

Singapore Index on Cities' Biodiversity



Session 7B: Measuring What We Do, 11 December 2016

5th Global Biodiversity Summit for Cities and Subnational Governments, 9-11 December 2016

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What is the Singapore Index?

- Tool to help cities evaluate/ monitor their biodiversity conservation efforts

- Key Features:

- self-assessment tool
- easy to apply
- scientifically credible
- objective and fair



- Secretariat of the Convention on Biological Diversity (CBD) – led collaboration with the Global Partnership on Local and Subnational Action for Biodiversity
 - Proposed by Singapore in 2008 at Ninth Conference of Parties to the CBD
 - Three Experts Workshops: Feb 2009, July 2010, Oct 2011
 - Endorsed in 2010 at Tenth Conference of Parties to the CBD
 - ASEAN Workshop in April 2010 (19 cities) and June 2014 (13 cities)

Singapore Index Framework

- **Part I: Profile of the City**

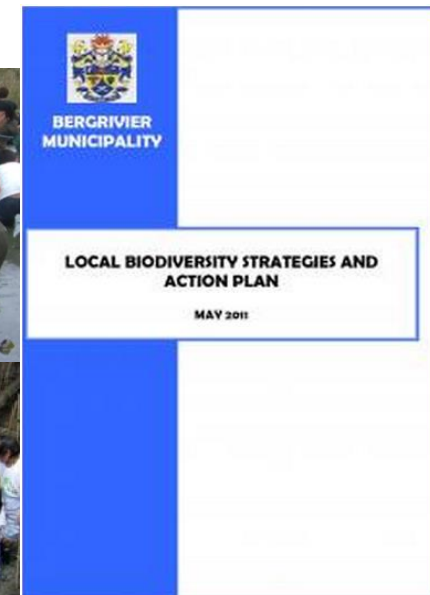
- Location and Size
- Physical Features of the City
- Demographics (population, density)
- Economic Parameters (GDP, GNP, key economic activities)
- Biodiversity Features (ecosystems, species)
- Administration of Biodiversity (management authorities, laws, rules)



Singapore Index Framework

- **Part II: Indicators of the Singapore Index**

- Native Biodiversity (10)
- Ecosystem Services (4)
- Governance and Management (9)



Singapore Index Framework

Indicators: Native Biodiversity

NO	INDICATORS
1	Proportion of Natural Areas in the City
2	Connectivity Measures or Ecological Networks to Counter Fragmentation
3	Native Biodiversity in Built-up Areas
4	Change in Number of Vascular Plant Species
5	Change in Number of Bird Species
6	Change in Number of Butterfly Species
7	Change in Number of Species (taxonomic group selected by city)
8	Change in Number of Species (taxonomic group selected by city)
9	Proportion of Protected Natural Areas
10	Proportion of Invasive Alien Species



Singapore Index Framework



Indicators: Ecosystem Services

NO	INDICATORS
11	Regulation of Quantity of Water
12	Climate Regulation: Carbon Storage and Cooling Effect of Vegetation
13	Recreation and Education: Area of Parks with Natural Areas
14	Recreation and Education: Number of Formal Education Visits Per Child Below 16



Singapore Index Framework

Indicators: Governance and Management

NO.	INDICATORS	
15	Budget Allocated to Biodiversity	
16	Number of Biodiversity Projects Implemented by the City Annually	
17	Existence of Local Biodiversity Strategy and Action Plan	
18	Institutional Capacity: Number of Biodiversity-related Functions	
19	Institutional Capacity: Number of City or Local Government Agencies Involved in Inter-agency Cooperation Pertaining to Biodiversity Matters	
20	Participation and Partnership: Existence of Formal or Informal Public Consultation Process	
21	Participation and Partnership: Number of Agencies/ Private Companies/ NGOs/ Academic Institutions/ International Organisations with which the City is Partnership in Biodiversity Activities, Projects and Programmes	
22	Education and Awareness: Is Biodiversity or Nature Awareness Included in the School Curriculum	
23	Education and Awareness: Number of Outreach or Public Awareness Events Held in the City per Year	

