CITY BIODIVERSITY INDEX

PART I: PROFILE OF THE CITY

As the CBI 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, and in particular details of biodiversity data, so as to give a more comprehensive background on the city and to place the city's evaluation for the Index in the proper perspective. The data and information including images of native flora, fauna and ecosystems in cities should be included in this section which will be used for the computation of the indicators. The information could include:

(i) Location (geographical coordinates (latitudes and longitudes); climate (temperate or tropical); temperature (range and average); rainfall/ precipitation (range and average); other relevant information)

(ii) Size (area and include google map or satellite image, and define city boundaries; number of administrative units in cities or local authorities)

(iii) Population (including total population and population density of the city; the population of the region could also be included if appropriate, and for the purpose of placing it in the regional context)

(iv) Economic parameters (Gross Domestic Product (GDP), Gross National Product (GNP), per capita income, key economic activities, drivers and pressures on biodiversity)

(v) Physical features of the city (geography, altitude of the city**,** area of impermeable surface, information on brownfield sites, etc.)

(vi) Biodiversity features and characteristics such as:

- Ecosystems found in the city
  - Mandatory: Cities to list ecosystems present in the first year in which they participate in the Index as a baseline. The Habitat Authority File (http://intranet.iucn.org/webfiles/doc/SSC/RedList/AuthorityF/habitats.rtf) will be used as the reference list for cities to select the ecosystems that occur within their city boundaries.
  - Optional: Maps which show the location of ecosystems, if available

- Species found in the city (data will be used for the calculation of Indicators 3,4,5,6,7,8 and 10)
  - Mandatory species: Number of species of vascular plants, birds, butterflies and 2 other taxonomic groups of the city's choice. The data from the first year of participating in the Index will form the baseline for future monitoring.
  - Optional species: Cities can also list the total number of species for other taxonomic groups if they have the data. This would give a more complete picture of the species diversity in the cities.

- Quantitative data on populations of key biodiversity indicators. These include quantitative data on major taxonomic groups which are used to determine the conservation status of the species.

- Relevant qualitative biodiversity data. These include write-ups on the natural history of the cities, ecological rehabilitation and restoration initiatives, special biodiversity features, re-introduction of native species, etc.

(vii) Administration of biodiversity (Relevant information include agencies and departments responsible for biodiversity; how natural areas are protected (through national parks, nature reserves, forest reserves, secured areas, parks, etc.) with information like what are the categories, where are the protected areas, how large are they, what are the aims of conserving these areas and functions of these areas etc.)

(viii) Links to relevant websites including the city's website, environmental or biodiversity-specific websites, websites of agencies responsible for biodiversity

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PART II: INDICATORS OF THE CITY BIODIVERSITY INDEX

CBI	INDICATORS	VARIABLES	SCORE
Native Biodiversity	**INDICATOR 1: PROPORTION OF NATURAL AREAS IN CITY**		
	RATIONALE FOR SELECTION OF INDICATOR 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. 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: 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**.** 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. 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.	HOW TO CALCULATE INDICATOR (Total area of natural areas, restored and naturalised areas) ÷ (Total area of city) × 100% WHERE TO GET DATA FOR CALCULATIONS 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.	BASIS OF SCORING 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 0 point : < 1% 1 point: 1% – 6% 2 points: 7% – 13% 3 points : 14% – 20% 4 points : > 20%

