



## Singapore City Biodiversity Index

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**Short title:** Singapore city biodiversity index

**Key Message:** The creation of a self assessment tool, which aims to assist cities in benchmarking their biodiversity conservation efforts.

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### Background

The United Nations Department of Economics and Social Affairs highlighted that the world population in 2008 would reach a landmark: the urban population would equal that of the rural. It also projected that the urban population would double by 2050, from 3.3 billion in 2007 to 6.4 billion in 2050 (about 70% of the world population). Thus, the major impact on biodiversity will be from urban settlements. Unfortunately, there has been a lack of indices available for measuring biodiversity in cities<sup>1</sup> (ACB 2010).

In light of the above, Minister Mah Bow Tan, Minister for National Development of Singapore and host of the World Cities Summit of June 2008, proposed establishing an index to measure biodiversity in cities.<sup>2</sup> Following his recommendation, two expert workshops took place in February 2009 and July 2010 to develop the index. In recognition of Singapore's innovative contribution and leadership, the Secretariat of the Convention on Biological Diversity formally named the index "The Singapore Index on Cities' Biodiversity" also known as the City Biodiversity Index or CBI (Chan and Djoghlaflaf 2009, Chan et al. 2010 and CBD 2010).

### Development and Implementation of the City Biodiversity Index (CBI)

*The aim of the CBI is to:*

- (a) Serve as a self-assessment tool;
- (b) Assist national governments and local authorities in benchmarking biodiversity conservation efforts in the urban context at the city level;
- (c) Help evaluate progress in reducing the rate of biodiversity loss in urban ecosystems;
- (d) Help measure the ecological footprint of cities,

<sup>1</sup> The 2005 Environmental Sustainable Index (ESI) and the 2008 Environmental Performance Index (EPI) are the most widely accepted indices to measure biodiversity at a country wide level.

<sup>2</sup> At the ninth meeting of the Conference of the Parties in Bonn, on 27 May 2008

- (e) Help develop guidelines to prepare a Plan of Action for cities' biodiversity to achieve the three objectives of the convention;
- (f) Make cities aware of important gaps in information about their biodiversity (CBD 2009).

*Calculating the CBI:*

First, it includes a profile of the city. This includes important general information and details related to biodiversity data to give a more comprehensive background and perspective on the city. The profile should include location, size, population and biodiversity features/characteristics (such as ecosystems and species found in the city, quantitative data on population of key biodiversity indicators and relevant qualitative biodiversity data).

Second, it includes a table with explanation and guidelines on 23 indicators. It includes the rationale for selecting the indicator, how to calculate it (where to get the data) and the basis of the scoring. Scoring is quantitative and to ensure that scoring is unbiased and fair, statistical analysis is applied to the data from a broad spectrum of cities with different characteristics over a wide geographical range. A minimum of data sets from 20 cities is required to ensure a sample size suitable for statistical analysis. A maximum score of four is allocated for each indicator, and currently with 23 indicators, the maximum score of the CBI is 92.

The index comprises three components: native biodiversity; ecosystem services provided by biodiversity; and governance and management of native biodiversity within the city. The first of these, native biodiversity, focuses on how biodiversity is conserved, what threatens it etc. The second, the ecosystem services provided by biodiversity, includes water regulation, carbon storage and recreational and educational services. The third component, governance and management encompasses budget allocation, institutional set-ups, the number of biodiversity-related projects, public awareness programs, administrative procedures, etc. Below is an example of the index prepared on the Indicators of the CBI<sup>3</sup> (Chan et al. 2010).

**NATIVE BIODIVERSITY IN THE CITY**

<b>CBI</b>	<b>INDICATORS</b>	<b>VARIABLES</b>	<b>SCORE</b>
	<b>Indicator 1: Proportion of natural areas in city</b>		

<sup>3</sup> A complete listing of Index on the Indicators of the CBI is available from the User's Manual for the CBI: <http://www.cbd.int/authorities/doc/User%27s%20Manual-for-the-City-Biodiversity-Index27Sept2010.pdf>

<b>Rationale for selection of indicator</b>	<b>How to calculate indicator</b> (Total area of natural areas) ÷ (Total area of city)	<b>Basis of scoring</b>
<p>Natural ecosystems contain more species than disturbed or human-made landscapes, hence, the higher the proportion of natural areas to 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 Second Expert Workshop on the Development of the CBI 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 or enhance native biodiversity.</p> <p>Natural ecosystems are defined as all areas that are natural and not highly disturbed or completely human-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><b>Where to get data for calculations</b></p> <p>Possible sources of data on natural areas include government agencies in charge of biodiversity, city municipalities, urban planning agencies, biodiversity centers, nature groups, universities, publications, etc. Google maps and satellite images also provide information for calculating this indicator.</p>	<p>The scoring is based on the area of the city covered by natural areas. i.e.</p> <p>0 point : &lt; 0.01            1 point: 0.01 – 0.06            2 points: 0.07 – 0.13            3 points : 0.14 – 0.20            4 points : &gt; 0.20</p> <p>Based on the assumption that, by definition, a city comprises mainly human-made landscapes, the maximum score will be reached if more than 0.20 of the total city area is covered by natural areas.</p>

**Wider Implications:**

The CBI is dynamically evolving so that it can be more scientifically robust and more useful and applicable to more cities. Its strength is that it is the only index that focuses on biodiversity. Its coverage is diverse and comprehensive -- incorporating indicators on biodiversity, ecosystem services, and good governance and management. Cities can also do their own assessments,

hence building capacity in city-specific biodiversity conservation and databases. Further, scores are quantitative, making objectivity and monitoring of change over time possible. Finally, a diverse range of experts and stakeholders contribute to its design.

Its weaknesses are that it is difficult to select indicators that all cities have data on. The scoring of some of the indicators is difficult due to the different ecological zones that cities are located within. Also, indicators for ecosystem services are difficult to design as this a new field of study.

More than 30 cities, from London to Curitiba to Nagoya, have either completed or are in various stages of trialing the Singapore Index. Their feedback has been invaluable in fine-tuning the index. European cities taking part in the IUCN 2010 Countdown Project and other cities from Paris to King County (USA) have indicated interest in the Singapore Index (Chan et al. 2010).

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