which the City is Partnering in Biodiversity Activities, Projects and Programmes	4 points
		22. Education and Awareness: Is Biodiversity or Nature Awareness Included in the School Curriculum	4 points
		23. Education and Awareness: Number of Outreach or Public Awareness Events Held in the City per Year	4 points
	<b>Native Biodiversity in the City (Sub-total for indicators 1-10)</b>		<b>40 points</b>
	<b>Ecosystem Services provided by Biodiversity (Sub-total for indicators 11-14)</b>		<b>16 points</b>
	<b>Governance and Management of Biodiversity (Sub-total for indicators 15-23)</b>		<b>36 points</b>
	<b>Maximum Total:</b>		<b>92 points</b>



## The IUCN Urban Nature Indices

A Methodological Framework

Updated: 14 September 2022



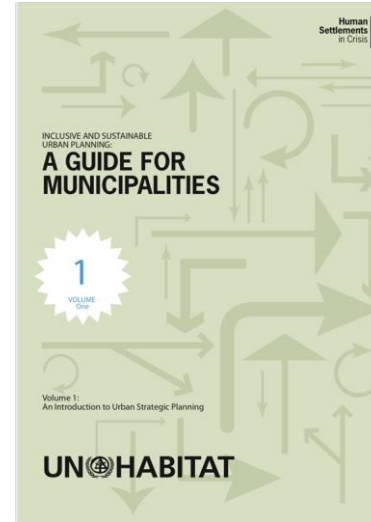
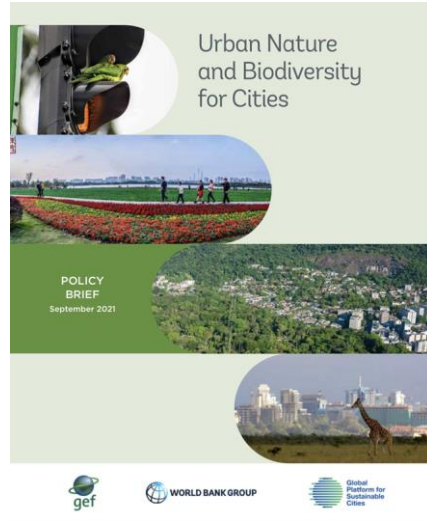
INTERNATIONAL UNION FOR CONSERVATION OF NATURE

Theme	Indicator Topics	Theme	Indicator Topics
1. Consumption Drivers	Material consumption	2. Human Pressures	Sprawl
	Harmful harvest & trade		Water pollution
	GHG emissions from energy		Noise pollution
	Unsustainable diets		Light pollution
	Water withdrawal		Invasive species
3. Habitat Status	Land use/protection	4. Species Status	Animal species
	Ecosystem restoration		Plant species
	Shorelines & riverbanks		Functional diversity
	Vegetation		Microbiota
	Connectivity		Endemic species
5. Nature's Contributions to People	Exposure to nature	6. Governance Responses	Planning
	Access to nature		Law & policy
	Human health		Education
	Livelihoods		Management
	Sacred natural sites		Incentives & participation

# Ecological Planning Tools



# Tools To Help You Develop Strategic Plans



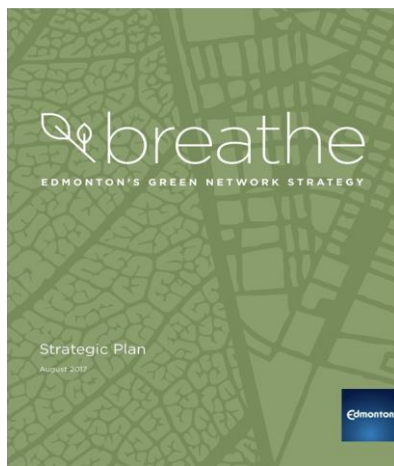
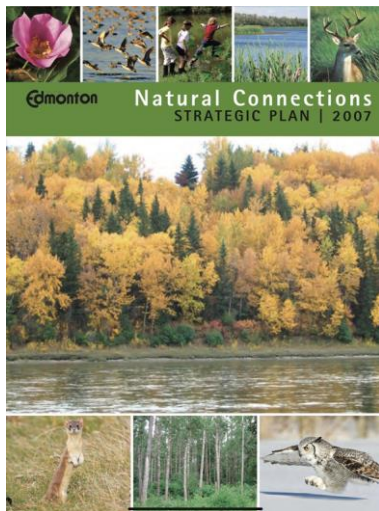
Phase 1:  
Urban Situational  
Analysis

