

21 November 2009

USER'S MANUAL FOR THE SINGAPORE INDEX ON CITIES' BIODIVERSITY

Background

The ninth meeting of the Parties of the Convention on Biological Diversity (COP9) in Bonn, Germany, recognized the role of cities and local authorities and the fact that the implementation of national biodiversity strategies and action plans (NBSAPs) requires the close collaboration with subnational levels of government. In the light of the above, the Minister for National Development of Singapore, Minister Mah Bow Tan, proposed the establishment of an index to measure biodiversity in cities, at the high level segment of COP9, on 27 May 2008. Following up on his announcement, the first expert workshop on the development of the City Biodiversity Index (CBI) took place from 10 to 12 February 2009 at the Singapore Botanic Gardens, at the invitation of the National Parks Board (NParks), the Secretariat of the Convention on Biological Diversity and the Global Partnership on Cities and Biodiversity.

Deliberations and follow-up actions of the workshop

The workshop was organized in close consultation with the members of the Global Partnership on Cities and Biodiversity.

The key objectives of the workshop were to develop the City Biodiversity Index (CBI) to:

- a) Assist national governments and local authorities in benchmarking biodiversity conservation efforts in the urban context; and
- b) Help evaluate progress in reducing the rate of biodiversity loss in urban ecosystems.

A total of seventeen technical experts on biodiversity indicators as well as city executives and city representatives responsible for implementation and/or management of biodiversity and urban projects and programmes attended the workshop. These included

four city and city state governments (Curitiba, Montreal, Nagoya, and Singapore), experts from the London School of Economics, Stockholm Resilience Center, Institute of Housing and Environment (Germany), National University of Singapore, the International Union Conservation of Nature and Natural Resources (IUCN), ICLEI's Local Action for Biodiversity (LAB) Initiative and the East Asian Seas Partnership Council. From the Secretariat of the Convention on Biological Diversity (SCBD), Mr. Oliver Hillel, Programme Officer for Sustainable Use, Tourism and Island Biodiversity, attended the workshop.

Over the three-day workshop, the experts deliberated on the format of the index and agreed that it should comprise three components, i.e., a) Native Biodiversity in the City, b) the Ecosystem Services Provided by Native Biodiversity in the City, and c) Governance and Management of Native Biodiversity in the City. The experts, divided into three groups, discussed in depth each of the components and decided on 26 indicators in the table below.

In recognition of Singapore's innovative contribution and leadership, the Secretariat of the Convention on Biological Diversity has formally named the index, "The Singapore Index on Cities' Biodiversity". In short, it may be called "The Singapore Index" or the "CBI".

A Technical Task Force, comprising Dr. Nancy Holman (London School of Economics), Mr. Peter Werner (Institute of Housing and Environment, Darmstadt, Germany), Professor Thomas Elmqvist (Stockholm Resilience Centre), Mr. Andre Mader (ICLEI – Local Governments for Sustainability), Ms. Elisa Calcaterra (IUCN), Mr. Oliver Hillel (SCBD) and Dr. Lena Chan (NParks), was delegated to prepare the User's Manual for the Singapore Index on Cities' Biodiversity.

General Information on the Draft User's Manual for the Singapore Index on Cities' Biodiversity

The table contains explanation and guidelines on a) the rationale for selection of the indicator, b) how to calculate the indicator, c) where to get data for the calculations, and d) basis for the scoring.

Three methods of scoring have been proposed. The first method, i.e., involving quantitative scores, has been developed in greater detail, as the two other methods of comparing with the baseline of 100 and the traffic system, also require some quantitative measurement for their scoring.

During the preparation of the User's Manual, repetition of indicators was deleted, and more appropriate measurements were proposed. As a result, 25 indicators are now included in the calculation of the Singapore Index. Since a maximum score of 4 is allocated for each of the indicator, the maximum score of the Singapore Index is 100.

