

NATURAL SOLUTIONS INITIATIVE

MULTI-BENEFIT INDICATORS TOOL

NATURE-BASED SOLUTIONS INDICATOR SERIES

JULY 2024



SFU **ACT** Action on
Climate Team

MULTI-BENEFIT INDICATORS TOOL, V. 1



ACT'S NATURAL SOLUTIONS INITIATIVE

VISION:

The Natural Solutions Initiative (NSI) aims to mobilize nature-based solutions (NbS) as crucial opportunities in the transition toward just, low carbon resilient, and sustainable communities and regions.

MISSION:

The goal of the NSI is to co-create and advance a cohesive and systemic framework-for-action that optimizes the benefits of NbS for both people and nature in a rapidly changing climate.

ACT – Action on Climate Team at Simon Fraser University is a state-of-the-art research-to-practice hub for climate change and sustainability solutions. We work across sectors to mobilize relevant knowledge for practice. We do this by advancing public and private sector partnerships, coordinating and co-creating leading-edge research for practice, mobilizing policy relevant knowledge to help us all go further faster on climate and sustainability action.

RECOMMENDED CITATION

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**Simon Fraser University
respectfully acknowledges
xwməθkwəyəm (Musqueam),
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kwikwə́ləm (Kwikwetlem),
Qayqayt, Kwantlen, Semiahmoo
and Tsawwassen peoples on whose
traditional territories our three
campuses reside.**

INTRODUCTION

Nature-based solutions (NbS) are a crucial low carbon resilience ([LCR](#)) strategy, and include a suite of approaches that can be used to multi-solve across key societal challenges. Forests, wetlands, rain gardens, and green roofs, for example, can increase resilience to extreme heat and flooding, store and sequester carbon, and provide multiple co-benefits such as improving water and air quality, contributing to biodiversity, health and well-being, cost savings, green jobs, and more.

NbS are “actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits” ([UNEP, 2022](#)).

The [Natural Solutions Initiative \(NSI\)](#) aims to overcome disconnected disciplinary and practitioner approaches, ad hoc planning, and narrow applications of NbS projects which fail to fully capture their abundance of ecological and community benefits. The goal of the NSI is to create and test a framework-for-action that optimizes NbS benefits for people and nature. The table below provides a high-level overview of the NSI and the approaches, scales, and areas in which NbS projects may take place.

Table 1: The NSI Framework-for-Action ([ACT, 2023](#))

Three Nested NbS Approaches <i>Build coherence</i>	Four Scales of NbS Action <i>Promote cohesion</i>	Five Key Areas <i>Advance systemic NbS</i>
<ul style="list-style-type: none">• Ecosystem-based management• Natural asset management• Blue-green infrastructure strategies	<ul style="list-style-type: none">• Watershed• Community• Neighbourhood• Parcel	<ul style="list-style-type: none">• Climate action (adaptation & mitigation)• Biodiversity• Indigenous knowledges & leadership• Sustainable service delivery• Health, equity, & justice

MULTI-BENEFIT INDICATORS TOOL: FIVE KEY AREAS

While the pace of NbS implementation has been accelerating, assessments of NbS benefits often focus on specific issues (e.g., flood mitigation, stormwater management), categorizing other factors as secondary or supplementary benefits (e.g., biodiversity, social cohesion). Failing to track the complete suite of NbS benefits across multiple indicators leads to an incomplete understanding of the full potential of NbS. Singular approaches may limit the capabilities of NbS and lead to improper NbS planning and practice.

ACT's NSI aims to facilitate a more comprehensive assessment and systematic evaluation of NbS benefits across five key areas ([ACT, 2023](#)). The following NSI tool is intended to help decision-makers, practitioners, and other interested parties identify and cluster indicators to assess the multiple benefits of NbS. Below we provide a high-level set of indicators across five key areas: These areas are:

- Climate Action
- Biodiversity
- Indigenous Knowledges and Leadership
- Sustainable Service Delivery
- Health, Equity, and Justice

Each area is complemented by a "To Explore Further" section, providing additional information for those seeking a deeper understanding of specific key areas. For indicators that require further explanation, hyperlinks to examples are provided for quick reference.