Phase 2:  
Sustainable Urban  
Development  
Planning

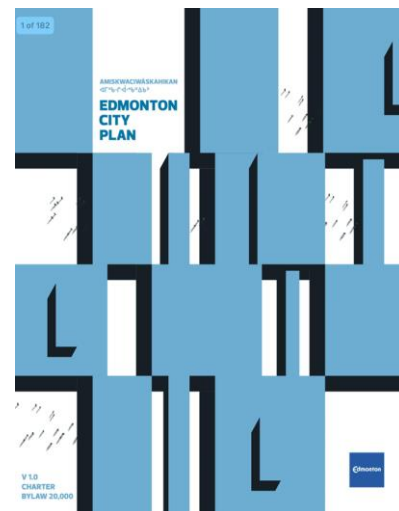
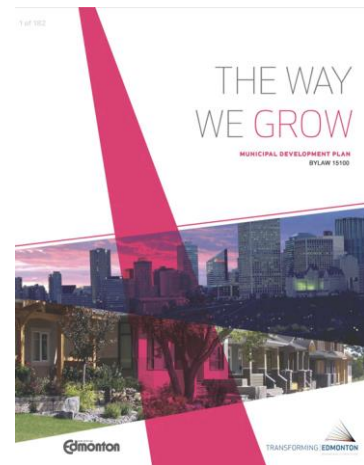
Phase 3:  
Sustainable Action  
Planning

Phase 4:  
Implementation  
and Management  
of Projects





2007-2009	2017-2020
Conservation Network Focus	Included Ecological Networks to Planning Policy
Parks and Open Space Focus at a Landscape Scale	Retained Ecological Network



# Edmonton's Official City Plan



**5.1.2 Promote the conservation and restoration of natural systems to improve ecological connectivity and reduce habitat fragmentation.**

5.1.2.1 Improve the quality and function of habitat greenways and ecological connections within the Green and Blue Network.

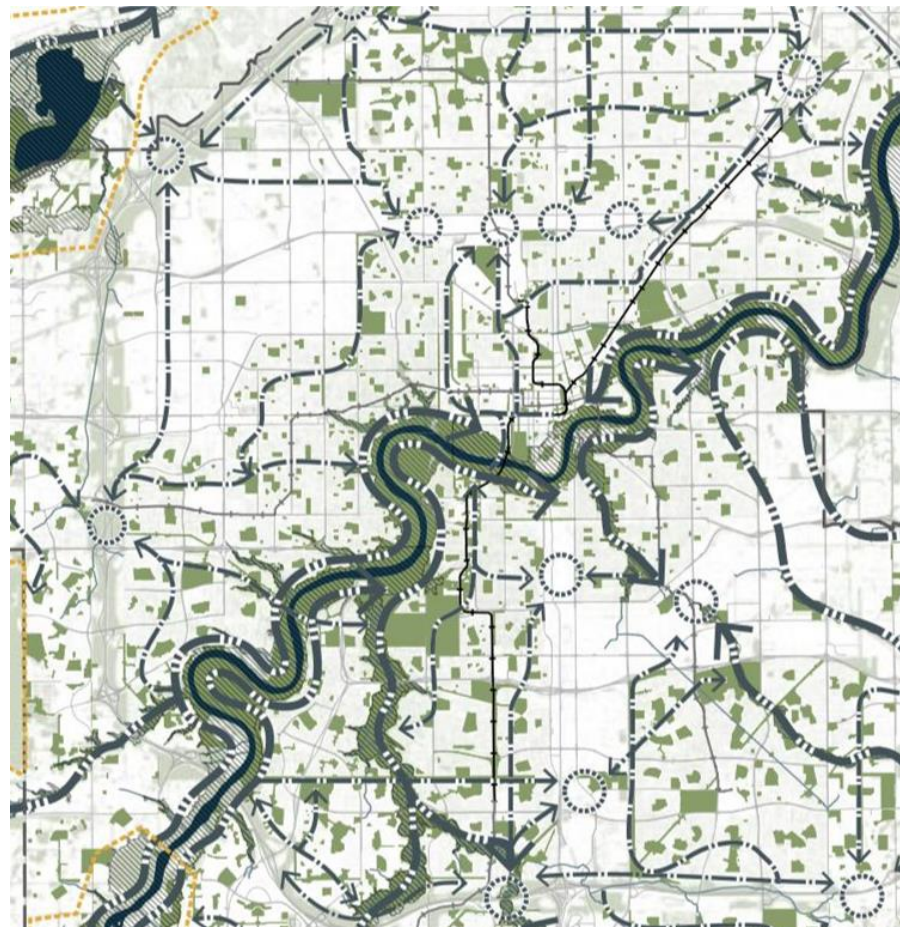
5.1.2.2 Expand and diversify Edmonton's urban tree canopy and native vegetation.