Updates on the test-bedding of the Singapore Index

Some cities, i.e., Curitiba, Joondalup, Edmonton, Brussels, Montreal, Nagoya and Singapore, have already completed an initial stock-take of the availability of the biodiversity-related data necessary for the test-bedding of the Singapore Index. Their feedback have been invaluable in fine-tuning the Singapore Index. More cities and counties, viz., Paris, European Cities partaking in the IUCN 2010 Countdown Project, Frankfurt, and King County (USA), have indicated interest in test-bedding the Singapore Index.

Time-line

We are working towards the tabling of the Singapore Index on Cities' Biodiversity, for its endorsement as a self-assessment evaluation tool for post-2010 monitoring purposes, to the Parties to the Convention on Biological Diversity at its 10th Meeting in Nagoya, Japan, in October 2010. Based on this time-line, the following milestones are set, with the revisions and impending events highlighted in bold green:

- 10 July 2009 - Posting of the Draft User's Manual for the Singapore Index on Cities' Biodiversity on the CBD website for feedback from cities, academics, etc., on availability of data and other comments
- 31 December 2009 - Finalisation and posting of the User's Manual for the Singapore Index on the SCBD website
- 6-7 January 2010 - Discussion of the Singapore Index at the 2nd Meeting of the Global Partnership on Cities and Biodiversity in Curitiba, Brazil
- Early July 2010 - 2nd Expert Meeting on the Singapore Index
- 31 August 2010 - Collation of the results of the first batch of test-bedding of the Singapore Index by cities
- October 2010 - Discussion on the Singapore Index at the Biodiversity Summit, Nagoya

October 2010 - Tabling of the Singapore Index for the endorsement by the Parties to the CBD at COP10 of the Singapore Index as a self-assessment evaluation tool for post-2010 monitoring purposes

Cities that are interested in the test-bedding of the Singapore Index can forward their feedback and queries to Lena_CHAN@nparks.gov.sg and she will circulate them to the Task Force. Universities, researchers, academics, individuals, etc. who have invaluable biodiversity data that are relevant to the Singapore Index are invited to share their data with us. We will facilitate the channeling of the biodiversity data to the relevant city officials.

PROFILE OF THE CITY

As the Singapore Index on Cities' Biodiversity focuses on only a few parameters, it is important that other information not captured in the index be given so as to give a more holistic picture of the native biodiversity that can be found in the city. The profile of the city will include important general information on the city, in particular details of biodiversity data, so as to give a more comprehensive background on the city and to place it in the proper perspective. The data and information in this section will be used for the computation of the indicators. The information should include:

Location:

Size:

Population:

Biodiversity features/characteristics:

- Ecosystems found in the city
- Species found in the city
- Quantitative data on population of key biodiversity indicators

- Relevant qualitative biodiversity data

Table: INDICATORS OF THE SINGAPORE INDEX ON CITIES' BIODIVERSITY

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	1. Native Biodiversity in the City	<p>(IND.1) % of natural/semi-natural areas</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/semi-natural areas compared to that of the total city area gives an indication of the biodiversity richness. However, it should be taken into account that a city, by definition, has a high proportion of modified land area and this is factored into the scoring.</p>	<p>(IND.1) % of natural/semi-natural areas</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(Total area with natural ecosystems/Total area of city) X 100 where natural ecosystems are defined as all areas that are natural and not highly disturbed or man-made landscapes. Some examples of natural ecosystems are forests, mangroves, freshwater swamps, natural grasslands, streams, lakes, etc. Parks, golf courses, roadsides are not considered as natural. However, natural ecosystems with dominant native species within parks can be included in the computation.</p>	<p>(IND.1) % of natural/semi-natural areas</p> <p><u>BASIS OF SCORING</u></p> <p>A) Based on the assumption that, by definition, a city comprises mainly man-made landscapes, the scoring will be based on a maximum of 20% of the city area coverage by natural area</p> <p>0 point - 0% 1 point - 1% - 6% 2 points - 7% - 13% 3 points - 14% - 20 % 4 points - 21% and more</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.1) % of natural/semi-natural areas</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.1)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		(IND.1) % of natural/semi-natural areas	(IND.1) % of natural/semi-natural areas <u>WHERE TO GET DATA FOR CALCULATIONS</u> 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.	(IND.1) % of natural/semi-natural areas	