CBI	INDICATORS	VARIABLES	SCORE
Native Biodiversity	**INDICATOR 2: CONNECTIVITY MEASURES OR ECOLOGICAL NETWORKS TO COUNTER FRAGMENTATION**		
	RATIONALE FOR SELECTION OF INDICATOR 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. Some of the ways to measure fragmentation include mean patch size or distance between patches, etc. It is recognised that the fragmentation of natural areas affects different species differently. For example, a road may not be a barrier for birds but it can seriously fragment a population of arboreal primates. A strip of urbanisation may not affect the dispersal of wind-pollinated plants but a plant that depends on small mammals for dispersal will be adversely affected. While these differences have been noted, considered and deliberated upon, a pragmatic approach towards the calculation of this indicator is adopted, as reflected in the formula given in the next column. Furthermore, to encourage positive action to increase connectivity or reduce barriers to connectivity, it would be more meaningful to measure connectivity rather than fragmented plots. This indicator score can be improved when more of the fragments are connected.	HOW TO CALCULATE INDICATOR $IND2 = \frac{1}{A_{\text{total}}}\left(A_1^2 + A_2^2 + A_3^2 + ... + A_n^2\right)$ Where: • n is the total number of connected natural areas • A_{total} is the total area of all natural areas • A_1 to A_n are areas that are distinct from each other (i.e. not connected) A_1 to A_n may consist of areas that are the sum of two or more smaller patches which are connected. In general, patches are considered as connected if they are less than 100m apart. However, exceptions to the above rule includes anthropogenic barriers such as: • Roads (15m or more in width; or are smaller but have a high traffic volume of more than 5000 cars per day) • Rivers that are strongly modified and other artificial barriers such as heavily concretised canals and heavily built up areas • Any other artificial structures that the city would consider as a barrier Details and illustrations of how this indicator may be calculated are included in ANNEX B. WHERE TO GET DATA FOR CALCULATIONS Satellite images can be used in the computation of this indicator.	BASIS OF SCORING To ensure a more realistic and unbiased scoring range, cities are requested to send in their actual data so that statistical analysis can be applied to the data using the mean as the reference for '2-point' score. *[scoring range to be determined]* Cities are requested to submit a list of all the natural areas within their city accompanied by a map (ideally in GIS format) indicating their respective locations.

CBI	INDICATORS	VARIABLES	SCORE
Native Biodiversity	**INDICATOR 3: NATIVE BIODIVERSITY IN BUILT-UP AREAS (BIRD SPECIES)**		
	RATIONALE FOR SELECTION OF INDICATOR It is acknowledged that cities comprise largely of built-up areas and brownfield sites with anthropogenic green spaces and minimal natural features. However, it should be recognised that built-up areas and brownfield sites do harbour biodiversity, e.g., birds like swallows and swiftlets nest under roofs of buildings, plants grow on buildings, butterflies flutter around sun-lit shrubs and grassy patches, dragonflies dart above water features, etc. Some built-up areas and brownfield sites have more biodiversity than others. By enhancing certain features in such areas, the biodiversity could improve. Hence, native biodiversity in built-up areas and brownfield sites should be an indicator. Most cities have data on bird species. Hence, this taxonomic group will be used as an indicator. The number of native bird species in built-up areas and anthropogenic green spaces is inevitably lower than that found in sites with natural ecosystems; however implementing appropriate measures such as planting fruit trees, shrub with berries, etc. may attract birds into built-up areas of the city.	HOW TO CALCULATE INDICATOR Number of native bird species in built-up areas where built-up areas include impermeable surfaces like buildings, roads, drainage channels, etc., and anthropogenic green spaces like roof gardens, roadside planting, golf courses, private gardens, cemeteries, lawns, urban parks, etc. Areas that are counted as natural areas in Indicator 1 should not be included in this indicator. WHERE TO GET DATA FOR CALCULATIONS City councils, universities, NGOs, etc.	BASIS OF SCORING To obtain a more realistic and unbiased scoring range, cities are requested to send in their actual data for normalisation, taking the mean of the bird species found in built-up areas of cities which have tested the index to be used as reference for the '2-point' score. *[scoring range to be determined]*

CBI	INDICATORS	VARIABLES	SCORE
Native Biodiversity	**INDICATORS 4 - 8: CHANGE IN NUMBER OF NATIVE SPECIES**		
	RATIONALE FOR SELECTION OF INDICATOR As this is an index focussing on biodiversity in cities, it is essential that the native flora and fauna diversity be incorporated as indicators. 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. To ensure that these 5 indicators on species are unbiased against any city based on its geographical location, ecological history, size, land-use, etc., it was decided that • All cities and local authorities are requested to list the number of native species of a) vascular plants, b) birds, and c) butterflies, d) at least 2 other taxonomic groups, and e) any other taxonomic groups that they have data on, in Part I: Profile of the City • The indicators will measure the change in number of species over time rather than the absolute number of the species • The year 2010 will be taken as the baseline year for the species count. The net change in species numbers (increase in number of species due to re-introduction or restoration efforts minus the number of species that went extinct) will be incorporated in the 2012 calculations of the CBI. Conducting more surveys on the target groups which will result in the finding of and reintroducing 'extinct' native species would help to increase the number of extant native species.	HOW TO CALCULATE INDICATORS The total number of native species is used for Indicators 4 to 8. The 3 core groups are: - Indicator 4 : vascular plants - Indicator 5 : birds - Indicator 6 : butterflies These groups have been selected as data are most easily available and to enable some common comparison. Cities can select any 2 other taxonomic groups for Indicators 7 and 8 (e.g., bryophytes, fungi, amphibians, reptiles, freshwater fish, molluscs, dragonflies, carabid beetles, spiders, hard corals, marine fish, seagrasses, sponges, etc.) The above data for 2010 would be recorded in Part I: Profile of the City as the baseline. Net change in species from the previous survey to the most recent survey is calculated as: Total increase in number of species (as a result of re-introduction, rediscovery, new species found, etc.) minus number of species that have gone extinct WHERE TO GET DATA FOR CALCULATIONS Possible sources of data include government agencies in charge of biodiversity, city municipalities, urban planning agencies, biodiversity centres, nature groups, universities, publications, etc.	BASIS OF SCORING Data listed in Part I: Profile of the City will be used to measure change in species diversity every 3 years. Cities first application will be considered as the baseline information for all subsequent monitoring, In their second application of the index, cities will calculate the net change in species for the respective taxonomic groups. The scoring range below is based on the acceptance that it is not easy to recover or re-introduce species successfully over a short period of time. However, species recovery, re-introduction and restoration efforts must be given due recognition. In recognition of the mission of the Aichi Biodiversity Targets the scoring below indicates that 1 point will be accorded if a city does not lose any species in the target group. 1 point: No loss of species 2 points: 1 species increase 3 points: 2 species increase 4 points: 3 species or more increase