5.1.2.3 Pursue the protection, management and integration of wetlands into new and existing developments.

See Map 4  
Green and Blue  
Network

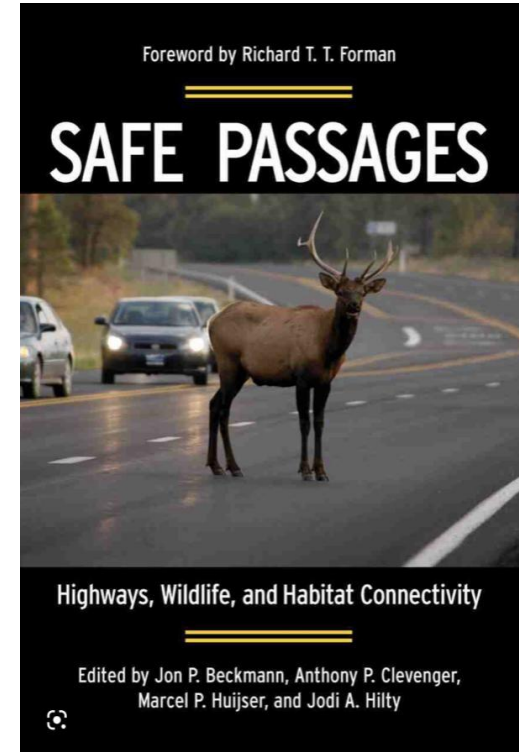
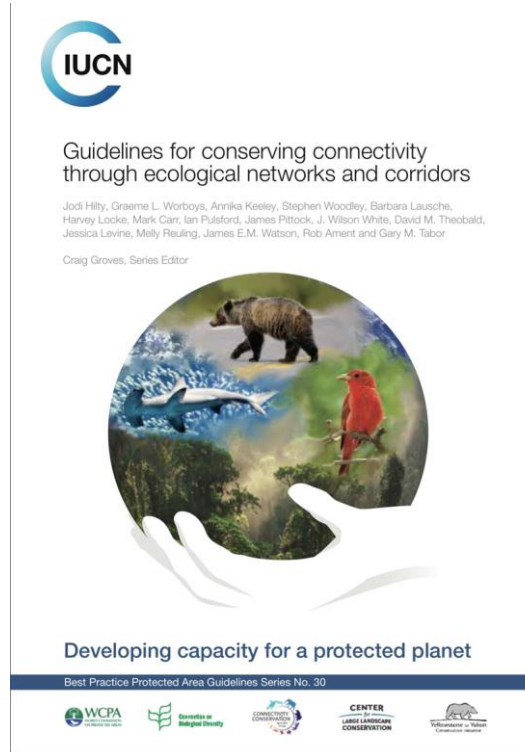
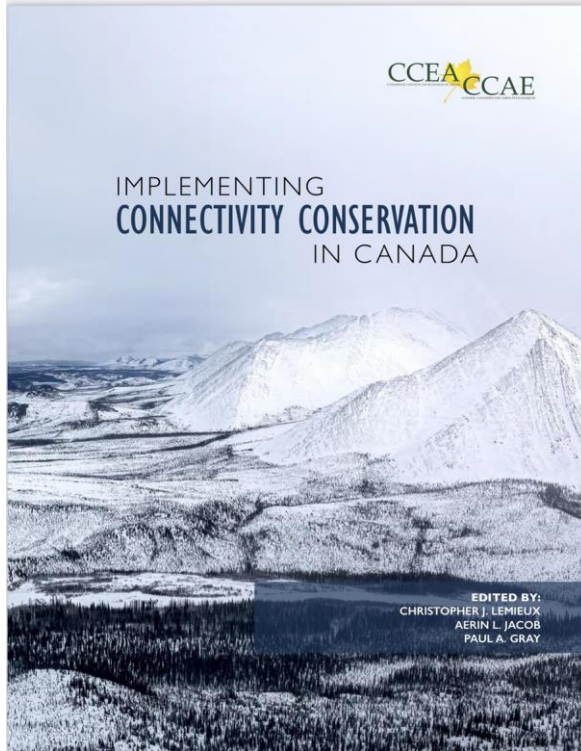
## MAP 2: Conceptual Spatial Connections