User's Manual on the Singapore Index

CBI	INDICATORS	VARIABLES	SCORE
Native Biodiversity	<p>INDICATOR 1: PROPORTION OF NATURAL AREAS IN CITY</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Natural ecosystems harbour more species than disturbed or man-made landscapes, hence, the higher the percentage of natural areas compared to that of the total city area gives an indication of the biodiversity richness. However, a city by definition has a high proportion of modified land area and this is factored into the scoring.</p> <p>Taking into account the inherent differences in the richness in biodiversity of tropical vs temperate regions, new vs mature cities, large vs small cities, developing vs developed countries, it was agreed at the Third Expert Workshop on the Development of the City Biodiversity Index that the working definition of "Natural Areas" is as follows:</p> <p>Natural areas comprise predominantly native species and natural ecosystems, which are not, or no longer, or only slightly influenced by human actions, except where such action is intended to conserve, enhance or restore native biodiversity.</p> <p>Natural ecosystems are defined as all areas that are natural and not highly disturbed or completely man-made landscapes. Some examples of natural ecosystems are forests, mangroves, freshwater swamps, natural grasslands, streams, lakes, etc. Parks, golf courses, roadside plantings are not considered as natural. However, natural ecosystems with dominant native species within parks can be included in the computation.</p> <p>The definition also takes into consideration "restored ecosystems" and "naturalised areas" in order to recognise efforts made by cities to increase the Natural Areas of their city. Restoration helps increase natural areas in the city and cities are encouraged to restore their impacted ecosystems.</p>		
		<p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(Total area of natural areas, restored and naturalised areas) ÷ (Total area of city) × 100%</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>Possible sources of data on natural areas include government agencies in charge of biodiversity, city municipalities, urban planning agencies, biodiversity centres, nature groups, universities, publications, etc. Google maps and satellite images also provide information for calculating this indicator.</p>	<p><u>BASIS OF SCORING</u></p> <p>Based on the assumption that, by definition, a city comprises mainly man-made landscapes, the maximum score will be accorded to cities with natural areas occupying more than 20% of the total city area.</p> <p>0 points: < 1.0% 1 point: 1.0% – 6.9% 2 points: 7.0% – 13.9% 3 points: 14.0% – 20.0% 4 points: > 20.0%</p>

Promoting Application of the Singapore Index

Regional

- ASEAN – ASEAN Working Group on Environmentally Sustainable Cities and ASEAN Working Group on Nature Conservation and Biodiversity – ASEAN Framework Indicators for Environmentally Sustainable Cities – Clean Air, Clean Water, Clean Land
- China-ASEAN Environmental Cooperation Framework – Seminar on ASEAN-China Partnership for Ecologically Friendly Urban Development, 17-18 November 2015, Beijing, China
- ASEAN-India – Seminar/ Workshop on the Application of the Singapore Index for ASEAN and Indian cities (tentatively 2017)
- Two bilateral workshops with Thailand (2013)

International

- Examples: Cities Biodiversity Summits (Hyderabad, Pyeongchang, Cancun), ICLEI World Congress 2015 and relevant seminars and conferences
- Partnerships with ICLEI-Local Government for Sustainability – Cities Biodiversity Centre (South Africa)

Promoting Application of the Singapore Index

Adaptable:

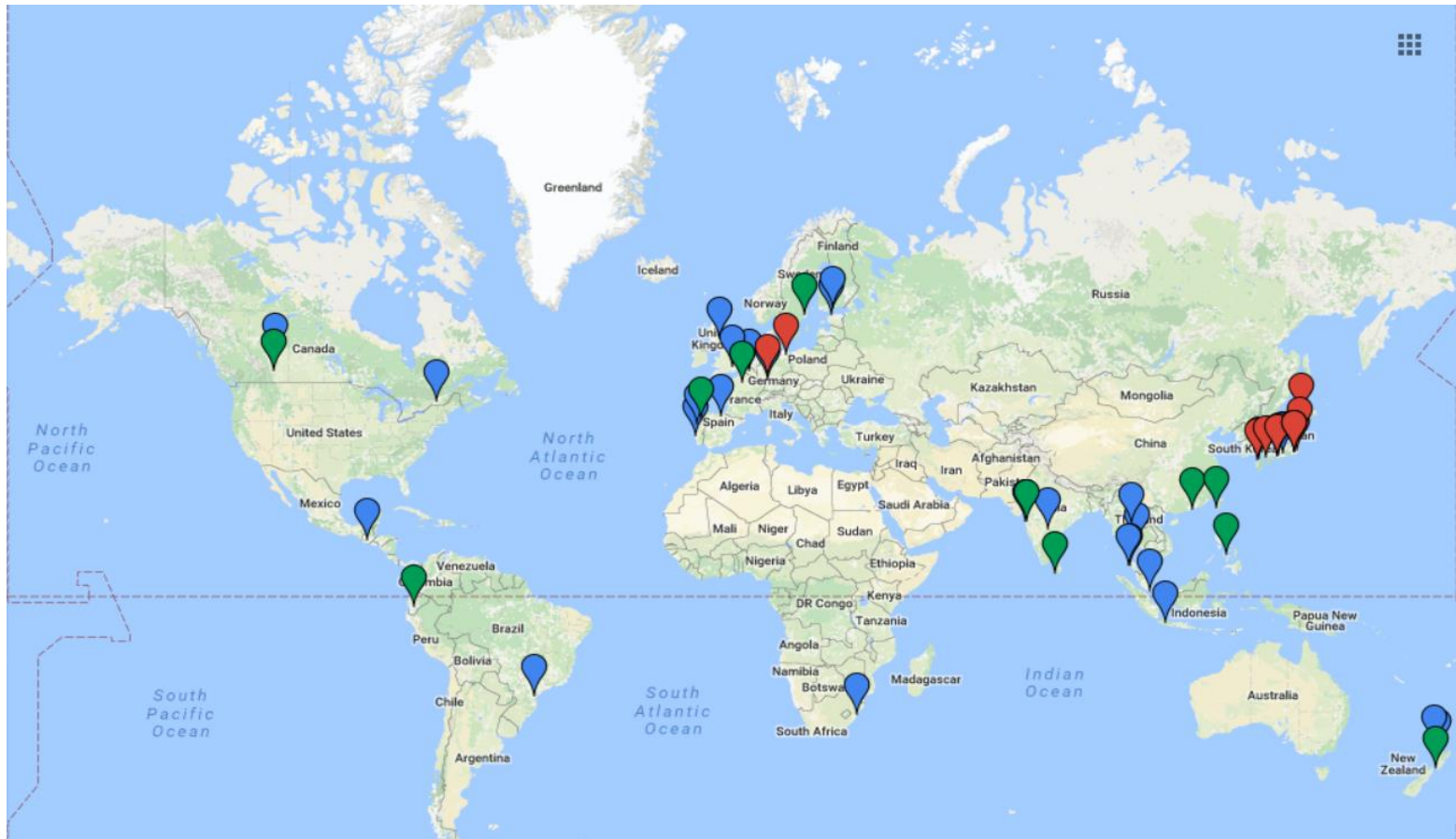
- European Capitals of Biodiversity: search for the city/ municipality which is most committed to biodiversity conservation (2010/11)
 - Total of 334 cities/municipalities from five countries: Spain, France, Germany, Hungary and Slovakia
 - Adapted the SI to score cities (definitions and scoring ranges were tweaked to fit European context)
- Japan Ministry of Infrastructure Land and Transport – adapting the SI for application to Japanese cities/ municipalities (2014)
- Philippines – adapting the SI, included in their updated NBSAP – a section on Urban Biodiversity
- European Project in support of the CBI (2015 ongoing) – measuring selected indicators using satellite data and tailor made processing for cities in Europe; include web-based visual dissemination tool (6 cities – Barcelona, Buenos Aires, Edmonton, Hamilton, Lisbon, Tallinn)

New Interest:

- PhD Students interested in the SI – Carolina (Paris), Jennifer (Vancouver)
- Jennifer and interested youths from the Global Youth Biodiversity Network

Current Application of Singapore Index

- Currently **25** city governments have applied the SI.
- In addition, **38** cities have made enquiries on the SI, some of which are in the process of applying.
- NParks translated the SI into French, Chinese, and Thai. Draft translations by partners available in German, Portuguese, Japanese and Vietnamese



- **Blue** placemark: have applied the SI
- **Green** placemark: currently in the process of applying
- **Red** placemark: cities where the SI was applied by academics



City of Helsinki



CITY
ADMINISTRATION

SOCIAL SERVICES
AND HEALTH
CARE

MAPS AND
TRANSPORT

DAYCARE AND
EDUCATION

CULTURE AND
LEISURE

HOUSING AND
ENVIRONMENT

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BIODIVERSITY

[Natural environments](#)

[Cultural environments](#)

[Special features of nature in the city](#)

[Benefits of nature](#)

[Nature database](#)

ENVIRONMENTAL PROTECTION DEPARTMENT

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00790 Helsinki
P.O. Box 500, 00099 City of Helsinki
09 310 1635

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**PUBLIC WORKS
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City Biodiversity Index

The City Biodiversity Index, also known as the Singapore Index, is an index that measures the biodiversity of urban nature. Developed as a result of international cooperation, the purpose of the index is to offer tools for the protection of urban biodiversity. It is meant to serve as a tool with which cities can evaluate the development of their native biodiversity. The development work is coordinated from Singapore.

The CBI is composed of 23 indicators, which are divided into three Core Components: native biodiversity, ecosystem services and governance. Each indicator is scored on a range of 0–4. This was the first time that the indicators were scored in Helsinki. In the future, the index is meant to be calculated every four years.