⊕ is used to highlight health-related indicators.




This tool is built upon previous efforts to collect various NbS indicators. The full list of references used in the development of this tool can be found in the [Indicator References](#) section. The goal is to put nature back into NbS and to optimize the values and priorities associated with NbS when measuring performance and effectiveness over time. This document is intended to be evergreen and while it's not exhaustive we aim to elicit feedback that enhances its relevance for decision-making. Please send your feedback to actinfo@sfu.ca.



CLIMATE ACTION

It is important to understand how NbS can support climate action strategies, while also recognizing that natural systems are at risk from projected climate impacts. This can be done by identifying how and where NbS approaches can minimize risks and vulnerabilities to hazards such as heat, flood, and landslide. In addition, by better anticipating how projected climate changes will impact the resilience of natural systems and NbS strategies under more frequent and severe hazards, including both sudden and slow onset events. The protection and restoration of natural areas are considered to be one of the highest-impact emissions reduction strategies in both the short and long-term ([IPCC, 2022](#)).

Category	NbS Multi-Benefit Indicator
Mitigation	
Carbon storage & sequestration	<ul style="list-style-type: none"> Increased volume of carbon storage (e.g., tonne of carbon dioxide equivalent stored in forests, wetlands, agricultural soils) Increased volume of annual carbon sequestration (e.g., tonne of carbon dioxide equivalent uptake per year by forests, wetlands, peatlands)
Avoided GHG emissions	<ul style="list-style-type: none"> Avoided GHG emissions by land cover and land use change (e.g., tonne of carbon dioxide equivalent per km² of forest land not converted to urban area or non-forested landscapes [or baseline carbon stock of forest land] through conservation easement, development restriction, carbon offset program) Avoided GHG emissions by energy savings (e.g., electricity [kWh], natural gas [kBtu], or energy cost savings due to decreased heating/cooling needs from green roofs, shade trees)
Adaptation	
Flood	<ul style="list-style-type: none"> Increased stormwater storage capacity (e.g., m³ of stormwater storage within a wetland, stormwater pond) Decreased peak flow volume and/or duration (e.g., m³/s after adopting sustainable forest management, clear-cutting ban) Improved ecological processes (e.g., hydrological cycle) through floodplain restoration (e.g., m³ of stormwater storage capacity, infiltration rate) Decreased coastal wave height [cm] and/or energy [kW/h] (e.g., attenuated wave energy and height by mangroves, coral reefs)

Category (cont.)	NbS Multi-Benefit Indicator (cont.)
Flood (cont.)	<ul style="list-style-type: none"> Potential reduction in total losses and damages from flooding through living shoreline projects (e.g., km² of stabilized shorelines with marsh habitats) or planned retreat approaches (e.g., km² of riparian area restored to be flood resilient and/or % of homes or businesses relocated from flood-prone areas)
Erosion & landslide	<ul style="list-style-type: none"> Decreased erosion rate (e.g., soil mass lost [kg/year] or lowering of earth surface [m/year] before and after beach protection, afforestation) Increased area of stabilized slope (e.g., km² of slope stabilized with hydroseeding, brush layering) Decreased coastal wave height [cm] and/or energy [kW/h] (e.g., attenuated wave height and energy by mangrove/salt marsh stabilized shorelines) Potential reduction in total losses and damages from landslide (e.g., avoided landslide risks to life, health, assets, and ecosystems through natural-based stabilization techniques, such as vegetation maintenance) 
Heat	<ul style="list-style-type: none"> Decreased outdoor surface temperature in summer (e.g., average and/or maximum °C) in and around natural assets and blue-green infrastructure Reduced days requiring air conditioning (e.g., reduced cooling degree days from green roofs, shade trees, etc.) Decreased urban heat island effects on health (e.g., reduction in heat related illness or death, reduction in healthcare costs or number of hospital visits) 
Wildfire	<ul style="list-style-type: none"> Improved wildfire risk index as per the Canadian Forest Fire Weather Index (e.g., improved fuel moisture, duff moisture, drought moisture codes, decreased initial spread, reduced buildup) Improved maintenance of urban-wildfire interface (e.g., no flammable fuels within a 30-metre radius of buildings and infrastructure) Potential reduction in total losses and damages from wildfire (e.g., avoided wildfire risks to life, health, assets, and ecosystems through FireSmart landscaping, such as fuel removal from homes and xeriscaping) 
Drought	<ul style="list-style-type: none"> Improved regional drought index (e.g., Canadian Drought Monitor, Vegetation Drought Response Index), including soil moisture Improved natural hydrological cycle (e.g., improved ground water recharge rates, base flow streams, and evapotranspiration rates through daylighting, re-naturalized riverbed, wetland restoration)