CBI	INDICATORS	VARIABLES	SCORE
Native Biodiversity	**INDICATOR 9: PROPORTION OF PROTECTED NATURAL AREAS**		
	RATIONALE FOR SELECTION OF INDICATOR Protected or secured natural areas indicate the city's commitment to biodiversity conservation. Hence, the proportion of protected or secured natural areas is an important indicator. The definition of protected natural areas should be broadened to include legally protected, formally secured areas, and other administratively protected areas, as different cities have different terminologies and means for protecting their natural areas.	HOW TO CALCULATE INDICATOR (Area of protected or secured natural areas) ÷ (Total area of the city) × 100% WHERE TO GET DATA FOR CALCULATIONS Possible sources of data include government agencies in charge of biodiversity, city municipalities, urban planning agencies, biodiversity centres, nature groups, universities, publications, etc.	BASIS OF SCORING To ensure a more realistic and unbiased scoring range, cities are requested to send in their actual data so that statistical analysis can be applied to the data using the mean as the reference for '2-point' score. *[scoring range to be determined]*
CBI	**INDICATORS**	**VARIABLES**	**SCORE**
Native Biodiversity	**INDICATOR 10: PROPORTION OF INVASIVE ALIEN SPECIES (AS OPPOSED TO NATIVE SPECIES)**		
	RATIONALE FOR SELECTION OF INDICATOR Invasive alien species out-compete native species and, thus, threaten the survival of native species and the integrity of ecosystems. As cities are very open to influx of alien species, this indicator measures the status of this threat. The definition of alien invasive species adopted follows that accepted by the SCBD, i.e.: An alien species whose introduction and/ or spread threaten biological diversity (For the purposes of the present guiding principles, the term "invasive alien species" shall be deemed the same as "alien invasive species" in decision V/8 of the Conference of the Parties to the Convention on Biological Diversity). It is inevitable in cities, which are open to external influences, to have alien species. Alien species which are not invasive or detrimental to native species are not considered in this indicator. In fact in many cities, exotic or alien species enhance the diversity. Cities can decide on the taxonomic groups which are most problematic for their city or where most data are available.	HOW TO CALCULATE INDICATOR To ensure that the comparison of invasive alien species with that of native species is meaningful, it would have to be a comparison of identical taxonomic groups. (Number of invasive alien species) ÷ (Number of native species) × 100% WHERE TO GET DATA FOR CALCULATIONS Possible sources of data include government agencies in charge of biodiversity, city municipalities, urban planning agencies, biodiversity centres, nature groups, universities, publications, etc.	BASIS OF SCORING The scoring range is based on the premise that the more invasive alien species that are in the city; the more destructive impact will be to the native species. 0 point : > 30% 1 point : 21%-30% 2 points : 11%-20% 3 points : 1%-10% 4 points : < 1%