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	1. Native Biodiversity in the City	<p>(IND.2) Diversity of ecosystems</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>The number of natural ecosystems found in a city gives an indication of the diverse range of niches for native flora and fauna. Since different ecosystems are found in different geographical regions, any scientifically acceptable terrestrial and marine ecosystems, including forests (tropical, subtropical, monsoon, temperate, lowland, montane, primary, secondary, etc.), mangroves, freshwater swamps, peat swamps, natural grasslands, rivers, streams, lakes, rocky shores, beach, mud-flats, sand dunes, sea grass beds, corals, etc., can be computed in the calculation of this index.</p>	<p>(IND.2) Diversity of ecosystems</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>Number of natural ecosystems found in the city</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.</p>	<p>(IND.2) Diversity of ecosystems</p> <p><u>BASIS OF SCORING</u></p> <p>A) Based on the estimation that realistically, any city can accommodate to about 10 natural ecosystems, within its boundaries, the scoring would be</p> <p>0 point - 0 natural ecosystem 1 point - 1-3 ecosystems 2 points - 4-6 ecosystems 3 points - 7-9 ecosystems 4 points - 10 and more ecosystems</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.2) Diversity of ecosystems</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.2)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	1. Native Biodiversity in the City	<p>(IND.3) Fragmentation Measures</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Fragmentation of natural areas is one of the main threats to the sustainability of biodiversity in a city, hence, it has been selected as an indicator to chart possible future trends. However, it is not easy to measure fragmentation although there are several ways to measure fragmentation, i.e., mean patch size or distance between patches, etc.</p>	<p>(IND.3) Fragmentation Measures</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>Equation for mean patch size, (S_M)</p> $S_M = \frac{A_T}{N}$ <p>where A_T - the total area of all natural and semi-natural ecosystems (see IND.1) N – the number of patches</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>Satellite images can be used in the computation of this indicator.</p>	<p>(IND.3) Fragmentation Measures</p> <p><u>BASIS OF SCORING</u></p> <p>A) 0 point: < 1 km² 1 point: 1 to 2.4 km² 2 points: 2.5 to 4.9 km² 3 points: 5 to 15 km² 4 points: > 15 km²</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.3) Fragmentation Measures</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.3)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	1. Native Biodiversity in the City	<p>(IND.4) Native biodiversity in built-up areas</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>It is acknowledged that there are built-up areas with minimal natural features, anthropogenic green space and brown sites in cities. However, they too have biodiversity, e.g., birds like swallows and swiflets nest under roofs of buildings, plants grow on buildings. Some built-up areas have more biodiversity than others. By enhancing certain features in built-up and brown sites, the biodiversity could improve. Hence, they should be factored in as an indicator.</p>	<p>(IND.4) Native biodiversity in built-up areas</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>No. of bird species in built-up areas where built-up areas include impermeable surfaces like buildings, roads, drainage channels, etc., and anthropogenic greenery and green space like roof gardens, roadside planting, golf courses, lawns, urban parks.</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u> City councils, universities, NGOs, etc.</p>	<p>(IND.4) Native biodiversity in built-up areas</p> <p><u>BASIS OF SCORING (IND.3B)</u></p> <p>Most cities have data on bird species. Hence, this taxonomic group will be used. The number of bird species in built-up areas and anthropogenic greenery and green space is inevitably lower than that found in sites with natural ecosystems. It is anticipated that built-up areas would have about 5% of the species diversity found in natural ecosystems. Based on the scoring adopted in IND.5 for the number of native bird species, the following scoring is proposed for this indicator:</p> <p>0 point: 0 bird species 1 point: 1-3 bird species 2 points: 4-5 bird species 3 points: 6-7 bird species 4 points: 8 bird species or more</p>	<p>(IND.4) Native biodiversity in built-up areas</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.4)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	<p>1. Native Biodiversity in the City</p>	<p>(IND.5, IND.6, IND.7, IND.8, & IND.9) Number of native species</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>As this is an index focussing on biodiversity in cities, it is essential that the native flora and fauna diversity be incorporated as indicators.</p> <p>Three key taxonomic groups that are most surveyed worldwide, i.e., plants, birds and butterflies, have been selected as “core indicators”. To ensure fairness and objectivity in the index, cities can select 2 other taxonomic groups that would reflect their best biodiversity.