Category (cont.)	NbS Multi-Benefit Indicator (cont.)
Drought (cont.)	<ul style="list-style-type: none"> Decreased water demand (e.g., m³ of water conserved through rain barrels, drought-resilient landscaping, less water-intensive crops)
Sea level rise	<ul style="list-style-type: none"> Reduced sea level rise risks, including storm surge risks (e.g., km of re-naturalized shorelines and/or % of homes or businesses relocated from flood-prone areas) Reduced potential damage and loss from sea level rise and/or saltwater intrusion into groundwater
<p>To explore further:</p> <ul style="list-style-type: none"> ACT-Action on Climate Team. (2022). <u>Low Carbon Resilience Planning Handbook</u>. Bridges, T. S., J. K. King, J. D. Simm, M. W. Beck, G. Collins, Q. Lodder, and R. K. Mohan, eds. (2021). <u>International Guidelines on Natural and Nature-Based Features for Flood Risk Management</u>. Vicksburg, MS: U.S. Army Engineer Research and Development Center. C40 Cities. (2019). <u>Measuring Progress in Urban Climate Change Adaptation: A monitoring, evaluating and reporting framework</u>. CSA Group. (2021). <u>Nature-Based Solutions for Coastal and Riverine Flood and Erosion Risk Management</u>. Federal Emergency Management Agency. (n.d.). <u>Engineering with Nature: Alternative Techniques to Riprap Bank Stabilization</u>. FireSmart Canada. (2018). <u>Wildfire Exposure Assessment</u>. FireSmart BC. (n.d.). <u>Landscaping Guide</u>. International Council for Local Environmental Initiatives. (n.d.). <u>Introducing Indicators: A First Look at Using Indicators to Measure Adaptation Success</u>. 	

⊕ indicates a health-related indicator.

BIODIVERSITY

Climate change is negatively impacting ecological processes and the watersheds upon which all living species depend. NbS must be used to enhance the health of species, habitats, and watershed functions, ensuring connectivity across scales, and supporting resilience over time. Improper and disconnected NbS approaches can negatively impact biodiversity and contribute to species decline ([Seddon, 2022](#)).