-  Connection Challenges + Opportunities
-  Major Ecological Connections
-  Open Space Connections  
(Green Connections / Enhanced Streets)
-  Existing LRT Route
-  Proposed LRT Route
-  Regional Biodiversity Core Areas
-  Key Natural Linkages and Areas
-  Open Water
-  Natural Land Cover
-  Open Spaces





# Tools to Understand Ecological Connectivity

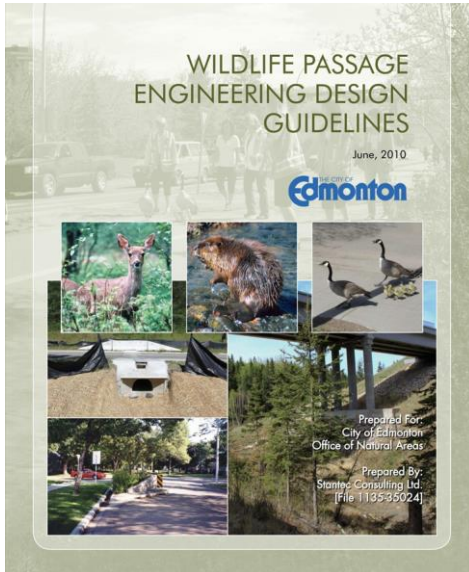


## 4.0 DESIGN GUIDELINES

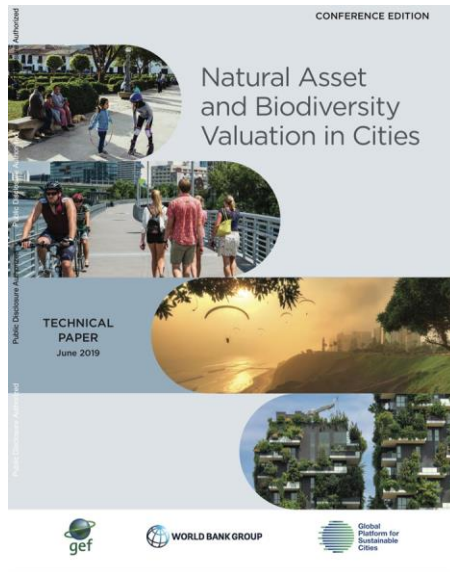
**Table 4.2 – Summary of Preferred Dimensions for Crossing Structures**