CBI	INDICATORS	VARIABLES	SCORE
Ecosystem Services	**INDICATOR 11: REGULATION OF QUANTITY OF WATER**		
	RATIONALE FOR SELECTION OF INDICATOR Climate change is in many places predicted to result in increased variability in precipitation which in urban landscapes may translate into high peaks in water-flow and damage to construction, business and transport. Vegetation has a significant effect in reducing the rate of flow of water through the urban landscape, e.g. through presence of forest, parks, lawns, roadside greenery, streams, rivers, waterbodies, etc.	HOW TO CALCULATE INDICATOR Proportion of all permeable areas (including areas identified in Indicator 1 plus other parks, roadside greenery, green roofs, private gardens, streams, rivers, etc.) to total terrestrial area of city (excluding marine areas and artificial permeable surfaces, if applicable) (Total permeable area) ÷ (Total terrestrial area of the city) × 100% WHERE TO GET DATA FOR CALCULATIONS Possible sources of data include government environmental agencies, city municipalities, urban planning, water and land agencies, satellite images, etc.	BASIS OF SCORING To ensure a more realistic and unbiased scoring range, cities are requested to send in their actual data so that statistical analysis can be applied to the data using the mean as the reference for '2-point' score. ***[scoring range to be determined]***
Ecosystem Services	**INDICATORS**	**VARIABLES**	**SCORE**
	INDICATOR 12: CLIMATE REGULATION: CARBON STORAGE AND COOLING EFFECT OF VEGETATION		
	RATIONALE FOR SELECTION OF INDICATOR Two important aspects of climate regulation services are carbon storage and cooling effects provided by vegetation, in particular tree canopy cover. Climate regulation services are affected by many factors, including the size of trees, the different characteristics of tree species, and other variables, etc. With regards to carbon storage, plants capture carbon dioxide during photosynthesis, hence, capturing carbon that is emitted by anthropogenic activities. Canopy cover of trees, which includes those that are naturally occurring and planted in a city, is accepted here as an indirect measure of the carbon sequestration and storage services. Plants, through shading, evapotranspiration, and decreasing the proportion of reflective surfaces, reduce the ambient heat in the air and the surface temperature in the urban landscape. As a general rule, a 10% increase in vegetation cover reduces the temperature by about 3 degrees, hence, cooling the ambient temperatures. The extent of tree canopy cover can also act as a proxy measure for filtering of air and numerous other biodiversity benefits. Planting of native trees to increase the canopy cover is encouraged. This indicator is optional for cities in the desert or arid zones or other ecological zones where extensive canopy cover in the city may not be feasible.	HOW TO CALCULATE INDICATOR Carbon storage and cooling effect of vegetation (Tree canopy cover) ÷ (Total terrestrial area of the city) × 100% WHERE TO GET DATA FOR CALCULATIONS City councils and satellite images	BASIS OF SCORING To ensure a more realistic and unbiased scoring range, cities are requested to send in their actual data so that statistical analysis can be applied to the data using the mean as the reference for '2-point' score. *[scoring range to be determined]*

CBI	INDICATORS	VARIABLES	SCORE
Ecosystem Services	**INDICATORS 13 –14: RECREATIONAL AND EDUCATIONAL SERVICES**		
	RATIONALE FOR SELECTION OF INDICATOR Biodiversity provides invaluable recreational, spiritual, cultural and educational services. It is essential for physical and psychological health.	HOW TO CALCULATE INDICATOR Indicator 13: (Area of parks with natural areas and protected or secured natural areas)* / 1000 persons *Some cities refer to this as accessible green spaces Indicator 14: Number of formal educational visits per child below 16 years to parks with natural areas or protected or secured natural areas per year WHERE TO GET DATA FOR CALCULATIONS Indicator 13: City councils Indicator 14: School records	BASIS OF SCORING Indicator 13: 0 point : < 0.1 ha/ 1000 persons 1 point : 0.1 – 0.3 ha/ 1000 persons 2 points : 0.4 – 0.6 ha/ 1000 persons 3 points : 0.7 – 0.9 ha/ 1000 persons 4 points : > 0.9 ha/ 1000 persons Indicator 14: 0 point : 0 formal educational visit/ year 1 point : 1 formal educational visit/ year 2 points: 2 formal educational visits/year 3 points: 3 formal educational visits/year 4 points: > 3 formal educational visits/ year
CBI	**INDICATORS**	**VARIABLES**	**SCORE**
Governance and Management	**INDICATOR 15: BUDGET ALLOCATED TO BIODIVERSITY**		
	RATIONALE FOR SELECTION OF INDICATOR This indicator evaluates what programmes and projects are put in place to ensure the maintenance and enhancement of biodiversity in cities. The relative amount spent on biodiversity related administration by a city can be seen as a representation of the city's commitment towards environmental stewardship. It is recognised that there are numerous other factors affecting the amount allocated towards biodiversity, but in general the greater the proportion of the total city's budget allocated, the greater the level of commitment by the city. In cities where the functions of maintaining greenery and biodiversity conservation are also assigned to the private sector or government-linked corporations, the budget for these government-linked companies may also be included in the calculations.	HOW TO CALCULATE INDICATOR (Amount spent on biodiversity related administration) ÷ (Total budget of city) × 100% Computation should include the city's or municipality's manpower budget as well as its operational and biodiversity related project expenditure. The calculation may also include the figures of government linked corporations that have a component spent on biodiversity, where such figures are available. WHERE TO GET DATA FOR CALCULATIONS Possible sources of data include government agencies responsible for biodiversity conservation and finance departments. For cities where the budget of government-linked companies are included, annual reports of those companies can provide relevant data.	BASIS OF SCORING To ensure a more realistic and unbiased scoring range, cities are requested to send in their actual data so that statistical analysis can be applied to the data using the mean as the reference for '2-point' score. ***[scoring range to be determined]***