Category	NbS Multi-Benefit Indicator
Habitat availability	<ul style="list-style-type: none"> Increased number or size of natural/restored/hybrid habitat areas or increased proportion of vegetated area in a defined urban area (e.g., canopy cover area [m²/km²]) Increased area of nature positive agriculture (e.g., km² of agroforestry, regenerative agriculture, re-wilded cultivated lands) Reduced area of unsustainable agriculture and aquaculture (e.g., monoculture, open-net salmon farming)
Habitat quality	<ul style="list-style-type: none"> Improved vegetation condition (e.g., vegetation diversity, integration, density, height variation, shape, spatial arrangement) Improved environmental conditions (e.g., water quality, soil pH, organic matter)
Landscape connectivity/ fragmentation	<ul style="list-style-type: none"> Enhanced structural connectivity (i.e., connectivity of natural areas, degree of habitat fragmentation) (e.g., adjacency of habitat patches, also known as spatial contagion, the presence of physical connections, such as habitat corridors) Improved functional connectivity (i.e., corridor connectivity for the movement of organisms, also known as migration corridor)
Species richness, abundance, and diversity	<ul style="list-style-type: none"> Increased species diversity within a defined area Reduced number of species at-risk and potentially at risk Increased number of native species Reduced number of non-native and/or invasive alien species Reduced number of non-human species death due to human activities (e.g., roadkill, wind turbine-caused bird mortality)
<p>To explore further:</p> <ul style="list-style-type: none"> Conservation on Biological Diversity. (2014). City Biodiversity Index. Conservation on Biological Diversity. (2022). Kunming-Montreal Global Biodiversity Framework. City of Surrey. (2014). Biodiversity Conservation Strategy. City of Surrey. (2014). Biodiversity Strategy – Habitat Suitability Map. 	

- City of Surrey. (2021). [*Biodiversity Design Guidelines*](#).
- International Institute for Sustainable Development. (2023). [*Enhancing Biodiversity Co-Benefits From Nature-Based Solutions*](#).
- National Oceanic and Atmospheric Administration. (2020). [*Coral Reef Restoration Monitoring Guide Methods to evaluate restoration success from local to ecosystem scales*](#).
- Eyzaguirre, J., Boyd, R., Prescott, S., Morton, C., Nelitz, M. and Litt, A. (2020). [*Green Shores 2020: Impact, value and lessons learned*](#). ESSA Technologies Ltd. Stewardship Centre for BC.

INDIGENOUS KNOWLEDGES & LEADERSHIP








Indigenous peoples have stewarded the land and species for time immemorial, creating sophisticated place-based worldviews, ecological knowledge systems, and cultural practices. Bridging and braiding worldviews in support of the health and resilience of territories and watersheds is increasingly crucial for NbS planning and practice (e.g., co-existence with nature, cultural burning practices, biodiversity improvement and culturally integral species, natural water cycle improvement, etc.). Centring Indigenous knowledges and leadership in identifying key risks, vulnerabilities, and important NbS opportunities, particularly at a territorial scale, can play a crucial role in advancing innovative co-governance arrangements.

Category	NbS Multi-Benefit Indicator (adapted from WWF, 2022)
Fair	<ul style="list-style-type: none"> NbS are planned, designed, and implemented with deep, significant participation of interested parties Interested parties are broadly represented, with concrete social inclusion efforts Benefits are shared equitably, as interested parties define the terms The definition and calculation of benefits includes diverse definitions of value
Accountable	<ul style="list-style-type: none"> All elements of NbS planning and practice are transparent and understandable to all interested parties Every NbS project includes a resourced, effective, and appropriate grievance redress mechanism Partnership-building is long-term and applies the Truth and Reconciliation Commission Calls to Action recommendations and the Seven R's (Respect, Relevancy, Reciprocity, Responsibility, Rights, Reconciliation, and Relationships) into NbS planning and practice
Rights-based	<ul style="list-style-type: none"> NbS benefits take an active human rights-based approach to Indigenous Peoples aligning with the United Nations Declaration on the Rights of Indigenous Peoples First Nations, Métis, and Inuit are actively included in ecosystem-based management and the low carbon economy First Nations, Métis, and Inuit affected by an NbS intervention are openly and transparently consulted as per the OCAP® principles of ownership, control, access, and possession
Effective	<ul style="list-style-type: none"> Diverse NbS values, such as culturally-driven values, are considered in the value and valuation process, accounting for benefits and trade-offs NbS activate positive feedback loops for people and nature