Design Group	Optimal Fence Height (m)	Recommended Fence Type	Optimal Passage Dimensions (Height x Width) (m)	Optimal Passage Openness (m)	Optimal Frequency (m)	Comments
Large Terrestrial	2-4	Chain link or woven wire	2.4 x 6 or 3.1 x 3.1	1.5	Will depend on species	Moose will require larger structures than deer
Medium Terrestrial	1-1.8	Chain link	1.5 x 1.5	0.4	150-300	
Small Terrestrial	1-1.8	Fine mesh that organism cannot crawl through	0.3 x 0.3	≤0.4	50 - 100	Voles require smaller "vole tubes"
Amphibian	0.3 (salamander) 0.6-0.9 (frog). Should have a 15 cm wide lip at the top.	Small concrete wall is best or drift fence constructed out of polythene like a silt fence	0.2- 0.6 diameter with slotted top 1.2 - 2.0 diameter without slots.	0.16	50	Must remain moist. Alignment should be with migration routes not necessarily drainage patterns
Aerial Mammals	N/A	N/A	1.5-3.0 m tall and at least 3 m above the ground			Use culverts to roost

Sources: BC Ministry of Water, Land and Air 2004, Clevenger and Waltho 1999, Bank *et al.* 2002, Arizona Game and Fish Department 2006 Ruediger and DiGiorgio 2006. Jackson 2003, Huijser *et al.* 2008.



Implementation Tools:  
Valuing Natural Assets, Nature-based  
Solutions, and Financing



**Table 4: Sample Register of Ecosystem Services Provided by Urban Green Spaces and Associated Data Needs**

Asset	Ecosystem service	Type of service	Data needs
Green space	Physical activity and health	Cultural	Amount of green space Survey/observed data on park visit frequency and activities
	Mental well-being	Cultural	Census data on population characteristics and health outcomes Disease costs
	Amenity value	Cultural	Amount of green space Hedonic pricing model relevant to city context Property values
	Air quality	Regulating	Amount of green space Vegetation types Air quality data Health costs of air pollution
	Carbon sequestration	Regulating	Amount of green space Vegetation types Tree cover Carbon price



Assessment of Key Ecosystem Services Provided by the Haizhu National Wetland Park in Guangzhou, China

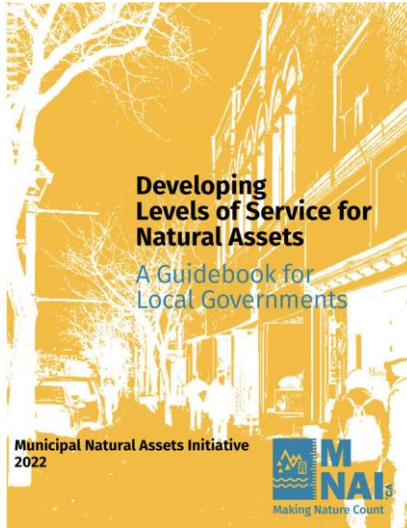


Prepared by: Chris Nootenboom, Eric Lonsdorf, Ray Renner, Rob Griffin, Beiling Han, Tong Wu, and Anne Goerry



Ecosystem Service	Supply Metric	Value Metric(s)	Valuation Modeling Approach	Value of the Wetland (30 year horizon)
Urban cooling*	Air Temperature	Productivity	Loss of workplace productivity as a result of temperature and humidity	Up to 16.1% in avoided productivity losses for nearby districts
		Private cost of cooling	Cost of cooling (and heating) as a function of temperature	\$1.9 million USD
		Mortality risk	Relative risk of mortality or morbidity as a function of temperature and region	Up to 1.27% in avoided mortality risks for nearby districts
Climate change mitigation*	Carbon Stored or Sequestered	Social cost of carbon	Net present value of change in damages from carbon emissions	\$77.8 million USD (7.4 million tons of avoided emissions)
Recreation*	Access (distance to parks)	Willingness-to-pay	Entry or use-fees; willingness-to-pay	\$67.8 million USD
Physical health	Access to urban nature (e.g., distance to parks, tree-lined streets, urban gardens, trails etc.)	Avoided cost of treatment	Change in costs associated with treatment to restore original physical health level	\$4.2 million USD
Mental health	Access to urban nature (e.g., views of greenery, distance to parks, amount of trees in neighborhood)	Avoided cost of treatment	Change in costs associated with treatment to restore original mental health level	\$70.1 million USD