CBI	INDICATORS	VARIABLES	SCORE
Governance and Management	**INDICATOR 16: NUMBER OF BIODIVERSITY PROJECTS IMPLEMENTED BY THE CITY ANNUALLY**		
	RATIONALE FOR SELECTION OF INDICATOR This indicator measures the number of biodiversity related projects and programmes that the city authorities are involved in, either as the main player or in partnerships with other entities where the city is a key collaborator. Programmes and projects are not limited to the conservation of protected areas but could include those pertaining to species conservation (e.g. plants, birds and butterflies), species recovery, biodiversity surveys, biodiversity enhancement projects, restoration projects, procurement of green services, etc. For a project or a programme to be included in this indicator, biodiversity must be an important consideration in the stated objectives. A programme designed to conserve species that are non-native to the city, but threatened elsewhere (e.g. zoo species conservation projects) can be considered as well.	HOW TO CALCULATE INDICATOR Number of programmes and projects that are being implemented by the city authorities, possibly in partnership with private sector, NGOs, etc. per year In addition to submitting the total number of projects and programmes carried out, cities are encouraged to provide a listing of the projects and to categorise the list into projects that are: 1. Biodiversity related 2. Ecosystems services related WHERE TO GET DATA FOR CALCULATIONS Possible sources of data include city authorities, private corporations and NGOs that conduct such activities etc.	BASIS OF SCORING To ensure a more realistic and unbiased scoring range, cities are requested to send in their actual data so that statistical analysis can be applied to the data using the mean as the reference for '2-point' score. *[scoring range to be determined]*

CBI	INDICATORS	VARIABLES	SCORE
Governance and Management	**INDICATOR 17: POLICY, RULES AND REGULATIONS – EXISTENCE OF LOCAL BIODIVERSITY STRATEGY AND ACTION PLAN**		
	RATIONALE FOR SELECTION OF INDICATOR To ensure that there is good governance, sound policies must be formulated. To facilitate the implementation of biodiversity management 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 the national agenda and CBD's initiatives, like the National Biodiversity Strategy and Action Plan (NBSAP) and/or the correspondent sub-national strategies. Some of the CBD initiatives include plant conservation, forest biodiversity, global taxonomy initiative, invasive species programme, marine biodiversity conservation, protected areas, etc. The initiatives might not be termed LBSAP. As long as the city can justify that a similar plan exists.	HOW TO CALCULATE INDICATOR Status of Local Biodiversity Strategy and Action Plan (LBSAP, or equivalent plan); number of associated CBD initiatives WHERE TO GET DATA FOR CALCULATIONS Possible sources of data include city councils, CBD national focal points, ICLEI-Local Governments for Sustainability LAB Initiative, United Nations University and IUCN, CBD website and publications	BASIS OF SCORING To ensure that biodiversity is conserved in a city, it is advisable to draw up a LBSAP (or any equivalent plan). This needs to be aligned with the NBSAP so that biodiversity conservation efforts are synchronised and synergised. 0 point : No LBSAP* 1 point : LBSAP not aligned with NBSAP 2 points : LBSAP incorporates elements of NBSAP, but does not include any CBD initiatives** 3 points : LBSAP incorporates elements of NBSAP, and includes 1 to 3 CBD initiatives 4 points : LBSAP incorporates elements of NBSAP, and includes 4 or more CBD initiatives * LBSAP or equivalent ** The thematic programmes of work and cross-cutting issues of the convention are listed in http://www.cbd.int/programmes/. Please refer to attached document for a brief explanation on CBD's relevant thematic areas such as ecosystem approach, etc. to cities and local authorities. The CBD Strategic Plan (2011-2020) and the Aichi Biodiversity Targets (http://www.cbd.int/sp/targets/) can also be used as a reference framework.