Category (cont.)	NbS Multi-Benefit Indicator (adapted from WWF, 2022) (cont.)
Effective (cont.)	<ul style="list-style-type: none"> NbS are monitored and adapted over time to changes in science, implementation, or interested parties' needs
<p>To explore further:</p> <ul style="list-style-type: none"> First Nations Information Governance Centre. (n.d.). <u><i>First Nations Principles of Ownership, Control, Access, and Possession (OCAP®)</i></u>. Indigenous Climate Action. (2021). <u><i>The risks and threats of “nature-based climate solutions” for Indigenous Peoples</i></u>. Naqsmist. (2023). <u><i>BC First Nations Spiritual Knowledge Keepers Gathering on Climate Change</i></u>. National Oceanic and Atmospheric Administration. (2021). <u><i>The 7 R’s of integrating tribal and Indigenous partnerships into aquaculture literacy</i></u>. Reed, G., Brunet, N. D., McGregor, D., Scurr, C., Sadik, T., Lavigne, J., & Longboat, S. (2022). <u><i>Toward Indigenous visions of nature-based solutions: An exploration into Canadian federal climate policy</i></u>. <i>Climate Policy</i>, 22(4), 514–533. Reed, G., Fox, S., Littlechild, D., McGregor, D., Lewis, D., Popp, J., Wray, K., Kassi, N., Ruben, R., Morales, S. and Lonsdale, S. (2024). <u><i>For Our Future: Indigenous Resilience Report</i></u>. World Wildlife Fund for Nature. (2022). <u><i>Who reaps the benefits? Integrity principles for benefit sharing in forest NbS for climate mitigation</i></u>. 	

SUSTAINABLE SERVICE DELIVERY

Natural assets and blue-green infrastructure approaches may be used to complement engineered infrastructure, bolstering ecosystem services, while also lowering construction, operational, and maintenance costs (as compared to engineered solutions) over time. NbS must be able to maintain resilient under projected climate changes over time.

Category	NbS Multi-Benefit Indicator
Air quality improvement	<ul style="list-style-type: none"> Reduced exposure to air pollutants (e.g., air quality improvement in CO, NOx, SOx, and PM)  Decreased healthcare costs (e.g., number of hospital visits, and mortality related to respiratory disease) 
Water quality and security improvement	<ul style="list-style-type: none"> Reduced water pollution (e.g., water quality improvements due to sediment trapping, nutrient removal, and chemical detoxification from natural assets such as forests and wetlands or blue-green infrastructure, such as bioswales and rain gardens)  Improved natural water cycle through increased permeable and vegetated surfaces that enhance filtration and aquifer replenishment Increased percent of population with access to safe, clean drinking water 
Stormwater management	<ul style="list-style-type: none"> Increased volume of stormwater runoff controlled (i.e., captured and managed at source/on-site) (e.g., maintained pre-development levels runoff volumes, capture of initial rainfall up to 5 mm from all rainfall events) Increased area of pervious surface (e.g., m² of pervious surface) or Greened Acre (i.e., an acre of impervious cover within the stormwater service area that has at least the first inch of runoff managed by bioswales, rain gardens) Increased volume of pollutants captured (e.g., reduced total suspended solid, such as e-coli)  Decreased cost for stormwater management (e.g., cost for stormwater and sewage treatment by volume [\$/m³]) Reduced healthcare costs (e.g., number of hospital visits, and/or mortality related to gastrointestinal and/or dermatological diseases, especially due to combined sewer overflow) 
Noise control	<ul style="list-style-type: none"> Decreased outdoor noise (e.g., a reduction in noise level of up to 10 decibels, reduced exposure to noise pollution from car or train traffic) 