</p>	<p>(IND.5, IND.6, IND.7, IND.8, & IND.9) Number of native species</p> <p><u>HOW TO CALCULATE INDICATORS</u></p> <p>The total number of native species is used for Indicators 4 to 9. 3 core groups, i.e., (IND.4) plants, (IND.5) birds and (IND.6) butterflies, have been selected as data for these 3 groups are most easily available and to enable some common comparison. Any 2 other taxonomic groups can be selected by the city (e.g., bryophytes, fungi, amphibians, reptiles, freshwater fish, molluscs, dragonflies, carabid beetles, spiders, hard corals, marine fish, seagrasses, sponges, etc.)</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.</p>	<p>(IND.5, IND.6, IND.7, IND.8, & IND.9) Number of native species</p> <p><u>BASIS OF SCORING</u></p> <p>A) Based on our knowledge of the number of species of each taxonomic groups that could be found in cities, we have proposed a ranked scoring for different species.</p> <p><u>Plants (IND. 5)</u> 0 point - 0 plant species 1 point - 1-99 plant species 2 points - 100-499 plant species 3 points - 500-999 plant species 4 points - 1000 and more plant species</p> <p><u>Birds (IND.6)</u> 0 point - 0 bird species 1 point - 1-50 bird species 2 points - 51-100 bird species 3 points - 101-150 bird species 4 points - 151 and more bird species</p> <p><u>Butterflies (IND.7)</u> 0 point - 0 butterfly species 1 point - 1- 50 butterfly species 2 points - 50–100 butterfly species 3 points - 101-150 butterfly species 4 points - 151 and more butterfly species</p> <p><u>Hard corals</u> 0 point - 0 hard coral species 1 point - 1-50 hard coral species 2 points - 51-100 hard coral species 3 points - 101-150 hard coral species 4 points - 150 and more hard coral species</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(INDS. 5, 6, IND.7, IND.8, & IND.9) Number of native species</p> <p><u>MAXIMUM SCORE</u></p> <p>4 pts each</p> <p>(IND.5, 6 & 7 – core indicators)</p> <p>4 pts each</p> <p>(INDS. 8 & 9 - indicators to be selected by city)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	1. Native Biodiversity in the City	<p>(IND.10) % of protected areas</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Protected areas indicate the government's commitment to biodiversity conservation. Hence, the % of protected areas is an important indicator. It is also recognised that the percentage of protected areas in a city must commensurate with the proportion of natural ecosystems within a city limit.</p>	<p>(IND.10) % of protected areas</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(Area of protected areas with natural ecosystems/ Total area of the city) X 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.</p>	<p>(IND.10) % of protected areas</p> <p><u>BASIS OF SCORING</u></p> <p>A) Taking into account that the generally accepted figure of legally protecting at least 10% of the country's area under natural ecosystems and recognising that cities are by nature urbanised, the following scoring scheme is proposed:</p> <p>0 point - 0 % 1 point - 1-2% 2 points - 3% 3 points - 4% 4 points - 5% and more</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.10) % of protected areas</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.10)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		<p>(IND.11) Proportion of native species (as opposed to invasive alien species)</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Invasive alien species outcompete native species and, thus, threaten the survival of native species. As cities are very open to influx of alien species, this indicator measures the status of this threat.</p>	<p>(IND.11) Proportion of native species (as opposed to invasive alien species)</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>To ensure that the comparison of invasive alien species with that of native species meaningful, it would have to be a comparison of specific taxonomic groups. (Number of total invasive alien species/Number of native species) X 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.</p>	<p>(IND.11) Proportion of native species (as opposed to invasive alien species)</p> <p><u>BASIS OF SCORING</u></p> <p>A) The scoring is based on the premise that the more invasive alien species that are in the city, the more destructive impact will be the native species.</p> <p>0 point - 31% and more 1 point - 21-30% 2 points - 11-20% 3 points - 1-10% 4 points - 0%</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.11)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		<p>(IND.12) Freshwater Services</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Freshwater is essential for our survival. Good forest cover in our water catchment areas provide water cleansing services. If the city does not have to spend any money on cleaning or filtering their water, then the ecosystem services of the freshwater catchment are good. However, if the ecosystem services of the water catchment is mildly affected, then the the cost of filtration could be low. The integrity of the ecosystem services is hence inversely proportional to the cost of replacing it.