# Municipal Natural Assets Initiative

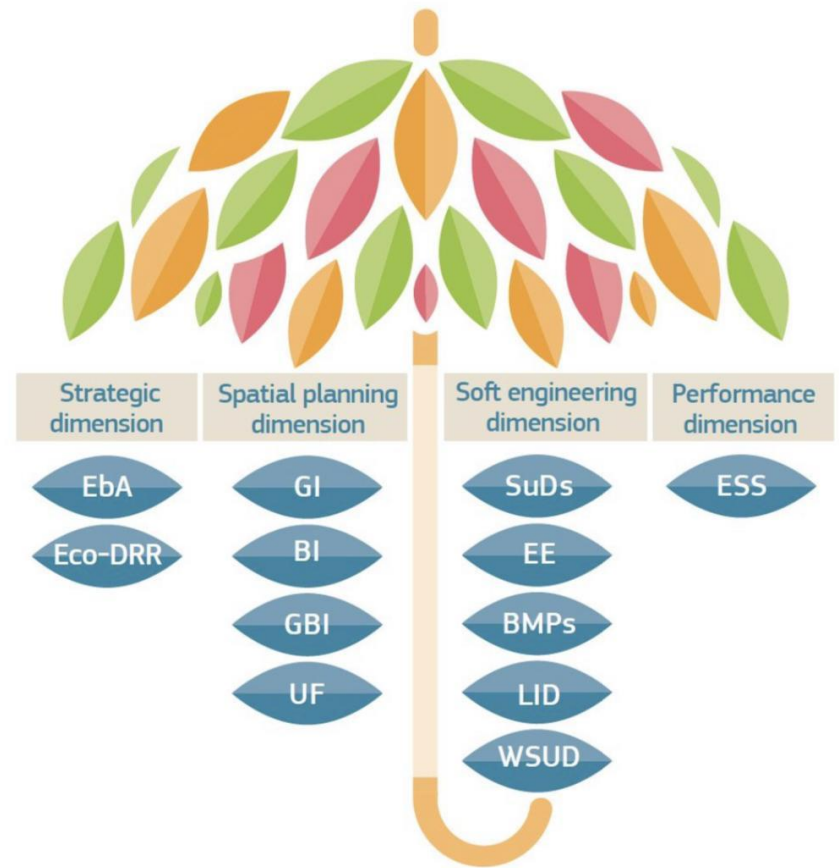


Canadian Standards Association will release a new standard for Municipal Natural Assets in 2023

Natural Asset Type/ Service Objective	Water (Surface, Groundwater)	Riparian Areas	Forest Assets	Green Open Spaces	Wetlands	Coastal Assets	Soils	Urban Green Infrastructure
Stormwater management	■	■	■	■	■		■	■
Drinking water	■	■	■	■			■	■
Wastewater		■			■			■
Transportation			■	■				
Recreation	■	■	■	■	■	■		■
Public Health	■	■	■	■	■	■	■	■
Biodiversity	■	■	■	■	■	■	■	■
Climate mitigation or adaptation	■	■	■	■	■	■	■	■
Local Economic Development	■	■	■	■	■	■	■	■
Culture and Heritage	■	■	■	■	■	■	■	■
Other?								

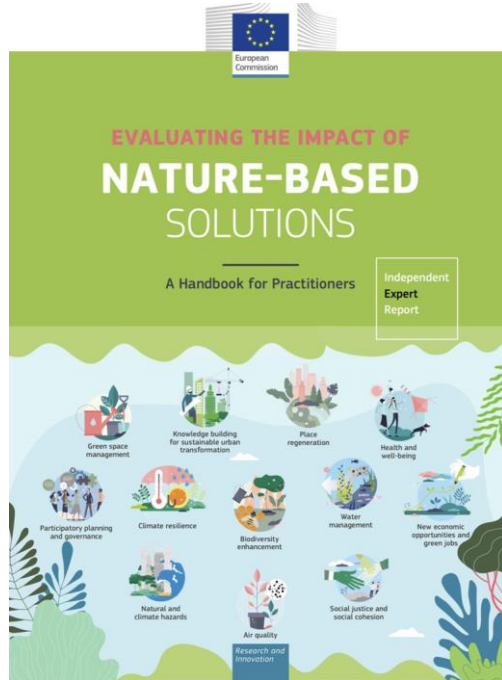
# Nature Based Solutions

The European Commission defines NBS as solutions that are “inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience.