Category (cont.)	NbS Multi-Benefit Indicator (cont.)
Food systems	<ul style="list-style-type: none"> Improved local food availability (i.e., quantity), accessibility (e.g., distance to grocery or farmer’s market), affordability, and adequacy (i.e., healthy and nutritious) through sustainable agriculture practices and community gardens + Improved Indigenous food sovereignty (i.e., the right of peoples to access healthy and culturally appropriate food produced through ecologically sound and sustainable methods, as well as their right to define their own food and agriculture systems) through protection and restoration of natural areas (e.g., forests, salt marsh habitats, salmon habitats and migration routes) + Potential to reduce the carbon footprint of food (e.g., reduced carbon emissions from food production, processing, transporting, storing, and disposing of food through community gardens)
Recreational service/Responsible eco-tourism	<ul style="list-style-type: none"> Increased number of users Increased number of facility reservations (e.g., camping sites, observation decks) Increased number of organized events and programs (e.g., open house, workshops, educational programs) Increased revenue generated from eco-tourism Potential reduction in healthcare costs due to greater opportunities for physical activity in greenspaces (e.g., urban parks, greenways) +
Education and training services	<ul style="list-style-type: none"> Increased number of NbS educational programs, institutional curriculums, professional certificates, etc. Increased number of residents participating in NbS training, workshops, etc. Increased number of volunteers and citizen scientists participating in NbS projects (e.g., tree inventory mapping) Increased public awareness and community support for NbS
Green job creation	<ul style="list-style-type: none"> Increased number of NbS relevant jobs (e.g., natural asset managers, blue-green infrastructure designer and contractors, landscapers, material suppliers, NbS educator and trainers)
Property value	<ul style="list-style-type: none"> Increased property value (e.g., increasing area [m²] of rain gardens, swales, planters, or pervious pavement near a home is associated with higher average home sale value)
Other: Environmental*	<ul style="list-style-type: none"> Area of land remediated (i.e., environmental clean-up) for NbS Improved aesthetics

Category (cont.)	NbS Multi-Benefit Indicator (cont.)
Other: Environmental*	<ul style="list-style-type: none"> Improved walkability and cyclability (e.g., street trees providing shade for multi-use paths) Reduced environmental impacts, such as disturbance or destruction of ecosystems, compared to grey infrastructure (e.g., bioswales vs. sewer construction, salt marsh vs. concrete levee)
Other: Social*	<ul style="list-style-type: none"> Improved community cohesion, sense of place, or sense of belonging through co-creation of NbS projects Improved safety for pedestrians and cyclists (e.g., Green Streets programs planting trees and installing bioswales with sidewalks and bike lanes) Potential improvement in mental health and stress reduction/recovery Reduced crime rate (greater amounts of greenspace are associated with lower property and violent crime risks) Conserved or restored cultural heritage (see epistemic justice in the Health, Equity, Justice section)
Other: Economic*	<ul style="list-style-type: none"> Reduced lifecycle cost compared to grey infrastructure (e.g., cost for construction, maintenance and operation, replacement, upgrade) Increased revenue for NbS relevant businesses (e.g., native plant suppliers, green roof construction and maintenance business, bird watching tour guide businesses, eco-friendly souvenir shops, local farm-to-table restaurants) Repurposed economically underutilized areas (e.g., parking lots or vacant lots converted to community gardens, stormwater parks)

To explore further:



- American Forests. (n.d.). [Understand Urban Forests Benefits for Climate and Health.](#)
- Asset Management BC. (2019). [Integrating Natural Assets into Asset Management: A Sustainable Service Delivery Primer.](#)
- UBC Forestry. (2015). [The Social and Economic Values of Canada's Urban Forests – A National Synthesis.](#)
- City of Toronto. (2017). [Green Streets Technical Guidelines.](#)
- City of Vancouver. (2016). [Best Management Practice Toolkit.](#)
- Center for Neighborhood Technology. (2020). [Green Stormwater Infrastructure Impact on Property Values.](#)
- Center for Neighborhood Technology. (2021). [Green Values Strategy Guide: Linking Green Infrastructure Benefits to Community Priorities.](#)
- International Labour Organization. (2022). [Decent Work in Nature-based Solutions.](#)
- Natural Asset Initiative. (2017). [Defining and Scoping Municipal Natural Assets.](#)

* “Other” categories include indirect or potential spillover benefits.

⊕ indicates a health-related indicator.