</p>	<p>(IND.12) Freshwater Services</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>Cost of cleaning the water in the city</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>The Water Authority of the city.</p>	<p>(IND.12) Freshwater Services</p> <p><u>BASIS OF SCORING</u></p> <p>A) The scoring is based on the premise that the less money spent on the cleaning of the water, the higher value of the water catchment services. This scoring applies only to water catchments that are protected under natural forests.</p> <p>0 point - More than 10% of the city's water supply budget 1 point - 8% - 10% of the city's water supply budget 2 points - 5% - 7% of the city's water supply budget 3 points - 2% - 4% of the city's water supply budget 4 points - 1% or less of the city's water supply budget</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.12)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		<p>(IND.13) Carbon storage</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Plants capture carbon dioxide during photosynthesis, hence, capturing the carbon that is emitted by anthropogenic activities.</p>	<p>(IND.13) Carbon storage</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>The total number of trees (including those that are naturally occurring and planted) in a city is an indirect measure of the carbon sequestration ecosystem services provided by flora biodiversity. Hence it can be used as an indicator for carbon sequestration.</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>City councils</p>	<p>(IND.13) Carbon storage</p> <p><u>BASIS OF SCORING</u></p> <p>A) The more trees there are in a city, the higher would be the carbon stock ecosystem services value provided. Synergising with UNEP’s Biollion Tree Campaign, the following scoring is proposed:</p> <p>0 point - 99,000 and less trees 1 point - 100,000 – 249,000 trees 2 points - 250,000 – 499,000 trees 3 points - 500,000 – 999,000 trees 4 points - 1 million trees</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.13) Carbon storage</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.13)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		<p>(IND.14, IND.15, & IND.16) Recreation and educational services</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Biodiversity provides invaluable recreational and educational services. It is essential for physical and psychological health.</p>	<p>(IND.14, IND.15, & IND.16) Recreation and educational services</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(IND.14) Number of visits/person/year</p> <p>(IND.15) Area of parks and protected areas/population of city</p> <p>(IND.16) No. of educational visits to parks or nature reserves per year</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>(IND.14) Surveys carried out in parks and protected areas</p> <p>(IND.15) City councils</p> <p>(IND.16) School records</p>	<p>(IND.14, IND.15, & IND.16) Recreation and educational services</p> <p><u>BASIS OF SCORING</u></p> <p>A) No. of visits to parks & nature reserves/person/year 0 point - 0 visit/person/year 1 point - 1-10 visits/person/year 2 points - 11-50 visits/person/year 3 points - 51-100 visits/person/year 4 points - more than 100 visits/person/year</p> <p>A) Area of accessible park area and nature reserves/person 0 point - 0 ha/person 1 point - 0.1 – 0.3 ha/person 2 points - 0.4 – 0.6 ha/person 3 points - 0.7 – 0.9 ha/person 4 points - 1 or more ha/person</p> <p>A) No. of educational visits to parks & nature reserves/child under 16 years/year 0 point - 0 educational visits/year 1 point - 1 educational visit/year 2 points - 2 educational visits/year 3 points - 3 educational visits/year 4 points - 4 and more educational visits/year</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.14, IND.15, & IND.16) Recreation and educational services</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.14)</p> <p>(IND.15)</p> <p>(IND.16)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	3. Governance and Management of Biodiversity	<p>(IND.17) Budget allocated to biodiversity projects</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>The first two sections measured the biodiversity in the city and the ecosystem services provided by the city. This indicator evaluates what programmes and projects are put in place to ensure the maintenance and enhancement of biodiversity in cities. Computation should include the city's/ municipal's manpower budget as well as its operational and project expenditure.</p>	<p>(IND.17) Budget allocated to biodiversity projects</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(Amount spent on institutions related to biodiversity and projects/total budget of city) X 100</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>Possible sources of data on natural areas include government agencies responsible for biodiversity conservation and finance departments.</p>	<p>(IND.17) Budget allocated to biodiversity projects</p> <p><u>BASIS OF SCORING</u></p> <p>A) (IND.17) A city's budget comprises several components, of which biodiversity is only one. Hence, a realistic estimate should be accorded, based on land-use proportion.