**Figure 1-1.** Nature-based solutions as an umbrella concept and the relation of NBS to key existing concepts. EbA = ecosystem based adaptation; Eco-DRR = ecosystem-based disaster risk reduction; GI = green infrastructure; BI = blue infrastructure; GBI = green-blue infrastructure; UF = urban forestry; SuDS = sustainable urban drainage systems; EE = ecological engineering; BMPs = best management practices; LID = low-impact design; WSUD = water-sensitive urban design; ESS = ecosystem services.

# Standards For Nature-based Solutions



Two Standards You  
Should Consider:

IUCN Global Standard for  
Nature-based Solutions

Evaluating the Impact of  
Nature-Based Solutions:  
A Handbook for  
Practitioners

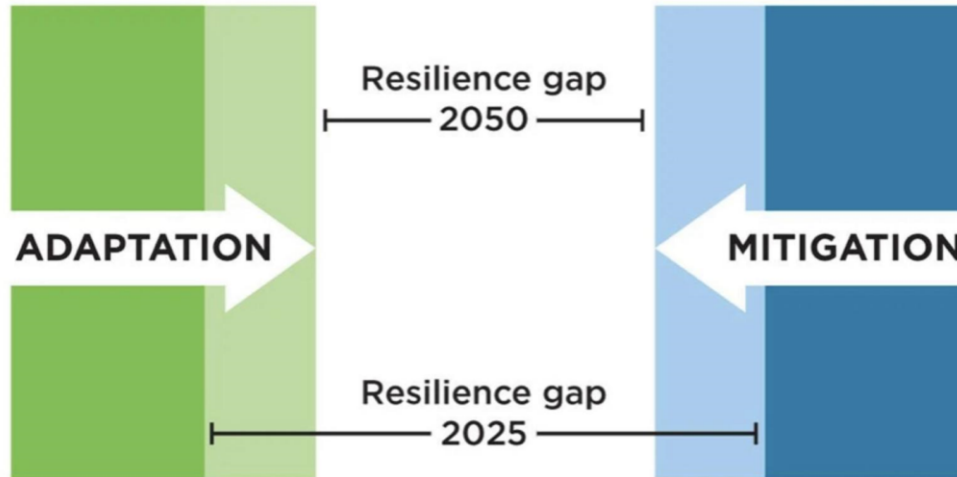


IUCN Global Standard for  
Nature-based Solutions

A user-friendly framework for the verification,  
design and scaling up of NbS

First edition

# Climate Resilience Gap and Urban Nature: Applying Nature Based Solutions

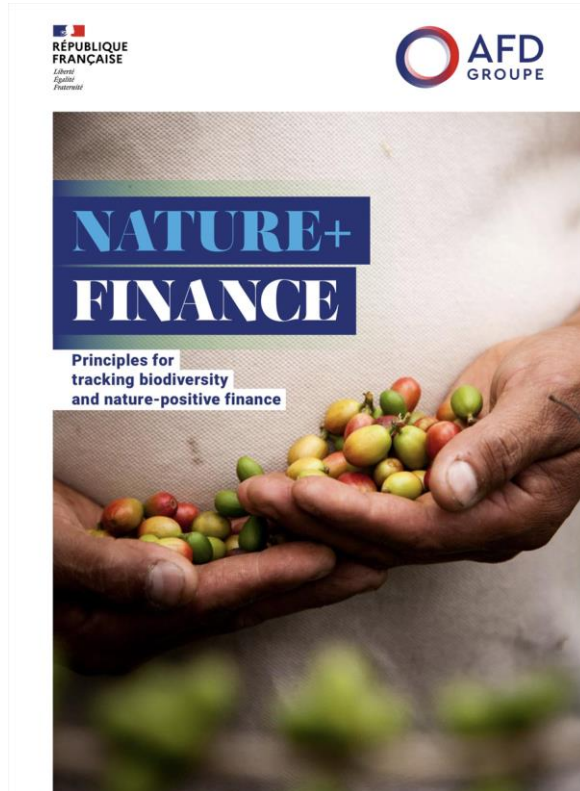


Press release | 16 Nov, 2022

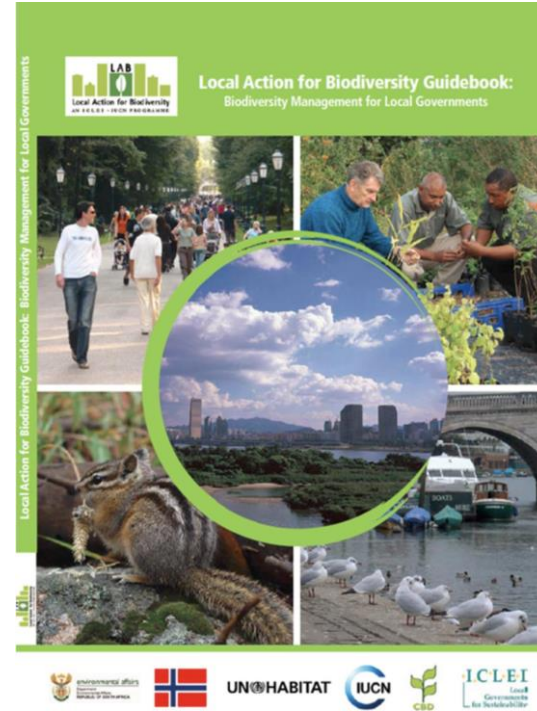