HEALTH, EQUITY, & JUSTICE

It is important to consider how every NbS project can support equitable, healthy, and resilient communities. Without careful consideration, NbS planning and practice may exacerbate inequity and injustice by perpetuating existing power dynamics (Heck, 2021; Wolch et al., 2014). Research shows that **vulnerable groups** are historically underrepresented, facing systemic barriers to resources, opportunities, and social services. Neighbourhoods housing these groups are often exposed to greater risks, such as flooding and urban heat island effects (Faber, 2015; Hsu et al., 2021). Integrating equity indicators is essential to maximize the benefits from NbS projects. Communities should carefully develop their own equity indicators that adequately and effectively reflect intersecting complexities of equity concerns, incorporate local knowledge based on lived experience, and inform next actionable steps to improve equity (Rosan et al., 2022).

Category	NbS Multi-Benefit Indicator
<p>Distributional: Who (or whose neighbourhoods) are least protected from hazards and most underserved by NbS, who benefits from NbS, and who bears the costs and burdens of implementing NbS?</p>	<ul style="list-style-type: none"> Vulnerable and underserved populations equally benefit from NbS (e.g., ensure that every person lives within a five minute walk of a park, greenway or other green space (Vancouver, 2020) ; equal ratio between the percentage of residents in the bottom and top income groups who do not live within a 5-minute walk of a park (NYC, 2018) ; proportion of target group reached by an NbS project (EC, 2021))
<p>Procedural: Who can meaningfully participate in the NbS decision-making process? Who is involved in NbS planning and implementation (from decision making to installation and maintenance)?</p>	<ul style="list-style-type: none"> Historically marginalized and underrepresented individuals meaningfully involved in the decision-making process with inclusive support (e.g., participation of vulnerable or traditionally under-represented groups (UNaLab, 2019); number of people reached through engagement activities (ICLEI, n.d.); diversity of interested parties involved (EC, 2021); involvement of interested parties in co-creation/co-design of NbS (EC, 2021)).
<p>Recognitional: Whose identities, rights, needs, livelihoods, histories, and cultures are recognized, and which historical and systemic contexts are considered? Who are the vulnerable groups, and what benefits do they need from NbS?</p>	<ul style="list-style-type: none"> Identities and needs of underrepresented groups are recognized, and the historical and systemic contexts for NbS are considered (e.g., assistant programs to help vulnerable populations' involvement in NbS incentive programs, such as rain barrel rebate programs provided in diverse languages (APA, 2023); anti-displacement strategies to avoid green gentrification (e.g., inclusionary zoning, affordable housing) (Rigolon & Christensen, 2019)

Category (cont.)	NbS Multi-Benefit Indicator (cont.)
<p>Epistemic: Whose knowledge systems (e.g., Indigenous knowledge, cultural knowledge, local knowledge, lived experience, citizen science, intergenerational knowledge, interspecies ethics, etc.) are acknowledged and incorporated into NbS planning and practice?</p>	<ul style="list-style-type: none"> Diverse worldviews and knowledges are valued and incorporated (e.g., natural areas or territories under Indigenous stewardship, managed by traditional ecological practices (Arango-Quiroga et al., 2023))
<p>To explore further:</p> <ul style="list-style-type: none"> American Forests. (n.d.). Tree Equity Score. Canadian Climate Institute. (2024). Turning the tide: How flood risk transparency can drive equitable outcomes in Canada. Center for Disease Control and Prevention. (2022). Environmental Justice Indicator. C40 Cities. (2020). Inclusive climate action planning: Identifying indicators for monitoring and evaluation. City of Cincinnati. (2021). Cincinnati Climate Equity Indicators Report 2021. City University of New York – Institute for State and Local Governance. (2018). Equity Indicators – Toward a St. Louis Region that works for us all. Frantzeskaki, N., Wijsman, K., Adams, C., Kabisch, N., Malekpour, S., Pineda Pinto, M., & Vandergert, P. (2023). Governance of and with nature-based solutions in cities. In T. McPhearson, N. Kabisch, & N. Frantzeskaki (Eds.), Nature-Based Solutions for Cities (pp. 241–258). Edward Elgar Publishing. Green Infrastructure Leadership Exchange. (2020). Insights: Learning from Equity Leaders. Green Infrastructure Leadership Exchange. (2022). Equity Guide for Green Stormwater Infrastructure Practitioners. Meerow, S., Pajouhesh, P., & Miller, T. R. (2019). Social equity in urban resilience planning. <i>Local Environment</i>, 24(9), 793–808. O'Donnell, E., & Doyon, A. (2023). Language, context, and action: Exploring equity and justice content in Vancouver environmental plans. <i>Local Environment</i>, 28(11), 1478–1495. 	