</p> <p>0 point - 0% of the city's total budget 1 point - 1% of the city's total budget 2 points - 2% of the city's total budget 3 points - 3% of the city's total budget 4 points - more than 3% of the city's total budget</p>	<p>(IND.17) Budget allocated to biodiversity projects</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.17)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		<p>(IND.18) Number of biodiversity projects and programmes organised by the city annually</p> <p>Projects and programmes include those pertaining to plant conservation, bird conservation, butterfly conservation, species recovery, biodiversity surveys, biodiversity enhancement projects, etc.</p>	<p>(IND.18) Number of biodiversity projects and programmes organised by the city annually</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(IND.18) It would be more inclusive to capture how many projects/programmes are being organised by the city authorities, private sector, NGOs, etc. per year</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>Possible sources of data on natural areas include city authorities, private sector, NGOs, etc.</p>	<p>(IND.18) Number of biodiversity projects and programmes organised by the city annually</p> <p>A) (IND.18)</p> <p>0 point - 0 projects/programmes per year 1 point - 1-10 projects/programmes per year 2 points - 11-20 projects/programmes per year 3 points - 21-30 projects/programmes per year 4 points - more than 30 projects/programmes per year</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.18) Number of biodiversity projects and programmes organised by the city annually</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.18)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	3. Governance and Management of Biodiversity	<p>(IND.19) Rules, Regulations & Policy</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>To ensure that there is good governance, sound policies must be formulated. To facilitate the operationalisation of policies, rules and regulations must be put in place. This section evaluates the existence of biodiversity-relevant policies, rules and regulations, in particular whether they are aligned with with the national agenda and CBD's initiatives, like the National Strategy and Action Plans (NBSAP).</p> <p>Some of the CBD initiatives include plant conservation, forest biodiversity, global taxonomy initiative, invasive species programme, marine biodiversity conservation, protected areas, etc.</p>	<p>(IND.19) Rules, Regulations & Policy</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>Existence of LBSAP; existence of NBSAP-aligned LBSAP; no. of CBD initiatives</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>City councils and National CBD Focal Points</p>	<p>(IND.19) Rules, Regulations & Policy</p> <p><u>BASIS OF SCORING</u></p> <p>A) To ensure that biodiversity is conserved in a city, it is essential to draw up a Local Biodiversity Strategy and Action Plan (LBSAP). This needs to be aligned with the NBSAP so that biodiversity conservation efforts are synchronised and synergised.</p> <p>0 point - No LBSAP 1 point - LBSAP not aligned with NBSAP 2 points - LBSAP aligned with NBSAP but does not include any CBD initiatives 3 points - NBSAP-aligned LBSAP which includes at least 2 CBD initiatives 4 points - NBSAP-aligned LBASAP which includes more than 2 CBD initiatives</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.19) Rules, Regulations & Policy</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.19)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	3. Governance and Management of Biodiversity	<p>(IND.20 IND.21) Institutional Capacity</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Institutions are necessary for the effective implementation of projects and programmes, hence, the existence of biodiversity-focussed and biodiversity-related institutions will greatly enhance biodiversity conservation in a city.</p> <p>Some of the essential institutions include a biodiversity centre, herbarium, zoological museum, botanical garden, zoo, insectarium, etc. It is more important to measure whether the functions of these institutions exist rather than the physical existence of these institutions. Hence, if a herbarium is situated in a botanical garden, then two functions exist in the city under one institution.</p> <p>Many biodiversity issues are cross-sectoral and, hence, involve inter-agencies. The evaluation of inter-agency coordination is an important indicator of the success of biodiversity conservation, more so in a city where it is so compact.</p>	<p>(IND.20 IND.21) Institutional Capacity</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>IND.20 To evaluate institutional capacity, it was decided that it would be more appropriate to indicate whether the essential biodiversity-related functions are supported with the appropriate institutional set-ups.</p> <p>IND.21 Number of agencies involved in inter-agency coordination pertaining to biodiversity matters</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>City councils</p>	<p>(IND.20 IND.21) Institutional Capacity</p> <p><u>BASIS OF SCORING</u></p> <p>A) (IND.20) No. of institutions 0 point - No institutions covering the essential biodiversity-related functions 1 point - 1 institution or function 2 points - 2 institutions or functions 3 points - 3 institutions or functions 4 points - 4 institutions or functions The institutions or functions could include any of the following: biodiversity centre, botanical garden, herbarium, zoological museum, insectarium, zoo, etc.