CBI	INDICATORS	VARIABLES	SCORE
Governance and Management	**INDICATORS 18 – 19: INSTITUTIONAL CAPACITY**		
	RATIONALE FOR SELECTION OF INDICATOR 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. Some of the essential institutions include a well-managed biodiversity centre, herbarium, zoological garden or museum, botanical garden, 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. Many biodiversity issues are cross-sectoral and, hence, involve inter-agency efforts. 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. This indicator promotes mainstreaming of biodiversity.	HOW TO CALCULATE INDICATOR **Indicator 18:** Number of essential biodiversity-related functions* that the city uses ** The functions could include the following: biodiversity centre, botanical garden, herbarium, zoological garden or museum, insectarium, etc.* **Indicator 19:** Number of city or local government agencies involved in inter-agency cooperation pertaining to biodiversity matters WHERE TO GET DATA FOR CALCULATIONS City councils	BASIS OF SCORING **Indicator 18:** 1 point : 1 function 2 points : 2 functions 3 points : 3 functions 4 points : > 3 functions **Indicator 19:** 0 point : 1 or 2 agencies* cooperate on biodiversity matters 1 point : 3 agencies cooperate on biodiversity matters 2 points : 4 agencies cooperate on biodiversity matters 3 points : 5 agencies cooperate on biodiversity matters 4 points : More than 5 agencies cooperate on biodiversity matters ** Agencies could include department or authorities responsible for biodiversity, planning, water, transport, development, finance, infrastructure, etc.*

CBI	INDICATORS	VARIABLES	SCORE
Governance and Management	**INDICATORS 20 – 21: PARTICIPATION AND PARTNERSHIP**		
	RATIONALE FOR SELECTION OF INDICATOR Indicator 20 evaluates the existence and the state of formal or informal public consultation process pertaining to biodiversity-related matters. Indicator 21 measures the extent of informal and/or formal partnerships, or collaboration with other entities. As it is impossible for any 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 in various departments, other spheres of government, the public, private sector, NGOs, etc. Such partnerships should have substantial and long-term involvement on the part of the city officials, such as programmes like Payments for Ecosystem Services (PES).	HOW TO CALCULATE INDICATOR **Indicator 20:** Existence and state of formal or informal public consultation process pertaining to biodiversity-related matters **Indicator 21:** Number of agencies/ private companies/ NGOs/ academic institutions/ international organisations with which the city is partnering in biodiversity activities, projects and programmes Inter-agency cooperations listed in IND19 should not be listed here again. WHERE TO GET DATA FOR CALCULATIONS City councils	BASIS OF SCORING **Indicator 20:** 0 point : No routine formal or informal process 1 point : Formal or informal process being considered as part of the routine process 2 points : Formal or informal process being planned as part of the routine process 3 points : Formal or informal process in the process of being implemented as part of the routine process 4 points : Formal or informal process exists as part of the routine process **Indicator 21:** 0 point : No formal/ informal partnerships 1 point : City in partnership with 1-6 other national or sub-national agencies/ private company/ NGO/ academic institutions/ international organisations 2 points : City in partnership with 7-12 other national or sub-national agencies/ private companies/ NGOs/ academic institutions/ international organisations 3 points : City in partnership with 13-19 other national or sub-national agencies/ private companies/ NGOs/ academic institutions/ international organisations 4 points : City in partnership with 20 or more other national or sub-national agencies/ private companies/ NGOs/ academic institutions/ international organisations