The scoring only took into account those indicators for which a score could be calculated. Helsinki achieved a total score of 58/96. The indicators on native biodiversity yielded a score of 17/44. The score for ecosystem services was 11/16, while governance earned a score of 30/36.

Based on the index, the state of biodiversity management in Helsinki is good. The city has retained much of its native

THE ORIGINAL NATURE

[Nature areas](#)

[Ecological networks](#)

[Birds in urban areas](#)

[Plants](#)

[Butterflies](#)

[Fish](#)

[Bats](#)

[Birds](#)

[Saproxylics](#)

[Protected nature areas](#)

[Alien species](#)

ECOSYSTEM SERVICES

[Impermeable surface](#)

[Canopy cover](#)

[Recreation areas](#)

[Fieldtrips](#)

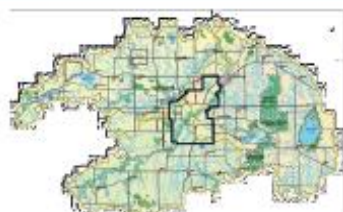


Example of a City's Factsheet

The city of Edmonton in Alberta, Canada sits at an elevation of 868m. It has a temperate climate with average daily temperatures ranging from -11.7°C in January to 17.6°C in July. The city experiences an average of 28 days below -20°C and 3 days above 30°C. The city's average annual precipitation is 478.9mm with most of this being rain rather than snow.

Edmonton occupies 889.8km² of the Capital Region, a 9,427km² area comprising 5 cities, 11 towns, 4 municipal districts, 3 villages and 1 specialised municipality. Edmonton's 612,261 residents form the majority of the Region's population base of 1.16 million. At 1,181 persons/km², it is much denser than the Region (123 persons/km²). The city enjoys a real GDP of CAD 38.8 billion and real per capita income of CAD 47,000. Key economic sectors include education, health services, public administration along with manufacturing and professional services that support the oil and gas sector.

EDMONTON



Application of Singapore Index on Cities' Biodiversity

NATIVE BIODIVERSITY

Edmonton lies in a deciduous transition zone between the northern boreal forest and southern grasslands. About 10% of its land base is made up of natural areas, including much of the North Saskatchewan River Valley and ravine systems that divide the city, wetlands and forests. Edmonton's ecological network resides within a larger regional network that extends into neighbouring municipalities. Forests and wetlands within developed areas support diverse urban wildlife.

Edmonton's ecosystem comprises forests (mostly aspen and balsam poplars), wetlands (mostly marshes and fens), and riverine/riparian systems (the North Saskatchewan River). Its native species count includes 487 vascular plants, 178 birds, 66 butterflies, 27 freshwater fishes and 47 mammals.



The Way We Green

In 2012, Edmonton City Council approved *The Way We Green* - the City's award winning environmental strategic plan. The importance of biodiversity to residents' well-being is central to this plan, which is one of six integrated high-level plans. The high priority Edmontonians place on biodiversity is reflected in *The Way We Green*'s first goal which states: "Edmonton is full of nature - a place where in the course of everyday life, residents experience a strong connection with nature."

The Implementation plan for *The Way We Green* (approved by City Council in October 2012) includes a suite of performance measures and indicators to monitor the desired outcomes of the plan and supporting strategies. The Singapore Index has been chosen as one of the principal biodiversity outcome measures.



GOVERNANCE AND MANAGEMENT OF BIODIVERSITY

The Office of Biodiversity coordinates the City of Edmonton's protection of its network of river valleys, ravines, wetlands and tree-lands. It partners City Branches namely Urban Planning and Environment, Drainage Services, Transportation, Corporate Properties, Current Planning, Community Services, and Waste Management. Edmonton also partners myriad community organisations on biodiversity protection initiatives, and supports community stewardship of natural areas through its Master Naturalist Programme.

Edmonton's biodiversity-related efforts include dedicating reserve lands to protect habitats from development, management approaches supporting the natural function of the landscape, and land purchase and donation programmes (e.g. the Edmonton and Area Land Trust (EALT)) that help secure unprotected natural areas. An important biodiversity protection tool is the designation of the Environmental and Municipal Reserve.

Upon subdivision, landowners must provide to the City Municipal Reserve (MR), land equal to 10% of the total developable land area to be used as public park, public recreation area, schools or to separate lands used for other purposes. For the protection of natural areas on the tablelands above the river valleys and ravines, MR can be used to a maximum of 2% of the developable land base (i.e. up to 20% of the available 10% MR). Environmental Reserve may be claimed for steep slopes and lands subject to flooding.