</p> <p>A) (IND.21) No. of inter-agency co-ordination initiatives 0 point - No inter-agency coordination 1 point - At least 2 agencies coordinate on biodiversity matters 2 points - At least 3 agencies coordinate on biodiversity matters 3 points - At least 4 agencies coordinate on biodiversity matters 4 points - At least 5 agencies coordinate on biodiversity matters Agencies could include department responsible for biodiversity, planning department, the water authority, transport authority, development agencies, etc.</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.20 IND.21) Institutional Capacity</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.20)</p> <p>4</p> <p>(IND.21)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
	3. Governance and Management of Biodiversity	<p>(IND.22 & IND.23) Participation & Partnership</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>There are two variables for this indicator. The first (IND.22) evaluates the existence of public consultation whether formal or informal while the second (IND.23) measures the extent of informal and/or formal partnerships. As it is impossible for any one single agency to carry out all the activities, responsibilities, projects and programmes that have biodiversity implications, hence, it is inevitable that engagement of all levels of the population must be facilitated. These include the city officials, the population, private sector, NGOs, etc.</p>	<p>(IND.22 & IND.23) Participation & Partnership</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(IND.22) Presence or absence of formal or informal consultation process pertaining to biodiversity-related matters.</p> <p>(IND.23) Number of agencies/private companies/NGOs that the city is partnering in biodiversity activities or projects or programmes</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>City councils</p>	<p>(IND.22 & IND.23) Participation & Partnership</p> <p><u>BASIS OF SCORING</u></p> <p>A) (IND.22) Existence of a consultation process 0 point - No formal process 1 point - Formal or informal process being considered 2 points - Formal or informal process being planned 3 points - Formal or informal process in the process of being implemented 4 points - Formal or informal process exists</p> <p>A) (IND.23) Existence of partnerships 0 point - No formal/informal partnerships 1 point - City in partnership with at least 1 other agency/private company/ NGO 2 points - City in partnership with at least 2 other agencies/private companies/ NGOs 3 points - City in partnership with at least 3 other agencies/private companies/ NGOs 4 points - City in partnership with at least 4 other agencies/private companies/ NGOs</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.22 & IND.23) Participation & Partnership</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.22)</p> <p>4</p> <p>(IND.23)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		<p>(IND.24) Education & Awareness-raising</p> <p><u>RATIONALE FOR SELECTION OF INDICATOR</u></p> <p>Education can take 2 forms, formal through the school curriculum or informal. This indicator will evaluate 2 aspects, i.e., formal education and public awareness. IND.16 gives an indication of school children’s use of the recreational services provided by ecosystems. Two more relevant measurements of education and awareness-raising proposed:</p> <p>1) Is biodiversity included in the school curriculum? (IND.24)</p> <p>2) How many outreach/public awareness events are held per year? (IND.25)</p> <p>Most cities have no jurisdiction over school curricula. The incorporation of this indicator creates the opportunity for city officials to liaise with education officers so that biodiversity courses are taught at pre-school, primary, secondary and tertiary levels.</p>	<p>(IND.24) Education & Awareness-raising</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(IND.24) Indication whether biodiversity is included in the school curriculum, (e.g., incorporated into biology, geography, social sciences, etc).</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>Education department, city councils, NGOs</p>	<p>(IND.24) Education & Awareness-raising</p> <p><u>BASIS OF SCORING</u></p> <p>A) (IND.24) Incorporation of biodiversity into the school curriculum</p> <p>0 point - Biodiversity or elements of it are not covered in the school curriculum</p> <p>1 point - Biodiversity or elements of it are being considered for inclusion in the school curriculum</p> <p>2 points - Biodiversity or elements of it are being planned for inclusion in the school curriculum</p> <p>3 points - Biodiversity or elements of it are in the process of being implemented in the school curriculum</p> <p>4 points - Biodiversity or elements of it are included in the school curriculum</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.24) Education & Awareness-raising</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.24)</p>