CBI	INDICATORS	VARIABLES	SCORE
Governance and Management	**INDICATORS 22 - 23: EDUCATION AND AWARENESS**		
	RATIONALE FOR SELECTION OF INDICATOR Education can be divided into two categories, formal through the school curriculum or informal. Two aspects will be evaluated, i.e., formal education and public awareness. While Indicator 14 gives an indication of school children's use of recreational services provided by ecosystems, Indicators 22 and 23 highlight: (i) whether biodiversity is included in the school curriculum; and (ii) the number of outreach or public awareness events are held per year? For Indicator 22, 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. For Indicator 23, the event should either be organised entirely by the city authorities, or there should be heavy involvement of the authorities before the event can be considered for inclusion in the indicator. Events that just take place within the city are not considered, as they are not representative of the governance exerted by the city authorities.	HOW TO CALCULATE INDICATOR Indicator 22: Is biodiversity or nature awareness ~~is~~ included in the school curriculum (e.g. biology, geography, etc.) Indicator 23: Number of outreach or public awareness events held in the city per year WHERE TO GET DATA FOR CALCULATIONS Education department, city councils, NGOs	BASIS OF SCORING Indicator 22: 0 point : Biodiversity or elements of it are not covered in the school curriculum 1 point : Biodiversity or elements of it are being considered for inclusion in the school curriculum 2 points : Biodiversity or elements of it are being planned for inclusion in the school curriculum 3 points : Biodiversity or elements of it are in the process of being implemented in the school curriculum 4 points : Biodiversity or elements of it are included in the school curriculum Indicator 23: 0 point : 0 outreach events/ year 1 point : 1 - 59 outreach events / year 2 points : 60 -149 outreach events / year 3 points : 150-300 outreach events / year 4 points : > 300 outreach events / year Cities are requested to include a full list of the events included in the calculation for Indicator 23, as well as information on how many people attended the event or were targeted where available.

PART III: CALCULATION OF THE INDEX

INDICATOR	CALCULATION	SOURCE	SCORE
Native Biodiversity in the City			
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Ecosystem Services Provided by Biodiversity in the City			
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Governance and Management of Biodiversity in the City			
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ANNEX A

Brief Explanation on CBD's Relevant Thematic Areas to Cities and Local Authorities

The thematic programmes of work and cross-cutting issues of the Convention (see http://www.cbd.int/programmes/ for a complete list) apply, in general, both to the national as to the sub-national level. For this reason, local authorities developing and/or reviewing their biodiversity strategies and action plans can be guided by all of them. However, for ease of reference, below is a list of the most recent (COP 9) decisions of the CBD with a direct bearing on local authorities:

Agriculture: decision IX/1 on Agricultural Biodiversity states, in its *consideration*, that Parties recognize the challenge to secure sustainable food production globally and increase agricultural production for local needs, as an important step to eradicate poverty and sustain livelihoods. Urban agriculture has increased in economic and social importance, and land-use planning in the agricultural expansion frontier is a key mandate for local authorities. Local authorities are invited to implement, as appropriate, projects and activities on urban agriculture. The CBD Food and Nutrition initiative (see http://www.cbd.int/agro/food-nutrition/) also relates to the work of local governments.

Ecosystem approach - This is the conceptual framework for the Convention, and in practice it means the full involvement of local authorities (see http://www.cbd.int/ecosystem/). Decision IX/7 on the Ecosystem Approach mentions, in item (c), that although the ecosystem approach is not being applied systematically to reduce the rate of biodiversity loss, many examples of successful application at the local scale are available and should be widely promoted and communicated (inter alia in National Reports). Most of these examples can be considered as positive outcomes for both biodiversity and human well-being. Local authorities are invited to report, to their National Governments, on such cases.

Climate change, desertification and biodiversity: Local authorities also retain critical mandates on the links between biodiversity and the other 2 Rio Conventions (climate change and desertification). Decision IX/16 notes that efforts at the national and local levels are of high importance to the achievement of synergies between activities addressing biodiversity, combating desertification/land degradation and climate change, and *invites* Parties and other Governments, where appropriate and based on national circumstances, to implement the activities contained in the indicative list in the annex to the decision – the same applies to local authorities.

Listing and identifying species - decision VIII/3 (paragraph 11 e) on the Global Taxonomy Initiative invites Parties to undertake, as part of the Global Initiative on Communication, Education and Public Awareness programme and in collaboration with relevant partners, activities demonstrating the importance of taxonomy for the general public, including information on products, lessons learned, and accomplishments of taxonomy-related projects, and activities encouraging public participation, recognising the importance of volunteer naturalists and local and indigenous people as a source of expertise; the request applies as well to local authorities in particular relating to the first component of the City Biodiversity Index (urban biodiversity assessments).

Local networks of protected areas: sub-national governments can contribute substantially to any 2011-2020 targets of the CBD on protected areas. The national protected areas network of Brazil, for instance, has over 700 municipal Parks and 600 State parks for 300 National parks – and 800 private reserves. Additionally, as development and urbanization define land-use patterns, the likeliness increases that new protected areas and corridors, as well as sustainable land-use mosaics such as biosphere reserves, will come from sub-national and local levels of government. CBD decision VIII/24 on Protected Area, item (f), vi, proposes to increase, where possible, national and local government budgets for protected-area management.