Edmonton's Natural Areas Reserve Fund, Wetland Acquisition Fund and Parkland Purchase Reserve Fund are dedicated to the purchase of natural areas. The city is also one of 6 partners in the EALT which is a non-profit charity dedicated to protecting natural areas. Conservation easements, which is the voluntary dedication of private land to a qualified land trust agency or organisation such as the EALT play a crucial role in the conservation of urban natural areas.

Findings on the Application of the Singapore Index

1. Natural areas and constructed wetlands make up 7,180ha (including North Saskatchewan River), or 10.3% of the City's area.
2. To be determined based on revised formula.
3. Baseline data: 102 bird species in built-up areas.
4. Baseline data: 487 vascular plant species.
5. Baseline data: 178 bird species can be found in the Edmonton region.
6. Baseline data: 66 butterfly species.
7. Baseline data: 27 freshwater fish species.
8. Baseline data: 47 mammal species.
9. Edmonton has 3,714ha of secured natural area, comprising 5.3% of total city area (69,979ha).
10. There are 41 invasive plant species in Edmonton. Therefore the proportion of invasive species as opposed to native species is 7%.
11. There are 49,174.9ha of permeable surfaces, comprising 70.3% of total city area.
12. Edmonton's tree canopy constitutes 10.5% of total city area.
13. Edmonton provides 8.7ha of natural coverage per 1,000 persons.
14. Systematic collection is not currently undertaken as all natural areas are open to the public for free. However, it is estimated that there were 2,239 visits in 2009.
15. The budget for the parks function makes up 4% of Edmonton's total annual budget.
16. A total of 43 biodiversity-related projects were implemented between 2009 and 2010.
17. Several of Edmonton's LBSAP elements align with Canada's NBSAP, including integrated urban planning, public education and engagement, and improving ecological management capacity.
18. Biodiversity-related institutions include the Royal Alberta Museum, John Janzen Nature Centre, Muttart Conservatory, Valley Zoo, Devonian Botanic Garden, City of Edmonton River Valley Forestry/Environmental Services Lab.
19. City or local government authorities involved in inter-agency cooperation include Urban Planning and Environment (includes Office of Biodiversity), Drainage Services, Current Planning, Transportation Planning, Edmonton and Area Land Trust, Community Services, River Valley Alliance, North Saskatchewan Watershed Alliance.
20. Edmonton's Public Involvement Policy (C-513) is implemented with every major new plan. The Natural Areas Advisory Committee advises on matters pertaining to biodiversity and natural areas protection.
21. Edmonton works closely with agencies and community partners (including the Master Naturalist Program, Edmonton and Area Land Trust, Edmonton BioKit project and "Learning the Language, Learning the Land" project) to achieve common biodiversity goals.
22. The Alberta curriculum includes aspects of biodiversity throughout elementary and secondary grades.
23. Edmonton runs or substantially contributes to the organisation of approximately 225 outreach events annually.

Native Biodiversity
in the City

Ecosystem
Services

Governance and
Management of Biodiversity



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Global Partnership on Local and Sub-national Action for Biodiversity

October 2012



Potential Other Applications

As a diagnostic, planning and decision-making tool:

- NParks collaboration with Housing Development Board and Urban Redevelopment Authority on applying the SI to the master planning of Punggol Eco-town and Marina Bay respectively

As the biodiversity component of broader indices/ frameworks:

- The SI has been incorporated into the Building and Construction Authority's Green Mark for Districts Version 1.0 (available on BCA's website); URA Benchmarks, Best Practices and Framework for Sustainable Urban Development (CSAC)

“Edmonton and Montreal scored a perfect 10 for their biodiversity monitoring efforts and I think that the CBI contributed significantly to this ranking.” – Mr Grant Pearsell, Director of the Office of Natural Areas, Edmonton, Canada on Corporate Knights’ study on good sustainable development practices in Canadian cities (2011)



For more information:
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Belgium	Brussels
Brazil	Curitiba
Canada	Edmonton
Canada	Montreal
Estonia	Tallinn
Finland	Helsinki
Germany	Heidelberg
Guatemala	La Antigua Guatemala
India	Hyderabad
India	Mira-Bhayandar
Indonesia	Bandung/West Java
Japan	Nagoya
New Zealand	Auckland/Waitakere
New Zealand	Hamilton
Portugal	Lisbon
Portugal	Porto
Singapore	Singapore
South Africa	Durban
Spain	Vitoria-Gasteiz
Thailand	Bangkok
Thailand	Chiang Mai
Thailand	Krabi
Thailand	Phuket
UK	Edinburgh
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