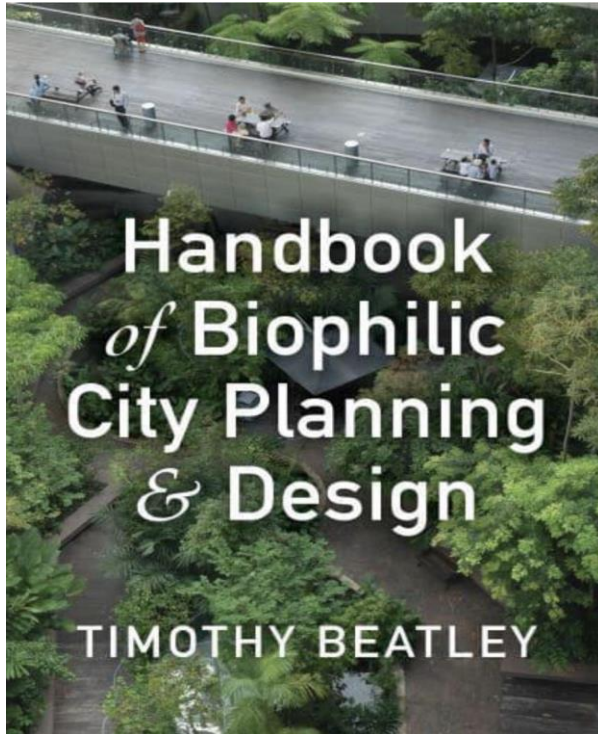
Egyptian COP27  
Presidency, Germany and  
IUCN announce ENACT  
Initiative for Nature-based  
Solutions



# Project Management and Finance



# Surveys of Global Urban Biodiversity Planning (If it's been done, you can do it too)





# Summary and Recommendations

1. Measuring biodiversity performance is essential to determine progress
2. You will limit your success if your biodiversity strategies are not reflected in your master plan or official plan
3. Adopt standards wherever practicable to focus decision making processes
4. Tailor your connectivity strategy to the animals in your community and develop design guidelines to speed up the decision making process
5. Valuation of ecosystem services should consider quantitative and qualitative measures: some values may be too hard to value quantitatively
6. Make friends with your engineers: you will be thankful that you did
7. A tool is just a tool and some tools may not be useful in your context and you may need to consider creating new ones.

La Fin, Merci