More recently, several references to the contribution of local authorities have come up at SBSTTA-14 and WGRI-3. The draft **CBD Strategic Plan** 2011-2020, as proposed by WGRI-3 under item VI ("Support Mechanisms", paragraph 23 on partnerships and initiatives to enhance cooperation), mentions that initiatives such as promoting engagement of cities and local authorities will contribute to the implementation of the Strategic Plan. Under item V of the draft Strategic Plan (Implementation, Monitoring, Review and Evaluation), WGRI-3 states that it will be implemented primarily through activities at the national and sub-national level, with supporting action at the regional and global levels. One of the targets for the Strategic Plan set by SBSTTA-14 (as strategic goal A, address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society) was that by 2020, the values of biodiversity should be integrated by all countries in their national and local strategies and planning processes, applying the ecosystem approach. SBSTTA-14 also recommended, under the topic of examination of outcome-oriented goals for the Strategic Plan, that the Conference of the Parties recognise the need to contribute to the development and refinement of indicators suitable for monitoring biodiversity at local level.

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ANNEX B

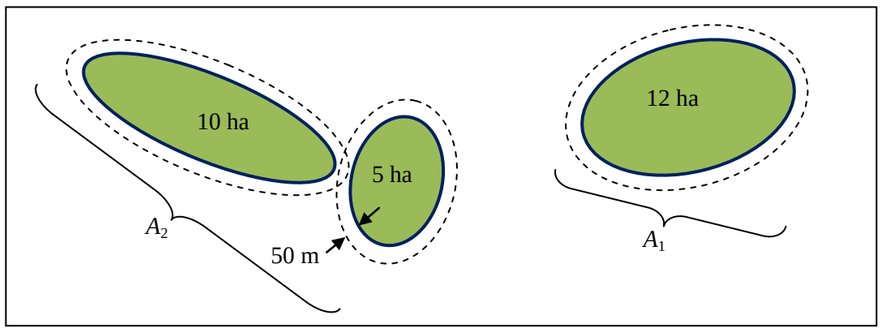
Illustration of the calculation for Indicator 2

Formula:

$$IND2 = \frac{1}{A_{\text{total}}}\left(A_1^2 + A_2^2 + A_3^2 + ... + A_n^2\right)$$

where *n* is the total number of natural areas (see example below), A_1 to A_n represent the sizes of the natural areas, from natural area 1 to natural area *n*, and A_{total} is the total area of all natural areas together.

Example:



Calculation steps: There are three patches in this landscape. We add a buffer of 50 m around each patch to find out which patches are considered to be connected. When the buffers overlap, the distance of the patches is less than 100 m. We see that the patch on the right (size of 12 ha) is not connected to any other patches. We give it the name A_1 = 12 ha. The two patches on the left are connected. Therefore, their areas have to be added, and we give this group of patches the name A_2 = 10 ha + 5 ha = 15 ha. A_{total} is the sum of A_1 and A_2, i.e., $A_{\text{total}} = 12\ \text{ha} + 15\ \text{ha} = 27\ \text{ha}$. We can now calculate *IND2* as

$$IND2 = \frac{1}{A_{\text{total}}}\left(A_1^2 + A_2^2\right) = \frac{1}{27\ \text{ha}}\left(12 \times 12\ \text{ha}^2 + 15 \times 15\ \text{ha}^2\right) = \frac{369}{27}\text{ha} = 13.67\ \text{ha}\ .$$

In case that the 5 ha patch and the 10 ha patch were farther apart from each other than 100 m, they would not be considered to be connected, and the value of *IND2* would be much lower, because then all three patches would be considered separately in the formula: $IND2 = \frac{1}{27\ \text{ha}}\left(10 \times 10\ \text{ha}^2 + 5 \times 5\ \text{ha}^2 + 12 \times 12\ \text{ha}^2\right) = \frac{269}{27}\text{ha} = 9.96\ \text{ha}\ .$

Cities with difficulties in calculating this indicator may contact Dr. Jochen Jaeger, Email: jjaeger@alcor.concordia.ca; Tel.: (+1) 514 - 848-2424 extension 5481, Fax: (+1) 514 - 848-2032.

For more information, please see the references listed below:

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