CBI	COMPONENTS	INDICATORS	VARIABLES	SCORE	MAXIMUM
		<p>(IND.25) Education & Awareness-raising</p> <p>The number of biodiversity outreach programmes /events over a year would give an indication of the diversity and range of outreach programmes and the cities' efforts at promoting biodiversity conservation.</p>	<p>(IND.25) Education & Awareness-raising</p> <p><u>HOW TO CALCULATE INDICATOR</u></p> <p>(IND.25) Number of outreach/public awareness events held in the city per year</p> <p>Examples of outreach/public awareness events include talks, guided walks, seminars, exhibitions, road shows, celebration of CBD International Biodiversity Day, World Environment Day, Earth Day, etc. organised by city officials, schools, NGOs, etc.</p> <p><u>WHERE TO GET DATA FOR CALCULATIONS</u></p> <p>City councils, education department, NGOs, etc.</p>	<p>(IND.25) Education & Awareness-raising</p> <p><u>BASIS OF SCORING</u></p> <p>A) No. of outreach programmes/public awareness events</p> <p>0 point - 0 outreach programmes/ events per year 1 point - 1-20 outreach programmes/ events per year 2 points - 21-50 outreach programmes/ events per year 3 points - 51-100 outreach programmes/ events per year 4 points - more than 100 outreach programmes/ events per year</p> <p>B) Baseline of 100</p> <p>C) Traffic line system of increase, neutral and decrease</p>	<p>(IND.25) Education & Awareness-raising</p> <p><u>MAXIMUM SCORE</u></p> <p>4</p> <p>(IND.25)</p> <p>TOTAL = SCORE FOR THE S'PORE INDEX Maximum = 100</p>