⊕ indicates a health-related indicator.

NSI RESOURCES

The selected priority multi-benefit indicators listed above can act as guidelines for setting NbS goals and benchmarks, evaluating various NbS options, assessing trade-offs, and monitoring the performance and effectiveness of NbS over time. The NSI mobilizes resources, tools, and case studies to increase learning about opportunities, trade-offs, and barriers in planning and implementing cohesive and systemic NbS. Four key resources are currently under development to support cohesive and systemic NbS planning-to-implementation for practitioners and decision-makers aiming to drive nature-positive change:

WATERSHED HEALTH & RESILIENCE INDICATORS

An assessment of 16 watershed health indicator frameworks across North America in support of the equitable development and prioritization of watershed health indicators that intersect with climate change and Indigenous leadership. This resource will inform policymakers and watershed managers about the importance of holistic and culturally sensitive WHI frameworks, and advocate for continuing legislative support for Indigenous leadership.

LOWER MAINLAND NBS BEST PRACTICES

Best practice examples of NbS in the Lower Mainland of British Columbia. It showcases communities using the three nested approaches put forward by the NSI in order to provide decision-makers, practitioners, and interested and affected parties with inspiration on how to implement more cohesive and systemic NbS.

NBS STRATEGY FRAMEWORK

A curated menu of strategies for NbS planning and practice organized across three nested approaches (ecosystem-based management, natural asset management, and blue-green infrastructure strategies) and five key areas (climate action, biodiversity, Indigenous knowledges and leadership, sustainable service delivery, and health, equity, and justice). Decision-makers can use this framework to enhance NbS planning, drawing on key strategies while tailoring approaches to support broader ecosystem health and resilience.

NBS REGULATORY MECHANISMS TOOLKIT

Recommendations for municipalities to leverage regulatory approaches to advance NbS in their communities. For each regulatory mechanism, the toolkit provides recommendations for how the mechanism can be used to facilitate NbS implementation or otherwise advance low carbon resilience.

NBS PLANNING-TO-IMPLEMENTATION ROADMAP

Guidance on how to build inclusive and just processes in NbS planning. Co-creating cohesive and systemic NbS requires considerations of power dynamics – who is included and who is not - in project framing, planning, and implementation. This roadmap provides step-by-step guidance for building an inclusive NbS planning-to-implementation process that incorporates diverse values and knowledges.

INDICATOR REFERENCES

This document is developed based on an evaluation of NbS indicators used in scholarship and practice. We have synthesized over 1,330 indicators collected from 25 resources to five sets of key indicators. Note that these indicators do not represent exhaustive lists, they have been selected to represent best practice multi-benefit indicators observed in the literature.

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GET INVOLVED

ACT invites collaboration and partnership from national, regional and local organizations to build a community of practice aimed at applying the NSI Framework-for-Action. The goal is to promote cohesive and systemic NbS to address the multiple challenges that ecosystems and communities are facing now and into future, and to advance knowledge that builds resilience and sustainability for people and nature.

By working collaboratively, we can catalyze learning and innovation, and advance best practices. We encourage interested parties to email us at actinfo@sfu.ca.

Check out the [2023 NSI Summary](#) for more information and sign up to [ACT's newsletter](#) to receive NSI updates!

CONTACT US

Please engage with us about our Natural Solutions Initiative, and anything else you would like to discuss with ACT – Action on Climate Team.

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